School-Based Intervention to Prevent Smoking Initiation among Adolescents in Egypt

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Declaration

The candidate confirms that the work submitted is his own and that appropriate credit has been given where reference has been made to the work of others.

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Abstract

Background: Egypt has the highest prevalence rate of current smoking (19.7% among adults) among Arab countries. Unless prevented, smoking would cause a heavy public health burden on Egypt in the future. Adolescents should be prevented from smoking as most Egyptians smokers initiate smoking before the age of 14 years and adolescents' smoking is a predictor of adults' smoking. School-based interventions are effective and cost-effective and commonly used in preventing adolescents from smoking initiation in many countries and appropriate for Egypt because of the high school attendance rates in both sexes. However, there are limited existing school-based smoking prevention interventions (SBSPIs) in Egypt.

This thesis **aims** to explore what needs to be implemented in schools to prevent Egyptian adolescents from smoking initiation and make recommendations towards designing culturally sensitive SBSPIs in Egypt. *This aim was achieved through three complementary studies*: 1) a literature review that determined factors that influence adolescents' smoking in Egypt. 2) A systematic review that identified factors which influenced the effectiveness of SBSPIs in Arabic and/or Low and Middle-income countries (LMICs) in terms of theoretical constructs, intervention functions, and cultural- appropriateness. 3) Then a qualitative study that explored the current and anticipated role of preparatory schools in preventing smoking initiation by adolescents in Upper-Egypt.

The finding from the three sub-studies emphasised that in order to increase pupils' capability, motivations and opportunities to avoid smoking initiation, SBSPIs in Upper-Egypt should: 1) raise awareness about various consequences of different forms of smoked tobacco using appealing and memorable educational methods through curricular and extracurricular activities and attractive school-posters. 2) Enhance skills of refusing smoking offers, positive self-assertiveness, stress management, problem-solving, decision-making and goals' setting, monitoring and achieving. 3) Encourage considering the social unacceptability of adolescents' smoking, especially by females. 4) Encourage imitating successful never-smokers and represent smokers in disliked pictures to create negative images about smoking. 5) Continue restricting pupils' smoking and carry of cigarettes inside schools and obtaining written commitments from pupils, witnessed and signed by parents, to do so. 6) Reward non-smokers, financially or socially, alongside penalizing smoker pupils. 7) Encourage and facilitate practicing hobbies and exercises as alternatives to smoking in burning negative emotions and using of free time. 7) Restrict smoking by staff, parents and visitors inside schools; educate them on smoking consequences; encourage them to be role-models; enable smoker staff and parents to quit; and use non-financial or feasible financial punishments if staff smoke in schools. 9) Train nominated volunteers of never-smoked pupils to provide informal peer-education and peer support to resist peer-pressure to smoke and create peer-pressure to avoid smoking. The thesis was **concluded** with an Egypt-tailored version of the Capability, Opportunity and Motivation (COM-B) model of the Behaviour Change Wheel (BCW).

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List of abbreviations

ASCE	Population Council's Adolescence and Social Change in Egypt
BCW	Behaviour change Wheel
CDC	Centre for Disease Control and Prevention
CI	Confidence interval
COM-B	Capability Opportunity Motivation –Behaviour
DHS	Demographic Health Survey
EMRO	Eastern Mediterranean Region
FCTC	Framework Convention on Tobacco Control
FGDs	Focused Group Discussions
GSHS	Global School-based Pupils Health Survey
GYTS	Global Youth Tobacco Survey
LMICs	Low and Middle income countries
MENA	Middle East and North Africa
MOE	Ministry of Education
MoHP	Ministry of Health and Population
MRC	Medical Research Council
NCD	Non Communicable Diseases
QDA	qualitative data analysis
RCTs	Randomized Control Trials
SBSPIs	School-Based Smoking Prevention Interventions
SD	Standard Deviation
SES	Socio-Economic Status
SYPE	Population Council Survey of Young People in Egypt
TDF	Theoretical Domain Framework
UNDESA	The United Nation Department of Economic and Social Affairs
UNESCO	The United Nations Educational, Scientific and Cultural Organization
UNFPA	The United Nations Population Fund
UNICEF	The United Nation Children's Fund
WB	The World Bank
WFP	The World Food Programme
WHO	The World Health Organization

Glossary

- **Adolescents**

The World Health Organization (WHO) defines adolescents as "those people between 10 and 19 years of age" (WHO, 2014c, p1). Therefore, majority of adolescents are children, based on the age-based definition of child who is a person under the age of 18 years old (United Nations General Assembly, 1989). Adolescence also overlaps with youth period, defined as a period of transition from been a dependent child to be an independent adult which includes people who are aged 15-24 years (UNDESA, 2016). WHO uses young people term to combine adolescents and youth (WHO, 2014c) .

However, adolescence is a characteristic of period of life with specific health and developmental needs and rights rather than an age. It is a period of learning to manage emotion and relationship, developing knowledge, skills and personality in preparation of taking adult roles (WHO, 2014c).

- **Indicators of Smoking Behaviour**

Smoking behaviour is usually measured using the following variables which are defined, in this study, as follow:

a) *Ever smokers* are defined as those who have tried smoking at least once in their lifetime, even a puff or two
b) *Current smokers* are defined as those who have smoked at least once in the 30 days prior to surveys administration.
c) Adolescents' susceptibility to smoke is measured by the absence of a firm decision not to smoke and adolescents who are susceptible to smoking are those who do not rule out smoking in future.

These definitions are commonly used in the global evidence and most surveys on smoking. (Asma et al., 2015, CDC, 2016a, Ng et al., 2014, WHO, 2014d, WHO and CDC, 2009a, WHO and CDC, 2014b).

- **Tobacco Use and smoking forms**

Tobacco-use includes the consumption of either smoked or smokeless tobacco products or both. Smoking means the combustion of tobacco leaves or inhaling the smoke which includes: manufactured cigarettes, cigars, pipes, roll-your-own cigarettes, Bidis, water-pipe (Shisha) and Electronic-cigarettes. Smokeless-tobacco is consumed through the moth or nose without combustion or burning which includes: chewing tobacco, snus, snuff (dry and moist) and dissolvable (WHO, 2006). The description of these tobacco products is provided in the Annex.

Chapter 1 - Introduction to the Thesis

1.1 Introduction

This PHD project explores school-based smoking prevention intervention (SBSPI) in Egypt. This chapter provides an introduction and rationales to the thesis and identifies its main objectives, focus, outputs and structure.

1.2 Tobacco-use epidemic

Tobacco-use is a global epidemic, as about 22% of adults worldwide are current users of tobacco, more than one billion smokers and 80% of them smoke daily (WHO, 2014a), and these rates increase annually (WHO, 2019). Although tobacco has addictive effects (Henningfield et al., 2004), it is the most commonly available licit drugs globally. Economically, tobacco-use causes over US$500 billion of global economic losses every year (Ekpu and Brown, 2015). Tobacco is the main cause of preventable morbidity, disability and premature death, globally (WHO, 2014a). It is estimated that over seven million people die annually because of tobacco-use, accounting for 10% and 6% of the global deaths among male and female adults respectively, 10% of these deaths caused by second-hand smoking (WHO, 2014b). If the current trend of tobacco-use continues, tobacco-related deaths are expected to increase to be 10 million by 2030 (Satcher, 2001). Tobacco-use is one of four major risk factors of Non-Communicable Diseases (NCD) (WHO, 2013a) and NCDs are responsible for 70% of the global deaths (WHO, 2018). Smoking-related morbidity, disability and mortality are preventable therefore, controlling tobacco-epidemic is a global concern and over half a trillion dollars are spent annually, worldwide, on tobacco control measures (WHO, 2008).

More than 80% of the worlds' smokers live in Low- and Middle-Income Countries (LMICs) (WHO, 2015c) and smoking negatively affect the health status, social development and economic growth of these countries through increasing smoking-related morbidity, disability and mortality which reduce labour productivity and potentials for income-earning (WHO, 2015c). LMICs carry the burden of three-quarters of the global NCD deaths and 82% of these deaths happen before the age of 70 years (WHO, 2014b, WHO, 2019). Smoking, similar to other NCD risk factors, is more prevalent in LMICs because of the unavailability or poor implementation of strong preventive measures in these countries compared with high-income countries which managed to reduce smoking rates over years (WHO, 2019). For example in many LMICs the cost of tobacco is affordable and accessible due to low tobacco taxation or poor restriction of tobacco promotion and advertisement (WHO, 2015c, WHO, 2013a, WHO, 2013b).

In Egypt, a low-income country (WB, 2017b), NCDs are responsible for 84.7% of all Egyptian deaths (WHO, 2016). It is estimated that one in four adults in Egypt would die prematurely (between the age of 30 and 70 years) from either cardiovascular disease, cancer, diabetes, or chronic respiratory disease (WHO, 2014b). Tobacco-use is a major risk factor of these diseases (WHO, 2014a), the CDC (Centre for Disease Control and Prevention) generally identified that patients with these diseases have either smoked, smoking or second-hand smokers (CDC, 2017) and 90% of the lung cancer cases reported in Egypt are associated with smoking (WHO, 2014d). In Egypt, current-smokers spend 23.1%, and the poor of them spend 10%, of their family-income on smoking (Hanafy et al., 2010, Nassar, 2003, Saleh et al., 2009). Nevertheless, smoking is prevalent in Egypt as the next section discusses.

1.3 Prevalence of tobacco-use in Egypt

Smoking is a public health problem in Egypt, as over 30 years, Egyptian smokers' number has annually increased more than twice as fast as the population growth rate (8-9% versus 2%) (Nassar, 2003). Egypt participates in two global standard surveys that aim at monitoring tobacco-use among adults and youths nationally and internationally: the Global Adult Tobacco Survey (GATS) and the Global Youth Tobacco Survey (GYTS) both are last implemented in Egypt in 2014. The GATS revealed that the prevalence rate of tobacco-consumption in Egypt is the highest in the Arab world and the second-highest rate in the Eastern Mediterranean (MENA) region, after Turkey (Asma et al., 2015). One fifth (19.7%) of Egyptian adults are current tobacco users (9.8 million) (Asma et al., 2015) and about one quarter (23.8%) of Egyptian adults had tried tobacco in their life (MOHP et al., 2009). In Egypt, the majority (87%) of current tobacco users (90.5% in men and 81.1% in women) smoke tobacco (Asma et al., 2015), 84% smoke manufactured cigarettes and 17% smoke Water-pipe (Shisha), whereas smokeless-tobacco is the least popular type of tobacco (MOHP et al., 2009). Out of the 23 countries in the MENA region, Egypt has the greatest cigarette consumption per capita (Shafey et al., 2003). Although Egyptians represent only 21.5% of the MENA's population (WB, 2017b), Egypt consumes 24% of the total cigarette consumption in the MENA region (Corrao et al., 2000). This is explained by the high rate of heavy smoking in Egypt, the majority of smokers (95%) smoke daily, four out of five daily smokers consume between 16 and 20 cigarettes per day and a quarter (25%) of daily smokers are nicotine dependants as they start smoking within five minutes of awakening (MOHP et al., 2009).

Egypt is the ninth-largest raw tobacco importer in the world, tobacco represents 1% of the total imports, which is relatively high and poses a burden on the country's economic development (Hanafy et al., 2010). Cigarettes' prices in Egypt are among the cheapest in the MENA region (Hanafy et al., 2010) which caused 3.8 fold increase in cigarette consumption rate between 1970 and 1999 in Egypt (Nassar, 2003). However, since 2014 cigarettes become less affordable, compared to 2008, buying 100 packs of the most popular brand in Egypt costs 3.35% of GDP per capita (WHO, 2015d), as a result of taxes increment (by 40%) (WHO, 2015c) which is expected to reduce the cigarettes consumption in Egypt by 19% (Hanafy et al., 2010). However, the dramatic increase in illicit tobacco trade in Egypt (from 11.3% in 2010 to 18.6% in 2013) might fuel the tobacco-epidemic as it increases accessibility and affordability to tobacco products, especially among the poor (MOHP and WHO, 2014). Upper-Egypt, where the highest poverty rate in Egypt exists (CAPMS, 2014), has the highest prevalence of daily cigarettes-smoking in Egypt (19.6%) (MOHP et al., 2009).

Smoking in Egypt markedly varies with gender (MOHP, 2015), 38% of men are current-smokers, compared with only 0.5% of women, showing the highest men to women ratio of smoking prevalence globally (76:1) (Asma et al., 2015) and in LMICs (Sreeramareddy et al., 2018). This variation is caused by cultural factors that view smoking as acceptable social behaviour for males and a taboo for females (Islam and Johnson, 2005). Consequently, women's smoking is hidden while men tend to smoke heavily over time. According to the GATS (Asma et al., 2015) over half of smoker men are heavy-smokers (smoke 20 or more cigarettes per day) whereas the average number of daily-smoked cigarettes by men was 19.4 cigarettes in 2009 (MOHP et al., 2009).

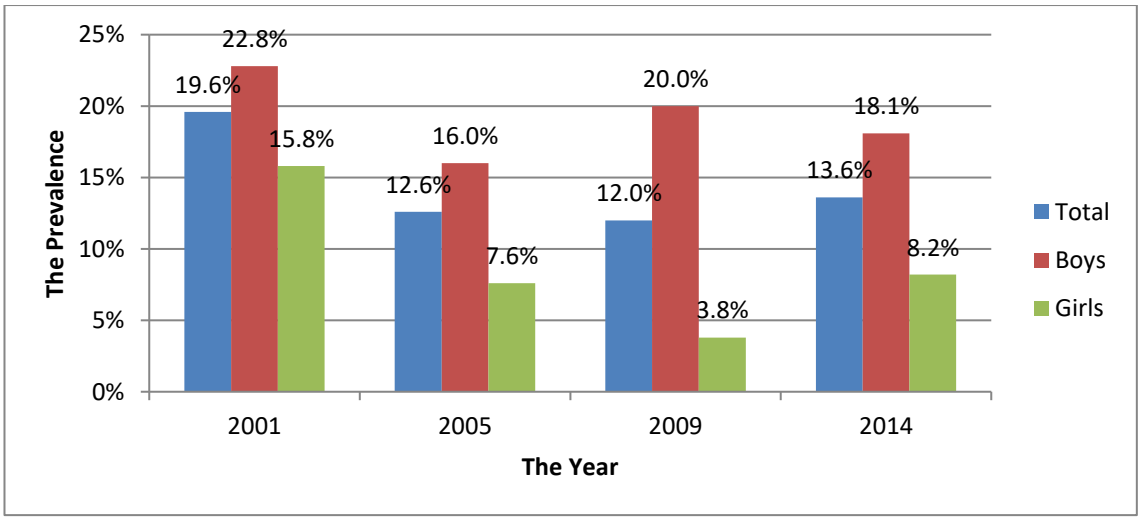
Current tobacco-use rates in Egypt increase with age (Asma et al., 2015). In 2009, the current daily-smoking rate in the age group 25-64 years was double the rate among those aged 15-24 years (20.3%)(MOHP et al., 2009).

If the current trend of tobacco-consumption continue in Egypt, tobacco will cause heavy public health burden on Egypt in the future; especially in such a country with a large and young population (91.51 million inhabitants, 60% of them are below the age of 24) (WB, 2017b). Smoking prevention interventions should target Egyptians at adolescence age because adolescents' smoking in Egypt is a predictor of adults' smoking (Youssef et al., 2002) and most Egyptian smokers start smoking at adolescence age. The national average age of initiating *daily* smoking among adults is 16.8 (CI= 16.6-17.1) years old (MOHP et al., 2009). The next section discusses adolescents' smoking in Egypt.

1.4 Tobacco use among Egyptian adolescents

A number of national and local studies have investigated tobacco-use among Egyptian adolescents. Although the validity and focus of these studies were different, all the findings emphasise the existence of adolescents' smoking problem in Egypt. GYTS is a standard school-based survey aims at monitoring tobacco-use, attitude and exposure to tobacco among a national representative sample of students aged 13-15 years. GYTS is implemented every 4-5 years in many countries using standard methods and indicators to allow comparison between countries over years (CDC, 2016b). The findings of GYTS indicate that tobacco-use by Egyptian adolescents is a major public health problem. One in three (31.3%) pupils aged 13-15 had ever-used tobacco (smoked or smokeless) and one in seven (13.6%) pupils currently use any tobacco products (WHO and CDC, 2014b). As Figure 1 reveals, there was a decline by 7.6% in the prevalence of current tobacco-use among Egyptian adolescents, aged 13-15, between 2001 and 2009; thereafter the rate has increased to 13.6% in 2014 (Dous, 2001, WHO and CDC, 2005, WHO and CDC, 2009a, WHO and CDC, 2014a). Furthermore, the proportion of pupils who ever-smoked cigarettes (even one or two puffs) before the age of 16 years has increased from 13.8% in 2001 to 18.2% in 2014 (WHO and CDC, 2014a, Dous, 2001). More male adolescents use tobacco than females, as illustrated in Figure 1, but this gender-difference is detailed in section 3.4.1.2.

Figure 1. The prevalence of current tobacco-use by Egyptian adolescents, aged 13-15, 2001-2014



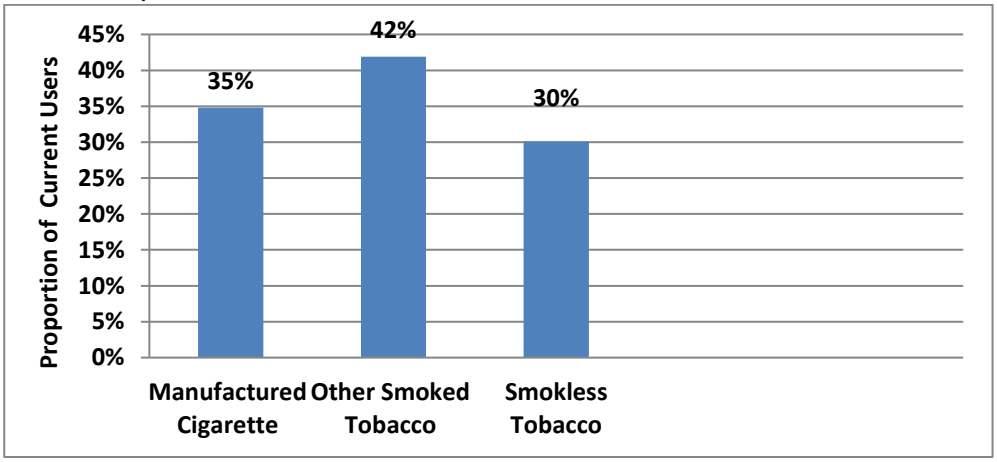
Source: (Dous, 2001, WHO and CDC, 2005, WHO and CDC, 2009a, WHO and CDC, 2014a)

Most (89.4% CI= 79.3-94.9) adolescents, aged 13-15, who ever-smoked cigarettes *tried a cigarette* before the age of 14 years (MOHP et al., 2011). While smokers of illicit cigarettes[1] start *daily smoking* at a later age, 19.68 years old on average (CI=13.0-26.3), probably because of the affordability as 73.5% of them have low-income (MOHP and WHO, 2014). The Global School-based Students Health Survey (GSHS) shows that most (89.4% CI= 79.3 -94.9) pupils aged 13-15 who ever-smoked cigarettes *tried a cigarette* before age of 14 years (MOHP et al., 2011). The GYTS indicates that about a third (32.3%) of adolescents aged 13-15 who ever-smoked Shisha tired it before 11 years old (WHO and CDC, 2014b). Also, another older and small school-based study (635 students in two schools) in Upper-Egypt (Assiut city)indicated that the median age of ever *trying* cigarettes and Water-pipe smoking is 11 and 12 years old, respectively (Gadalla et al., 2003).

1.4.1 Type of tobacco products used by Egyptian adolescents

Smoked tobacco (cigarette and Shisha) is the most popular form of tobacco among Egyptian adolescents (WHO and CDC, 2009a), used by 74.3% of current tobacco users adolescents aged 13-15 (WHO and CDC, 2014a). Until 2009, manufactured cigarette was the most popular tobacco products, used by 74.2% and 62.5% of current smokers, aged 13-15, in 2005 and 2009 respectively (WHO and CDC, 2005) (WHO and CDC, 2009a). However recently, other smoked tobacco becomes more popular than manufactured cigarette, used by 42% versus 35% of adolescents who are current tobacco users based on the last GYTS (WHO and CDC, 2014b), see Figure 2. Other smoked tobacco includes Shisha and hand-rolled-cigarettes but the rates of using each type were not specified in this GYTS report. The report also did not distinguish those who smoke more than one type of tobacco products. Another study emphasized the popularity of hand-rolled-cigarettes, especially among the poor, because of their low cost (MOHP and WHO, 2014).

Figure 2. Type of tobacco used by Egyptian adolescents aged 13-15 who are current tobacco users, 2014



Source: (WHO and CDC, 2014b)

The GYTS illustrates that among current tobacco users, boys use more cigarette than girls (45.9% versus 9.7%) whereas girls use more smokeless-tobacco than boys (65.9% versus 14.9%) (WHO and CDC, 2014b). Among adolescents aged 13-15 in general, over a quarter (26.3%) of boys, had ever-tried cigarettes-smoking compared with 8.7% of girls (WHO and CDC, 2014a). Whereas cigarette trials by boys is more common in rural Qualyobia where 40% of

[1] Imported through illicit tobacco trade, come with no graphic pictures, no warnings, no taxes, therefore cheaper than other cigarettes.

male pupils in secondary schools had ever-tried cigarettes compared with 7% of female pupils (7%) (El-Gilany et al., 2008).

There is an alarming growth of water-pipe smoking among Egyptian adolescents, especially Shisha, (Kheirallah et al., 2016a) which was a common practice by adult males in the past (El-Awa F, 2010). This is evidenced by the recent growth of the number of Shisha venues catering to youths in Egypt (El-Gilany et al., 2008). Shisha-smoking by male youths is most prevalent in the age group 25–29 years and regular Shisha-smoking is more prevalent in Frontier Governorates[2] (Population Council, 2015). However, experimenting Shisha at adolescence age is increasing as 17.9% of adolescents, aged 13-15, had ever-tried Shisha in 2014 compared with 11.3% in 2009, 6.3% of them are current Shisha-smokers (WHO and CDC, 2014b, WHO and CDC, 2009b). Approximately half (47.3%) of adolescents, mean age 17.8+1.2, who currently use Shisha smoke it once to two times per day and about a quarter of them (27% and 25.7%) smoke it either three to five times or more than five times per day (Labib et al., 2007). The rates of ever and current smoking of Shisha are higher among male than female secondary school pupils (Gadalla et al., 2003, El-Gilany et al., 2008). Among Egyptian youths, aged 13-35, more males (13.7%) tried Shisha than females (0.5%) but there is no significant gender-difference among the regular smoker smokers of Shisha (2.6% for males and 2.4% for females) (Population Council, 2015). Shisha-smoking by adolescents is associated with cigarettes-smoking, as as detailed in section 3.4.1.12.

The findings above indicate that smoked tobacco (cigarettes and Shisha) is the main form of tobacco used by Egyptian adolescents nationally. This is also confirmed in other local studies at different Egyptian governorates such as Mansoura (El-Gilany et al., 2008), Qualyobia (Gadalla et al., 2003), Assiut (Ibrahim and Ahmed, 2006), rural Minya (Harbour, 2012), Alexandria (Islam and Johnson, 2005, Youssef et al., 2002), Sharkia (Khafagy, 1996). Accordingly, this PhD project will be focused on adolescents' use of smoked tobacco.

1.4.2 Frequency of smoking by Egyptian adolescents

One in six (16.7%) current cigarettes-smoker adolescents, aged 13-15, smoke daily for at least 20 days a month while 52.4% of current Shisha-smokers smoke at least two sessions daily (WHO and CDC, 2014b). The frequency of smoking by adolescents is higher in Upper-Egypt as among current cigarettes-smokers in secondary schools at Assiut city, almost a quarter (23%) smoke daily and over a half (51.2%) have been smoking for more than three years and 30% of them smoke more than 16 cigarettes per day (Ibrahim and Ahmed, 2006).

Furthermore, 62% of current cigarettes-smokers, aged 13-15, start smoking immediately after awakening and 74% smoke daily every four hours (WHO and CDC, 2014b) which indicates nicotine dependency (Mayhew et al., 2000, DiFranza et al., 2007). Although these rates are fewer than adults' rates (Boulos et al., 2009, Nassar, 2003, MOHP et al., 2009), see section 1.3, the findings reflect that considerable proportion of smoker adolescents in Egypt are heavy and frequent smokers and therefore are exposed to serious risks.

[2] Egypt has 27 governorates divided into four regions: city governorates (Alexandria, Cairo, Port Said and Suez), Lower-Egypt (the Nile Delta region), Upper-Egypt along the Nile River from Cairo to Aswan, and frontier governorates covering Sinai and the deserts that lie west and east of the Nile.

1.5 Preventing Egyptian adolescents from smoking initiation through schools

Section 1.4 clarified that adolescents' smoking is a rising problem in Egypt, if this trend continues, Egypt will face the smoking epidemic among the young generation in the near future. In Egypt, smoking delays adolescents' growth, as smoker adolescents have less weight (by mean of 5.5 ± 5.16 Kilograms, P-value=0.001) and less height (by mean of 6.16 ± 5.22 centimetres, P-value=0.001) than non-smokers (Ibrahim and Ahmed, 2006). Moreover, young smokers are likely to be regular-smoker adults, in Egypt (Asma et al., 2015) and other countries (Haas and Smith, 2012, Chassin et al., 1996, Chen et al., 2014, Verma et al., 2015, Sussman, 2002), be nicotine dependent and adult substances abusers (Haas and Smith, 2012) and therefore are at high risk of developing physical and psychological complications of NCDs (Gomez et al., 2009, Vianna et al., 2008, El-Hosseiny et al., 2003, Williams and Sandler, 2001). However, the burden of smoking-related morbidity would takes years before been recognized because of the late onset of complication and mortality (WHO, 2013a). Moreover, it is challenging to quit smoking once smoking habit is established and the probability of quitting is inversely proportional with the age of initiating smoking (Breslau and Peterson, 1996, Hefler et al., 2017). Accordingly, preventing the uptake of smoking by Egyptians during adolescence is crucial as this would prevent the onset of subsequent NCDs in later-life and reduce the NCD burden in future Egyptian generations.

Preventing smoking initiation is prioritized in the global agenda for tobacco-epidemic control (WHO, 2013a). Smoking prevention is also a core in the global MPOWER package for tobacco control that includes the following six effective policies: "**M**onitor tobacco-use and prevention policies, **P**rotect people from tobacco smoke, **O**ffer help to quit tobacco-use, **W**arn about the dangers of tobacco, **E**nforce bans on tobacco advertising, promotion and sponsorship, and **Ra**ise taxes on tobacco" (WHO, 2008, p.10). This package was developed by the WHO to guide countries' implementation of the WHO Framework Convention on Tobacco Control (FCTC). Countries' implementation of MPOWER strategies is regularly monitored toward the global control of the tobacco-epidemic (WHO, 2015c). The overall target of the global strategy to accelerate controlling tobacco-use, which guides countries' implementation of the FCTC in the next seven years (2019 – 2025), is to reduce the age-standardized rate of current tobacco-use among those aged 15 years old and above by 30% (WHO, 2019). This target will not be achieved without preventing adolescents from smoking initiation. Egypt has signed the FCTC on 17 June 2003, became a part of this convention on May 26, 2005 (WHO, 2015d). Egypt adopted national policies for tobacco control (WHO, 2015b) and the smoking prevention plan aims to reduce adolescents' smoking to 3% and delay the age of smoking initiation (el-Henawy, 2000).

School-based interventions have been used, over the past three decades in many countries, in preventing adolescents' smoking (Thomas et al., 2013) because it offers sustainable, efficient and equitable access to adolescents and behaviour change activities could fit within the regular school curriculum (Langford et al., 2015, Griffin and Botvin, 2010, Green et al., 2015, Wagner and Waldron, 2001, Wanger et al., 2001). However, there is limited evidence on the existence of SBSPIs in Egypt in spite of the high attendance rates of schools by Egyptian adolescents of both genders (UNESCO, 2016, Ghoneim et al., 2014) which makes school-based interventions appropriate for targeting adolescents regarding smoking prevention. Accordingly, this thesis explores what feasible and culturally acceptable strategies should be included in school-based interventions in order to prevent adolescents in Egypt from smoking initiation.

1.5.1 Preparatory schools in Egypt

The school education system in Egypt consists of: pre-school (two years), primary (six years), preparatory (three years) and secondary (three years) (Ghoneim et al., 2014) educational levels. Children are enrolled in primary school at the age of six and should finish it before the age of 12 to start the preparatory school-education which is unusually completed before completing 15 years old (UNICEF, 2014). The primary and preparatory education is compulsory in Egypt and pupils are awarded a basic education certificate after passing the final exam at the end of preparatory education (Ghoneim et al., 2014). Thereafter they could go to secondary schools which are either general secondary schools, that offer General Secondary Education Certificate, or Technical Secondary schools, that offer Technical Secondary Education Diploma (MOE, 2017).

This thesis focuses on preparatory schools which usually include adolescents aged 13-15 years.

1.5.2 Types of schools in Egypt

According to the Central Agency for Public Mobilization and Statistics (CAPMS, 2017), there are five main types of schools in Egypt: public, private, institutional and faith schools addition to schools of embassies. Each type of these schools could include boys only, girls only or both sex.

A. Public Schools:

Public schools include 92% of students in Egypt and they are free of charge (CAPMS, 2017). Ministry of education is completely responsible for funding, supervising and managing public schools (CAPMS, 2017). In general, resources, equipment's, teachers' number and skills at public schools are inappropriate to adapt the large number of students (Abdelmajied, 2015). There are two types of public schools: local and experimental public schools. The local public schools teach the Egyptian curriculum in Arabic and provide limited foreign language skills. While the experimental public schools teach the curriculum in a foreign language (English or French)(MOE, 2016) .

B. Other schools

Only 8% of students in Egypt enrolled in schools that are not public which include private for profit, institutional and faith schools addition to schools of embassies (CAPMS, 2017).

- **Private for-profit schools**

Most private schools teach the national curriculum (in Arabic or another foreign language) in addition to advanced training on at least one foreign language (CAPMS, 2015). Moreover, some private schools offer accreditation equivalent to certificate in other developed countries such as including the British General Certificate of Secondary Education and the French Baccalaureate (Abdelmajied, 2015).

- **National Institutions' Schools**

These schools are owned, managed and supervised by national institutions rather than individuals (Ghoneim et al., 2014). The fee at these schools is close to the private school fees but it is not governed by the laws governing private schools. Institutional schools provide better foreign language training than public schools (Abdelmajied, 2015).

- **Faith schools**

Faith schools are type of institutional schools that teach the national curriculum but have religious mission. Faith schools charges less fees than institutional schools. Faith schools are either Christian or Al-Azhar schools (MOE, 2016). Although Al-Azhar schools are not directly managed or governed by ministry of education they teach the Egyptian curriculum is in

sciences, math and foreign languages in addition to private Islamic oriented curriculum in Arabic and religious studies. This private curriculum set by Al-Azhar institution, which supervise and manage these schools. Nevertheless faith schools teach faith oriented curriculum, they are subject to supervision by the Egyptian Ministry of Education (CAPMS, 2008).

- **Embassy Schools**

The Ministry of Education does not control these schools in any way because they belong to foreign embassies. These schools teach the curriculum of their nations and follow their educational system; without any adaptation to the curriculum to the Egyptian education system (MOE, 2016). According to the Egyptian law, these schools do not fall under private schools law (CAPMS, 2008).

1.6 The focus of the study and overall objectives

This thesis explores adolescents' smoking and SBSPI in Egypt. As explained in section 1.5, preventing adolescents from smoking uptake is promising in reducing smoking and its consequences later in life and thus expected to minimize the burden of smoking in Egypt. Additionally, it is challenging to quit smoking once the smoking habit is established (Breslau and Peterson, 1996, Hefler et al., 2017), especially in LMICs where quitting services are limited and challenged by the restricted resources and expertise in these countries (WHO, 2019, WHO, 2013a, WHO, 2014b). Therefore, this thesis is focused on the primary prevention of smoking (smoking initiation) rather than smoking secession.

The thesis is focused on smoking by adolescents in general; it was challenging to focus on one form of smoking because the identified data (in study-1 and study-2) did not allow that. fore example, in most of the included studies in study-1, it was unclear if the identified causes of smoking are specific to cigarette smoking or shisha smoking only. Also, the outcome of most of the RCTs that were included in Study-2 didn't explain the difference in cigarettes or shisha smoking rates after the intervention and if the contents of the interventions were focused on one type of smoking or addressed all types. Accordingly, the thesis explores smoked tobacco, including both cigarettes or Shisha, by adolescents in Egypt, and school-based intervention to prevent smoked tobacco in Egypt. However, differences between cigarettes or shisha smoking were highlighted when the evidence is available.

The broad aim of this study is to develop a better understanding of what should be considered in school-based interventions to prevent Egyptian adolescents from smoking initiation to contribute, through making recommendations, towards designing a culturally-sensitive school-based intervention to prevent smoking initiation by adolescents in Egypt, thus controlling the rising epidemic of smoking in Egypt. This will be accomplished through the following more specific objectives which were developed according to the theoretical frameworks, explained in the next chapter:

1. To identify factors that influence adolescents' smoking in Egypt;
2. To identify factors that influenced the effectiveness of the school-based smoking prevention interventions that were implemented in Arabic and/or Low and Middle Income Countries;
3. To identify the current role of preparatory schools in preventing adolescents from smoking initiation in Upper-Egypt;
4. To explore what could be implemented in preparatory schools in Upper-Egypt to prevent adolescents from smoking initiation, from the perspective of school staff and pupils;

5. To identify the perceived barriers and facilitators of implementing school-based smoking prevention interventions in the preparatory schools of Upper-Egypt;
6. To develop a set of recommendations on the intervention functions that should be considered in designing a culturally-sensitive school-based intervention that enhances adolescents' capability, opportunities and motivations to avoid smoking initiation in Upper-Egypt.

1.7 Study overview and outputs

To achieve the above-mentioned objectives, three complementary sub-studies were conducted, as Figure 3 illustrates. The aim, specific objectives and methodology and findings of each study are discussed separately, thereafter the thesis was concluded by discussing the overall findings from the three sub-studies and recommendations were developed accordingly.

The academic outputs from this thesis are structured in eight chapters. After this introductory chapter, theories that informed this thesis are explained in chapter 2. Thereafter, factors that influence adolescents' smoking in Egypt were identified and discussed, through a literature review, then summarised in a conceptual framework in chapter three. Then, a systematic review study of SBSPIs that were implemented in Arabic and/or LMICs was conducted; chapter four discusses the aim, objectives, methods, findings and discussion of this systematic review. Next, an exploratory qualitative study was conducted to explore the current and anticipated role of preparatory schools in preventing adolescents in Upper-Egypt from smoking initiation. Chapter five outlines the aim, objectives and methodology of this qualitative study while the findings were explained and discussed in chapters six and seven. Finally, chapter eight integrates the findings from the three sub-studies and concludes the thesis with the key conclusions, recommendations for designing a SBSPI sensitive to the Egyptian context and implications for future research in this regard. The thesis was concluded with an Egypt-tailored version of the Capability, Opportunity and Motivation (COM-B) model of the Behaviour Change Wheel (BCW) which summarises what intervention functions could be used in SBSPIs at the preparatory schools in Upper-Egypt to increase pupils' capability, motivations and opportunities to avoid smoking initiation.

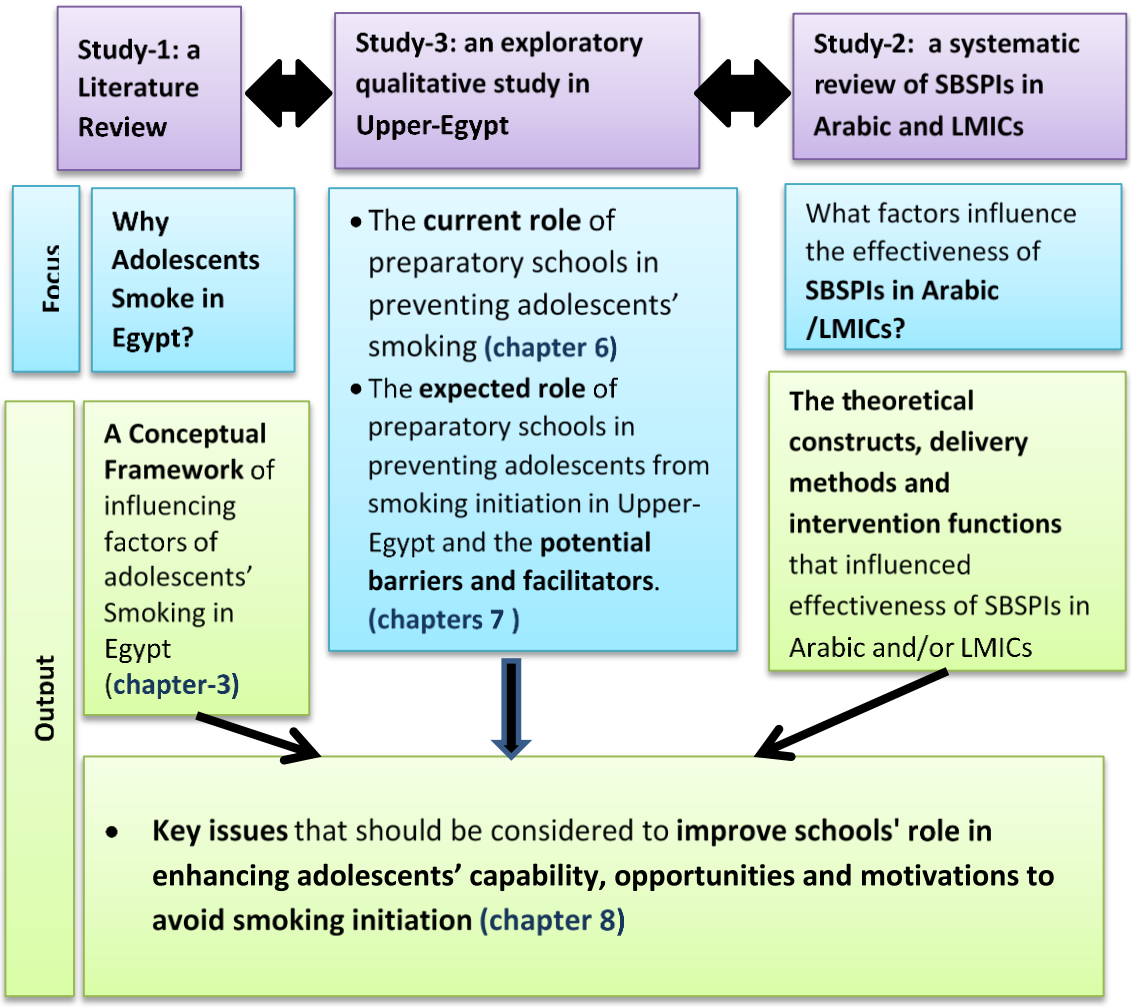
Additionally, writing academic papers on the following outputs of this thesis is planned:

1. A literature review of factors that influence adolescents' smoking in Egypt;
2. A systematic-review of SBSPIs in Arabic and/or LMICs;
3. What BCW intervention functions should be used in school-based interventions to prevent adolescents in Upper-Egypt from smoking initiation, a set of practical recommendations.

1.8 Chapter summary

This chapter has provided an overview of this PHD thesis and explained its rationale, overall aim, objectives and structure. The next chapter summarises the theoretical perspectives that informed this thesis and explains how they are utilized in each sub-study.

Figure 3 Study Structure and outputs



Chapter 2 - The Theoretical Perspective that Informed the Thesis

2.1 Introduction

The previous chapter provided an overview of the thesis and explained its rationale, overall aim, objectives and structure. This chapter introduces the theoretical study.

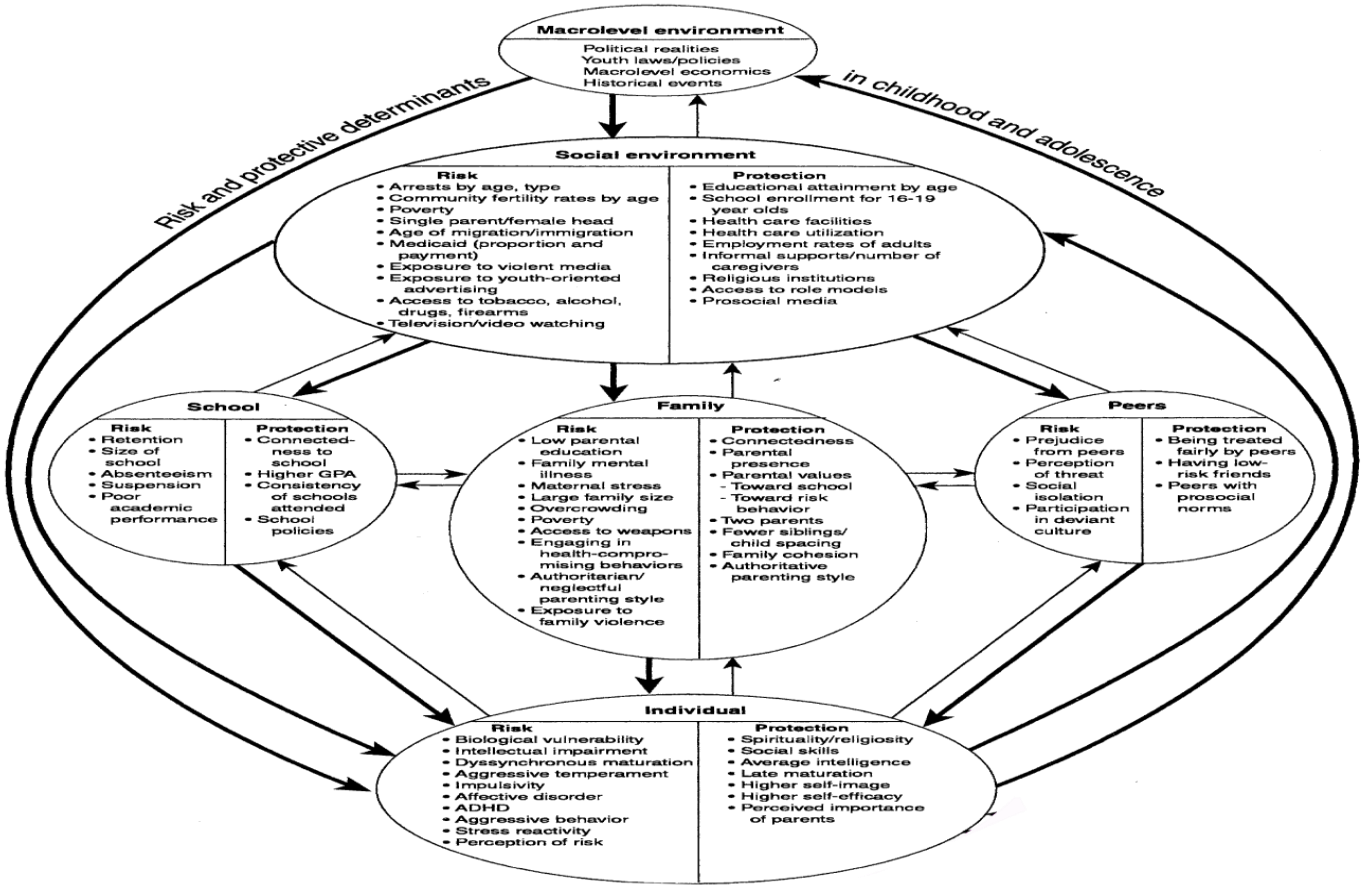
2.2 Framework for analysing factors that influence adolescents' smoking

The conceptual framework by Blum et al. (2001) was adapted and used in study-1 to organize the identified evidence on factors that influence adolescents' smoking in Egypt in order to gain a comprehensive understanding of these factors. This conceptual framework illustrates the risk and protective factors of adolescents' smoking at the following interacting domains : individual, peers, household, school, social and macro-environment, see Figure 4.

2.2.1 Background information about Blum's framework:

The framework by Blum et al. (2001) was designed to explain the causes of adolescents' health-risky-behaviours, including smoking, based on the findings of extensive longitudinal studies over years (Conrad et al., 1992) and theories that explain adolescents' behaviour (Blum et al., 2014). Blum's framework is mainly underpinned by Problem Behaviour Theory which is one of the oldest theories that have been used to explain smoking behaviour among adolescents in the USA (Perry and Jessor, 1985, Jessor, 1991) and LMIC (Jessor, 2014, Ndugwa, 2010). Problem Behaviour Theory is a framework that describes the relations of psychosocial protective and risk factors that influence adolescent problem behaviours, such as smoking, in the following domains: personality, social and perceived environment and problem behaviour (Donovan et al., 2017). Problem behaviour here is defined as behaving against social-norms (Perry and Jessor, 1985). Three categories of protective factors (models protection, controls protection, and support protection) and risk factors (models risk, opportunity risk, and susceptibility risk) are identified by this theory (Jessor, 1991). Regarding smoking, parents and peers could be protective or risk models; home, school and social environments could protect or expose adolescents to smoking behaviour. According to this theory, adolescents smoking behaviour is affected by the balance between these protective and risk factors which could be influenced by enforced laws and regulations (Jessor, 2017a, Jessor, 2017b). The factors included in Blum's framework are also explained by other theories such as: Social-Norm theory and Social Learning Theory which explain how adolescents smoking behaviour is affected by the social-norm and role models in their society (Lapinski and Rimal, 2005, Hayden, 2013); the Social Cognitive Theory which explains the influence of personal and environmental factors on adolescents' behaviour (Bandura, 2004); the Ecological Model which orders factors that influence adolescents vulnerability into levels starting from the internal factors (intrapersonal and interpersonal) to external factors in the micro then macro environments that surround adolescents such as the household, school, friends and society (Hayden, 2013). Considering all these theories in Blum's framework increases its validity. Therefore, it was selected to analyse factors that influence adolescents' smoking in Egypt, in study-1.

Figure 4: The generic conceptual framework for adolescents' risky behaviour by Blum (2001)



Source: (Blum et al., 2001. P.4)

Blum's framework is also a further development of another framework designed by Conrad et al. (1992), which explains six domains of adolescents smoking predictors: 1) social environment, 2) social bonding, 3) social learning, 4) psychological skills, 5) pharmacological effect, 6) knowledge, attitude, intention, and trial behaviour. Conrad's team developed this framework based on a review of the findings of 27 prospective studies that identified the predictors of adolescents' smoking in different contexts since 1980 (Conrad et al., 1992). The available evidence does not include clear explanation of how Blum's Framework builds upon Conrad et al. (1992). However the available evidence indicates that extensive research were implemented over years to identify factors associated with risk and protection in each of the domains in Conrad's framework and the findings of this research were used to further develop Conrad's framework and design Blum's framework (Jessor, 2014). The evidence indicates that these research activities included reviewing the findings of all empirical studies that were implemented over 20 years to identify factors that have been identified as either risk or protective factors within each domain (Jessor, 2017a).

Blum's framework lists factors that could affect adolescents' smoking behaviour, based on theories and empirical evidence from different contexts in a complex way, as shown in Figure 4. In study-1, Blum's framework was adapted and simplified to represent and discuss the predictors of adolescents' smoking in the Egyptian context based on the available evidence, see Figure 11 on page 56. The next section provides reflection on the use of Blum's framework in this thesis.

2.2.2 Reflection on the use of Blum's framework in this thesis:

As explained in the previous section, the framework by Blum et al. (2001) was designed to explains the causes of adolescents' health-risky-behaviours, including smoking, based on theories that explain adolescents' behaviour, then it was used and revised based on the findings of extensive longitudinal studies over years (Conrad et al., 1992). Underpinning Blum's framework by theories and empirical evidence from different contexts increased its validity in analysing factors that influencing adolescents' risky behaviour, including smoking (Blum et al., 2014). Accordingly, Blum's was selected to analyse the predictors of adolescents' smoking in Egypt, in study-1.

Blum's framework lists factors that could affect adolescents' smoking behaviour in various context in a complex way, as Figure 4 illustrates. Because Blum's framework is not specific for the Egyptian context, there is a probability that some factors that influence adolescents smoking in Egypt that were not presented in the original framework by Blum and vice versa. Therefore, all the available evidence about the predictors of adolescents' smoking in Egypt was reviewed in Study-1; and the findings from 31 studies were used to adapt the original framework by Blum to represent the predictors of adolescents' smoking in Egypt, these factors were discussed in chapter 3. The modified version of Blum's framework is presented in Figure 11 on page 56.

All the identified predictors of adolescents' smoking in Egypt were exist in the original framework by Blum and there was no issue generated in the identified literature that is not presented in Blum's framework. This could be explained by one of two possibility: 1) the validity of Blum's framework to explain predictors of adolescents' smoking due to its strong underpinning by theories and empirical findings from extensive longitudinal studies implemented in various context over years (Conrad et al., 1992, Blum et al., 2001, Blum et al., 2014). 2) There is also a possibility that there are limitations in the available evidence about the predictors of adolescents' smoking in the Egyptian context. This possibility is low, as 31 studies explored the predictors of adolescents' smoking in Egypt were identified and reviewed

in study-1 and used to adapt the framework. However, none of these studies was qualitative which limits the ability of study-1 in identifying the predictors of adolescents' smoking in Egypt in a more comprehensive way. To overcome this limitation, the researcher explored the predictors of adolescents' smoking in Upper-Egypt at the beginning of the FGDs and in-depth interviews with school staff and pupils in Study-3. The identified predictors in study-3 were in consistency with the identified predictors in study-1 and there was no additional factor was identified and could be used to adapt Blum's framework further. Although the findings from study-3 about the predictors of adolescents' smoking in Upper-Egypt were valuable, there was no chance to include these findings in this thesis due to the words limits. Nevertheless, it is important to mention that this step was done in this thesis to validate the findings of study-1. The researcher aims to publish, in a separate article, the qualitative findings from study-3 about the predictors of adolescents' smoking in Upper-Egypt to fill the gap in the available evidence on that.

Other researchers from various contexts also concluded that Blum's framework is comprehensive and valid enough to explain factors that influence adolescents' smoking in their researched contexts although these contexts were are markedly varied (Blum et al., 2014, Kågesten et al., 2016, de Jager, 2015, Nonnemaker et al., 2006, Thai et al., 2010). They include a researcher explored some aspects of the social norm on males adolescents' smoking in Egypt (Harbour, 2012).

2.3 The theoretical perspectives related to SBSPIs

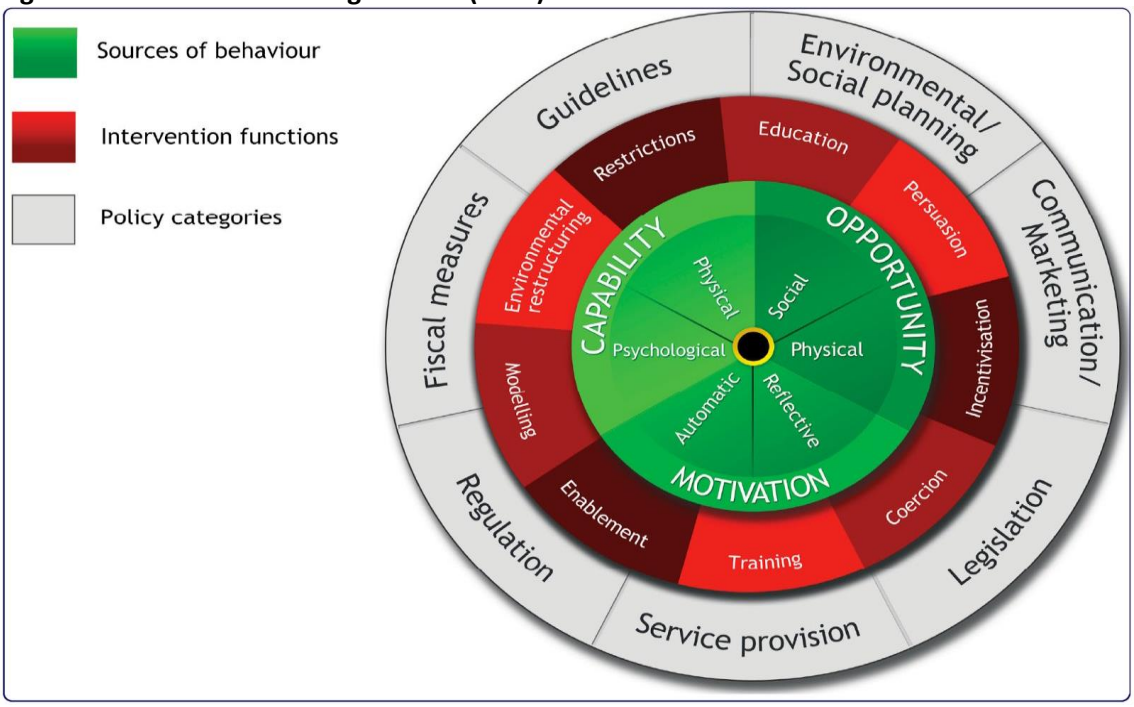
Considering a systematic and agreed standard in exploring the characteristics of effective SBSPIs then to identify what should be considered in the Egyptian context is recommended to maximise the efficiency accumulating evidence about these interventions (Michie and Wood, 2015). Several theoretical perspectives were used to review SBSPIs that were implemented in Arabic and/or LMICs in order to get a comprehensive understanding of factors that influenced the effectiveness of these interventions. This allowed consideration of a full range of potential options for SBSPIs that were used in Arabic and/or LMICs settings and then facilitated providing rationales for selecting among them options for SBSPI in the Egyptian context see chapter 8. This section provides background information of the theoretical perspectives used in this thesis in relation to SBSPIs and their utilization in each sub-study.

2.3.1 Behaviour Change Wheel (BCW)

This section explains the BCW by Michie et al. (2014a) first then explain its utilization in the three substudies of this PhD.

The BCW allows systematic reviews of the evidence on intervention functions which are then could be linked with factors that influence the targeted behaviour to inform the process of designing behaviour change interventions (Michie et al., 2014a). Therefore BCW was used in the three substudies of this thesis to facilitate achieving its overall aim. BCW was developed based on a systematic review of behaviour change literature and a synthesis of 19 frameworks of behaviour change (Michie and Wood, 2015). The review assessed these frameworks against three criteria: linkage to a model of behaviour, comprehensiveness and coherence but none met all the three criteria and theses frameworks are overlapping; therefore, they were synthesised to develop the BCW (Michie and Wood, 2015). BCW has three layers, as Figure 5 illustrates.

Figure 5 The Behaviour Change Wheel (BCW)



Source: (Michie et al, 2014a. p.18)

The core layer of BCW is the Capability, Opportunity, Motivation of the Behaviour (COM-B) Model which explains that individuals' behaviour is influenced by their physical and psychological capability, physical and social opportunities and automatic and reflective motivation to perform this behaviour (Michie et al., 2014a). The definitions of these components are provided in Box 1.

Box 1: The definition of each of COM-B model Component (the inner layer of BCW)

COM-B model Component
▪ **Physical capability:** having physical skills, strengths or stamina to practice a bahviour (smoking) ▪ **Psychological capability:** having knowledge, psychological skills, strengths or stamina to engage in the necessary mental processes that lead to smoking. ▪ **Physical opportunity:** opportunity afforded by the environment involving: time, resources, locations, cues (prompts/triggers), physical `affordance`. i.e. what environment allows including lack of barriers ▪ **Social opportunity:** opportunity afforded by inter-personal influences, social cues (prompts), cultural norms that influence the way that adolescents think about smoking ▪ **Reflective motivation:** reflective processes involving self-conscious planning, intention and evaluations (beliefs about what is good and bad) ▪ **Automatic motivation:** automatic processes involving: emotional reactions, desires (wants and needs), impulses (urges/ wishes), inhabitations, drive states and reflex responses.

Source: adapted from (Michie et al., 2014a. p. 63)

Factors that influence human behaviour could be diagnosed using COM-B model and modified or regulated through nine possible intervention functions (the middle layer of BCW). Five intervention functions (education, persuasion, Incentivisation, training and enablement) could be considered as individual-level functions while the other four intervention functions (coercion, restriction, environmental reconstruction and modelling) focus more on external influences of the targeted behaviour (Michie et al., 2011). These intervention functions are defined and supported by examples related to smoking prevention in Table 1.

Table 1 Definitions of the BCW intervention functions(the middle layer of BCW).

The intervention function	Definition	Example related to smoking prevention in school
1. Education	"increase knowledge or understanding"	Informing pupils on health, social and financial consequences of smoking
2. Persuasion	"Using communication to induce positive or negative feeling or stimulate action"	Discussion of advantages and disadvantages of smoking
3. Incentivisation	"Creating an expectation of reward"	Using prizes for non-smokers pupils or teachers, nominating their names on school newsletter
4. Coercion	"Creating an expectation of punishment or cost"	Sanction for short period in case of smoking inside schools
5. Training	" imparting skills"	Training on how to refuse smoking offers from peers
6. Restriction	using rules to reduce the opportunity to engage in smoking behaviour	Prohibiting teachers and visitors smoking at school. Prohibiting selling tobacco products to adolescents
7. Environmental restructuring	"changing physical or social context"	Creating anti-smoking norm at school
8. Modelling	"providing an example for people to aspire to or imitate"	Use teachers or peers or famous people as non-smoking role models

9. Enablement	"increase means/reducing barriers to increase capability (beyond education and training) or opportunity (beyond environmental restructuring)"	Providing behavioural support for resisting social pressure to smoke (such as counselling and alternative friends)

Source: adapted from (Michie et al., 2014a)

The nine intervention functions could be implemented and supported through seven policy categories (the outer layer of BCW): communication, guideline, fiscal, regulation, legislation, environmental social planning, and service provision. The policy categories are beyond the focus of this thesis; therefore, they will not be discussed in this chapter.

Each intervention function is linked to the components of the COM-B model as the matrix in Figure 6 shows. This matrix was developed based on group discussion and consensus of a group of behaviour change specialists and widely used in behaviour change interventions (Michie et al., 2014a). This matrix will be used to discuss the findings of study-2 (in section 4.5.4), study-3 (in sections 6.4 and 7.3) then the overall findings (in section 8.4) of the thesis about intervention functions that were used in SBSPIs in Arabic and/or LMICs, those used and could be used in Upper-Egypt to enhance pupils' capability, opportunity and motivation to avoid smoking initiation.

Figure 6 A Matrix of links between COM-B components and intervention functions[1]

	Intervention functions								
COM-B components	Education	Persuasion	Incentivisation	Coercion	Training	Restriction	Environmental restructuring	Modelling	Enablement
Physical capability					■				■
Psychological capability	■				■				■
Physical opportunity					■	■	■		■
Social opportunity						■	■	■	■
Automatic motivation		■	■	■	■		■	■	■
Reflective motivation	■	■	■	■					

Source: (Michie et al., 2014a. p. 116)

The inner two layers of the BCW have been used in many studies to identify factors to be addressed and intervention functions that could be used in designing interventions (Michie et al., 2014a, English, 2013, Hanbury et al., 2013). However, the BCW has not been used to explore evidence on SBSPIs. In this PhD thesis, inner two layers of the BCW were used as follow: 1) the middle layer of BCW was used to design the data collection tools, present and discuss findings of study-2 and study-3 that explored the intervention functions that have been used in Arabic and/or LMICs, currently used or could be used in the preparatory schools of Upper-Egypt to prevent adolescents' smoking initiation. 2) The COM-B model was used to structure and compare findings from the three sub-studies in order to identify what factors influence Egyptian adolescents' smoking (study-1) and what SBSPIs have used in Arabic and/or

[1] The grey shaded-cells indicate which intervention function is likely to be effective in changing each component of the COM-B model.

LMICs (study-2), whats is currently implemented or could be implemented in the Egyptian schools (study-3) to prevent adolescents from smoking initiation. 3) Thereafter, the COM-B model was used, in chapter 8, to discuss the findings from the three sub-studies and conclude what should be considered in SBSPIs to enhance pupils' capability, opportunities and motivations to avoid smoking initiation in the Egyptian context. The physical capability component was considered irrelevant to smoking initiation thus unconsidered in this study. For more elaboration on how BCW was used to facilitate achievement of the aim of each of the three substudiesa and the overall aim, see sections 2.3.5, 3.5.1, 4.3.6, and 8.2 repectively.

The Behaviour Change Techniques Taxonomy (BCTTV1) which is part of the BCW was not used in this thesis. This taxonomy is used to explain the purpose of interventions rather than the type of interventions and accommodate the complexity and diversity of interventions, which could identify the active ingredients of the intervention (Atkins et al., 2017). Study-2 attempted to use the behaviour change techniques taxonomy (BCTTV1) to explore which BCTs that have been used, singly or in combinations, and influenced effectiveness of SBSPIs that are implemented in Arabic and LMICs. However, the process of identifying the BCTs that were used in the included SBSPIs was challenged by the scanty of the available information about the contents of these interventions in the included articles. Authors were contacted to obtain more information on their interventions, however, few were able to provide more details because of lost documents, lost or incorrect contact details of interventions developers cannot attach or send documents or no reply received until data synthesis started. The paucity of information on the detailed contents of the included interventions hindered identifying which BCTs was used in effective SBSPIs in Arabic and/or LMICs. Therefore, this thesis didn't explore what behaviour change techniques are/could be used in SBSPIs to reduce the capability, opportunity and motivation of pupils to smoke.

2.3.2 The curriculum of school-based smoking prevention interventions

A review by Griffin and Botvin (2010) concluded that researchers have used the following major curricula to prevent youths at schools from smoking; each curriculum has a different theoretical basis as follow:

- **Traditional education curriculum** that only focuses on scaring youth from unhealthy behaviour, like smoking, through raising their awareness of the long and short term harms of this behaviour (Griffin and Botvin, 2010).
- **Normative education curriculum** which focuses on informing pupils on the accurate rate of smoking among youths in their society (Brown et al., 2010, Griffin and Botvin, 2010). The rationale of this curriculum is that overestimating rates of unhealthy behaviour encourage youths to initiate it (Lapinski and Rimal, 2005, Green et al., 2015). In many contexts, adolescents tend to overestimate the smoking rates among their peers (Elsey et al., 2015, Kuipers et al., 2016, Wang et al., 2011), and therefore they consider smoking as normal and acceptable behaviour in their age and society which encourage them to smoke (Brown et al., 2010). The normative curriculum is guided by the Social-Norm Theory which explains that people believe that they should behave like most other people in their society (Lapinski and Rimal, 2005). This normative education is an alternative to the traditional education curriculum (McAlaney et al., 2011). However, the assumption in both traditional and normative education is that providing the information is, probably, enough to prevent risky behaviours (Botvin and Griffin, 2001, McAlaney et al., 2011). Both traditional and normative education were under one category in Cochrane systematic reviews of SBSPIs (Thomas et al., 2013) but in study-2, they were separated as many SBSPI

in LMICs only provided information on smoking hazards without explaining the smoking rates among adolescents, see section 4.4.

- **Social competence curriculum** which aims to prevent adolescents from smoking by improving their general social competence skills such as cognitive skills for resisting interpersonal or media influences, problem-solving and decision-making, stress coping techniques, self-control and self-esteem, and general social and assertive skills (Thomas et al., 2013, Griffin and Botvin, 2010). The rationale of this curriculum is that adolescents with poor personal and social skills are susceptible to accept smoking offers by peers, relatives and others in their society or imitate their smoking behaviour, as the Social Cognitive Theory explains (Bandura, 2004, McAlister et al., 2008). Social cognitive theory clarifies that adolescents behaviour is influenced by their ability to translate their knowledge into action by managing social expectations through self evaluation and self satisfaction skills, setting personal goals and providing self incentives, managing their perception of external facilitators and obstacles, resisting external obstacles, and more importantly believing in their ability to do all that (Bandura, 2004).
- **Social influence curriculum** that aims to enable adolescents to overcome the social influences that promote smoking through increasing their awareness of different social influences surrounding them that support smoking and providing training on social resistance skills in order to enable adolescents to manage high-risk situation, peer and relatives pressure, and effectively refuse direct and indirect offers and persuades to smoke (Botvin and Griffin, 2001, Griffin and Botvin, 2010). The rationale behind the social influence curriculum is that adolescents' smoking is markedly influenced by their friends and relatives in many contexts (Wellman et al., 2016, Scalici and Schulz, 2014). Therefore, many school-based interventions used social influence curriculum to prevent adolescents' smoking by enabling them to overcome these social influences (Thomas et al., 2013). The social influence training curriculum is designed based on persuasive communication theory (Ajzen, 1992) that aims at improving individuals' resistance to smoking persuasion by influent relatives, peers and friends, and enabling them to formulate counter-arguments and effectively communicate their reasons for refusing smoking behaviour (Tormala, 2008, Griffin and Botvin, 2010). The assumption is that gaining these skills will change adolescents' attitude toward smoking, enable them to refuse smoking offers and therefore, prevent them from smoking initiation (Tormala, 2008).
- **Combined social competence and social influence curricula** which were used by some researchers who decided to evaluate the effectiveness of socialinfluence curriculum in combination with social competence curriculum because the evidence indicates that using social influence curriculum alone is usually ineffective in preventing smoking (Thomas et al., 2013). The rationale of combining social competence and socialinfluences curricula is that: 1) the impact of social influence is stronger among adolescents with poor social and resistance skills who smoke or use other drugs, as an adaptive coping technique (Botvin and Griffin, 2001, Griffin and Botvin, 2010). 2) Adolescents with strong social and resistance skills are more able to maintain the balance between the psychological and social dimensions of health which is important in preventing smoking behaviour (Jessor, 2017a, Jessor et al., 2017a).

Griffin and Botvin (2010) classification of smoking prevention curriculum was used in all Cochrane systematic reviews to classify school-based RCTs that aimed at preventing smoking (Thomas et al., 2013, Thomas and Perera, 2006, Thomas, 2002). Therefore it was used in this thesis to adapt the Theoretical Domain Framework (TDF) which was then used, in study-2, to extract data on the theoretical constructs of SBSPIs in Arabic and/or LMICs, see below.

2.3.3 The Theoretical Domain Framework (TDF) and Theory Coding Scheme

Theories can enhance the understanding of what works and why (Rothman, 2004, Michie et al., 2014b). Some evidence indicates that underpinning behaviour change interventions by theories enhance the effectiveness of these interventions in changing the targeted behaviour (Noar et al., 2007, Glanz and Bishop, 2010, Webb et al., 2010), although there is some inconsistency in this evidence (Prestwich et al., 2014). Using theories in designing, adapting and implementing intervention makes these processes more efficient (Michie et al., 2008). The Theory Coding Scheme by Michie and Prestwich (2010) is a reliable tool for describing theoretical-underpinning of interventions and assessing the extent of basing interventions on empirical evidence. This scheme was used in many reviews to assess theoretical-underpinning of different behaviour change interventions (Prestwich et al., 2014, Prestwich et al., 2017, Arnott et al., 2014). This scheme explores theoretical-underpinning of interventions through the following five questions: 1) was theory mentioned at any stage of the intervention; 2) were the relevant theoretical constructs targeted by the interventions; 3) was theory used to select recipients or tailor interventions; 4) were the relevant theoretical constructs measured; 5) was the theory tested or refined in the interventions. This scheme was used in study-2 to identify if the included SBSPIs were based on theory or not and to what extent.

Previous studies recognized poor reporting of theoretical-underpinning in behaviour change interventions (Davies et al., 2010, Painter et al., 2008, Prestwich et al., 2014). Moreover, there are many behaviour change theories (Michie et al., 2014b), some of them are overlapping (West and Brown, 2013) and researchers lacked a clear method for selecting among these theories and applying them (Michie et al., 2014b). Furthermore, many of the widely used behaviour change theories focus on intra-personal and sometimes inter-personal influencers of human behaviour with less attention to social and environmental influencers which could limit the effectiveness of the intervention underpinned by these theories (Glanz and Bishop, 2010). In response to these challenges, the Theoretical Domain Framework (TDF) was developed, by an international team of psychologists and health service researchers, in order to facilitate the accessibility of behaviour change theories and encourage intervention designers to underpin their intervention with theories (Michie et al., 2005).

The TDF is a systematic and comprehensive framework which aims to comprehend the theoretical constructs of behaviour change interventions and provides a robust basis for designing prevention interventions with good coverage of potential strategies (Atkins et al., 2017, French et al., 2012). The TDF consists of 14 theoretical domains that represent 128 explanatory constructs from 33 relevant behaviour change theories, a further three-step validation of TDF refined these explanatory constructs to be 84 (Cane et al., 2012). The revised version of the TDF includes the following 14 domains: knowledge; physical and psychological skills; memory, attention and decision process; behavioural regulation; managing environmental context and resources; social influences management; beliefs about consequences; beliefs about capabilities; optimism; intentions; professional/social role and identity; personal goals/target setting; reinforcement; and emotion management (Atkins et al., 2017).

The TDF was used in designing and evaluating interventions that address different human behaviours in different settings and context inside and outside the UK, where this framework was originally designed. This included promoting hand hygiene among employees of the NHS trusts in England; implementing a mental health guideline; cancer screening by physicians; antibiotic prescription by doctors in respiratory tract infection in teaching hospitals; transfusion prescription in physicians and surgeons; and back pain management in primary

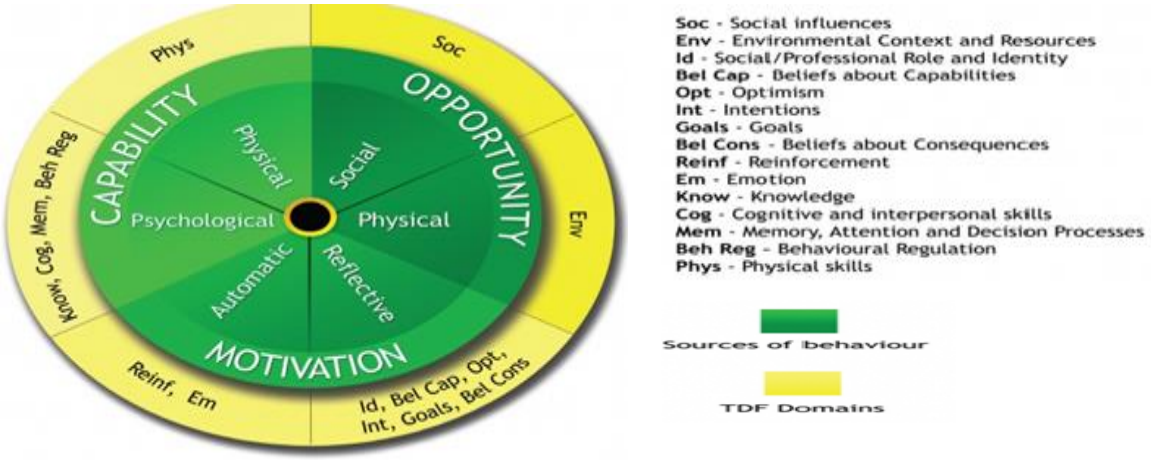
health care services (Francis et al., 2012, Michie and Wood, 2015, Michie et al., 2007, Taylor et al., 2014) as well as promoting smoking cessation by dental providers and midwives (Amemori et al., 2011, Beenstock et al., 2012). Additionally, some systematic reviews used TDF to identify the theoretical constructs of prevention intervention (Guillaumie et al., 2010). The utilization of the TDF in evaluating health interventions in different settings and contextes inisde and outside the UK reflects its flexibility and encourage researchers and intervention designers to use in the process of developing and evaluating interventions. However, none of the identified studies used TDF in exploring smoking prevention interventions. In this review the TDF was used, after adapted it using Griffin and Botvin (2010) classification of smoking prevention curricula, to extract data on theoretical constructs of SBSPIs in Arabic and/or LMICs. Adapting the TDF to the topic of smoking prevention was needed because TDF classifies the theoretical domains used in behaviour change interventions in general (Atkins et al., 2017, Michie and Wood, 2015, Michie et al., 2014a) while Griffin and Botvin (2010) classification is specific for adolescents' smoking prevention and it was used in all Cochrane systematic reviews to classify school-based RCTs that aimed at preventing smoking (Thomas et al., 2013, Thomas and Perera, 2006, Thomas, 2002). Also, the TDF identifies if interventions provide knowledge or psychological skills related to smoking without specifying types of this knowledge or skills (Michie et al., 2014a) while Griffin and Botvin (2010) differentiate between interventions based on the type of the information and skills provided regarding adolescents' smoking as explained in section 2.3.1.

The adaptation of the TDF using Griffin and Botvin (2010) included: A) dividing the knowledge domain into two categories corresponding to the type of information provided: 1) knowledge on smoking consequences (the traditional education curriculum), 2) knowledge on smoking rates (normative education curriculum); B) dividing the domain on skills into three categories corresponding to the type of the provided skills: 1) social competence skills (social competence curriculum), 2) social influence resistance skills (social influence curriculum), 3) and combined social competence and social influence resistance skills (combined social competence and social influence curricula). The TDF domain on social influence management was unchanged as it goes beyond providing skills to resist social influence to includes using teachers, peers, parents and leaders as non-smoking role models, school commitment to reduce pressure to smoke at school and creating anti-smoking norm at school (Michie and Wood, 2015, Michie et al., 2014a). The rest of the TDF domains were not changed. In summary, study-2 identified the presence or absence of the following 17 theoretical domains in each arm of the included SBSPIs: 1) knowledge on smoking hazards; 2) knowledge on smoking prevalence; 3) social competence skills; 4)social influence resistance skills; 5) combined social competence and social influence resistance skills; 6) memory, attention and decision process; 7) behavioural regulation; 8) managing environmental context and resources; 9) social influences management; 10) beliefs about consequences; 11) beliefs about capabilities; 12) optimism; 13) intentions; 14) professional/social role and identity; 15) personal goals/target setting; 16) reinforcement; 17) and emotion management.

According to Michie et al. (2014a), Figure 7, the 14 theoretical domains could be classified, based on the COM-B model, into the six categories influencing smoking behaviour: 1) psychological capability which depends on the individual's knowledge, psychological skills, memory, attention, decision-making process and behaviour regulation. 2) Physical capability to practice other hobbies or physical activities which might prevent smoking. 3) Physical opportunities which depend on the management of environmental context and resources in order to restrict facilitator and increase barriers of smoking. 4) Social opportunities which depend on managing social influences of smoking that can change individuals' thoughts,

feelings, or behaviours in relation to smoking such as role models, social pressure and social norms. 5) Reflective motivations which are affected by beliefs about consequences, beliefs about capabilities, optimism, social role and Identity, intentions and skills of personal goals-setting. 6) Automatic motivations through either emotion management or reinforcement using incentives, reward or punishment. Figure 7 illustrates the link between the TDF and the COM-B model (Michie et al., 2014a). The link between the TDF and the COM-B model was used to discuss the findings of study-2 on the theoretical domains that were used in effective SBSPIs in Arabic and/or LMICs to enhance pupils' capability, opportunity and motivation to avoid smoking initiation.

Figure 7 The link between TDF and the COM-B model



Source: (Michie et al., 2014a. p. 92)

2.3.4 Assessment of cultural- appropriateness of interventions

The area of SBSPIs is not well-researched in LMICs and most high-quality evidence on SBSPI comes from high-income countries (Thomas et al., 2013). Therefore, researchers and intervention designers in LMICs often base their intervention on SBSPIs that have been developed and evaluated in high-income developed countries. However, when importing interventions (totally or partially) from other countries it is important to consider cultural differences between countries and adapt the imported intervention/ evidence to the targeted context to ensure its appropriateness to the culture of the targeted population , even if this intervention showed effectiveness in the original context (Elliott and Mihalic, 2004). Tailoring SBSPIs to the targeted context is important for enhancing intervention effectiveness because predictors of adolescents' smoking changed by cultures (Wellman et al., 2016) which may vary across populations, even in the same region. For example, adolescents in Germany are more exposed to smoking in movies, advertisement, schools and public places than adolescents in the United States (WHO, 2013b). Also, adolescents' smoking is culturally more acceptable in Germany compared with the United States (Weichold et al., 2016).

The procedures for ensuring cultural appropriateness of SBSPIs could incorporate experts in designing SBSPI who have an evidence-based understanding of what encourages or discourages adolescents' smoking (top-down approach) plus members of a targeted community (bottom-up approach), who have an understanding of what is feasible and acceptable, at central and local levels, in the targeted context (Minkler and Wallerstein, 2003, Perry, 1999). Castro et al. (2010) identified two dimensions of cultural appropriateness: surface and deep. Surface appropriateness involves matching intervention contents, materials and methods to superficial characteristics of a targeted population such as: translating contents and using local people, clothes, music, language to develop and deliver interventions. Deep cultural- appropriateness involves incorporating social, cultural, psychological and environmental factors that influence the targeted behaviour of a specific population into the proposed intervention (Castro et al., 2004, Castro et al., 2010).

Kreuter et al. (2003) identified **six strategies for cultural-** appropriateness of health interventions. 1) *Linguistic strategy* which aims to make interventions contents accessibly in the native or dominant language of the targeted population; 2) *Peripheral strategy* which considers packaging interventions contents and materials in an appropriate way to the local context in term of images, colours, clothes and pictures of community members; 3) *evidential strategy* which focuses on demonstrating relevance of the intervention to the targeted population, mainly through presenting relevant morbidity and mortality rates; 4) *constituent-involving strategies* which allow expertise, staff and members of the targeted population to take role and provide insights in the planning and implementation process of interventions; 5) s*ociocultural strategy* which considers cultural values, beliefs and characteristics of the targeted population in addressing the involved health issue in a meaningful way to that population; 6) *cultural-tailoring* which covers all the above strategies with more consideration of differences between individuals in the targeted population (Green et al., 2015, Kreuter et al., 2003, Resnicow et al., 1998).

The above classifications were used in study-2 to explore approaches, dimensions and strategies used in adapting the included SBSPIs to the culture of the targeted population, see Table 10 on page 88. Additionally, study-3 of this thesis aimed to understand culturally relevant factors relating to smoking and its prevention through schools in Egypt with the view of using this to adapt relevant interventions/evidence to the context of Egypt to ensure cultural appropriateness of the designed SBSPIs.

2.3.5 Reflection on the use of the Behaviour Change Wheel in this thesis

As explained in section2.3.1 the BCW by Michie et al. (2014a) was used in the three substudies of this thesis to facilitate achieving its overall aim. One important issue to consider while using BCW in LMICs is that although this framework was developed based on a systematic review of behaviour change literature and a synthesis of 19 frameworks of behaviour change (Michie and Wood, 2015), these frameworks and literature were mostly generated from American and European countries. This might have implications on the applicability of this theoretical framework to the context of Arabic and LMICs. However, without using this framework in designing interventions in Arabic and LMICs, it is difficult to identify the applicability of this framework to these countries. Accordingly, the researcher decided to use the BCW in this thesis to explore the applicability of the BCW to the Egyptian context, similar to approaches taken by many researchers, although this might have implications for this thesis. This section provides a reflection the use of the BCW in this thesis.

The core layer of BCW (COM-B Model), in Figure 5, was used in study-1 to identify factors that could be modified through schools to prevent adolescents' smoking in the Egyptian context. Then the inner two layers of the BCW (the COM-B model and the intervention functions) were used first in study-2 to explore what have been used in school-based interventions that were implemented in Arabic and/or LMICs to prevent adolescents from smoking initiation. After that, the inner two layers of the BCW were used in study-3 to explore the current and anticipated school-based interventions to prevent adolescents at the preparatory schools in Upper-Egypt from smoking initiation. Using this approach across the three substudies facilitated, in chapter 8, comparing the findings and reaching the conclusion and recommendations on what, in relation to intervention functions, should be used in schools to influence the capability, opportunities and motivations of pupils to avoid smoking initiation which is the overall aim of this thesis.

In general, the inner two layers of the BCW, the COM-B model and the intervention functions, were fit for the purpose of using them in this thesis. This is not surprising as the BCW was developed, based on a systematic review of behaviour change literature and a synthesis of 19 frameworks of behaviour change (Michie and Wood, 2015), to allow systematic reviews of the evidence on intervention functions which are could be linked with factors that influence the targeted behaviour to inform the process of designing behaviour change interventions (Michie et al., 2014a). However, the following modifications were made on the inner two layers of the BCW to facilitate fitting the BCW for the purpose of using them in this thesis. First, the physical capability component of the COM-B Model was considered irrelevant to smoking initiation thus unconsidered in this study. Second, as explained in section2.3.2, the training intervention function was classified into three categories based on the type of the skills provided in the training: 1) social competence skills, 2) social influence resistance skills, 3) and combined social competence and social influence resistance skills. The education intervention function was also classified into two categories corresponding to the type of information provided: 1) education on smoking consequences, 2) education on smoking rates. These subcategories were essential to be specified because they address separate factors that influence adolescents' smoking and were and should be addressed separately through schools.

At the beginning of this thesis, the researcher aimed to get a comprehensive understanding of all factors that influence adolescents' smoking in Egypt, then select among them factors that could be addressed through school and explore how schools could address these factors to achieve the overall aim of this thesis. To achieve that, Blum's framework was used first, in study-1, to get a comprehensive understanding of all factors that influence adolescents'

smoking in Egypt as Blum's framework allows classifying the predictors of adolescents' smoking into factors related to the individual, parents, school, peers and the wider environment. This classification facilitated identifying factors to be addressed through schools. Thereafter the COM-B Model was used to classify factors that could be addressed through schools into factors that influence the capability, opportunity or motivations of pupils to initiate smoking. This process is explained in details in section 3.5. This classification facelifted exploring, contrasting and comparing what has been used in schools at Arabic and/or LMICs to (in study-2) and what has been currently implemented and what else could be implemented at the preparatory schools of Upper-Egypt (in study-3) to address these factors and enhance the capability, opportunity or motivations of pupils to avoid smoking initiation. As explained above, using the COM-B Model in the three substudies, facilitated comparing and contrasting the findings of the three studies, in chapter 8, which lead to making recommendations on how schools could contribute in preventing adolescents from smoking initiation in Egypt. However, it was essential to start the thesis by getting a comprehensive understanding of all the predictors of adolescent smoking in Egypt before choosing among them those to be addressed through schools. This could have been complex without using Blum's framework which simplifies the classification of the predictors and acknowledges the overlap and boundaries between factors at different levels. The BCW does not show clear boundaries between the predictors of adolescents' smoking at the level of the individual, family, peers, schools and the wider environment which complicate the identification of factors that could be addressed through schools. This limitation in the BCW could be because this framework was used to design interventions at a specific level or setting as it appears from reviewing most of the publications that used this framework in designing interventions. These publications were obtained from the team who designed the BCW after being contacted by the researcher at the early stage of this thesis. The following are unexclusive examples of these interventions: (Hubbard et al., 2016, Craig et al., 2017, Laba et al., 2013, Finck Barboza et al., 2013, Connell et al., 2015, Khanal et al., 2017, Govender et al., 2017).

2.4 Chapter summary

This chapter has provided an overview of the theoretical perspectives that informed this PhD thesis and explained their utilization in each sub-study. The next chapter outlines the aim, objectives, methodology, findings and discussion of the literature review, study-1, of factors that influence adolescents' smoking in Egypt.

Chapter 3 - Factors that Influence Smoking by Adolescents in Egypt: a Literature Review (Study-1)

3.1 Introduction

As discussed in chapter 1, an appropriate School-Based Smoking Prevention Intervention (SBSPI) needs to be developed in order to prevent adolescents from smoking initiation and thus limit the rising smoking epidemic in Egypt. Adolescents should be targeted because 1) many Egyptians start smoking at adolescence age (16.8 years old on average) (MOHP et al., 2009); 2) smoking rates in Egypt significantly increase by age and adolescents smoking is a predictor of adults' smoking (Asma et al., 2015, Harbour, 2011). 3) Preventing adolescents' smoking would reduce the tremendous negative consequences of early smoking that extend beyond adolescence age and thus reduce the heavy burden of Non Communicable Diseases (NCDs) on Egypt in the long-term (Gomez et al., 2009, Vianna et al., 2008, El-Hosseiny et al., 2003, Williams and Sandler, 2001).

Smoking behaviour is markedly influenced by the culture (Wellman et al., 2016) and influencing factors of smoking vary across countries (Steptoe et al., 2002). Understanding influencing factors of human behaviour in the targeted context is a crucial step in designing effective interventions to prevent this behaviour (Craig et al., 2008, Michie et al., 2014a). Accordingly, this thesis started by conducting this literature review (study-1) that aimed at gaining a comprehensive understanding of factors that influence adolescents' smoking in Egypt, factors that could be addressed through schools are then classified using the COM –B model. This chapter discusses the used methods in this literature review and the main findings and concludes with a conceptual framework that summarises factors that influence adolescents' smoking in Egypt.

3.2 Methods

Three thorough searches were conducted, one between November 2016 and February 2017 which was then updated in March then in October 2019.

3.2.1 Eligibility criteria

The following criteria were used for selecting studies in this review:

A. Types of studies

❖ **Inclusion criteria**

- Studies that investigated predictors/associated factors/determinants/risk factors of using smoked tobacco (cigarettes and Shisha) alone or with other substances use;
- The smoking status was assessed using either self-reported smoking with or without bio-medical validation[2];
- There was no restriction by the study design as all types are included because of the limited number of studies that investigated this topic in Egypt.
- There was no restriction by the language or date of publication.

❖ **Exclusion criteria**

- Studies that investigated only illegal drug abuse or alcohol;
- Studies that investigated smoking as a risk factor, not an outcome;

[2] Like measuring saliva thiocyanate or cotinine or expired air carbon monoxide levels

- Studies that are drawn solely on patients or from a treatment setting (clinical or hospital-based studies).

B. Types of participants

❖ **Inclusion criteria**

- The sample included adolescents, aged between 10-19 years, and if the sample included a broader age range, results for adolescents aged 10-19 were easily distinguishable in the sub-analyses;
- Household-based or (primary, elementary or secondary schools) school-based studies;
- Studies conducted in any part of Egypt.

❖ **Exclusion criteria**

- University students or adults only, unless if those under 19 years old are included;
- Pregnancy-related studies.

3.2.2 Information source

The following databases were searched, using the searches filters are indicated between brackets:

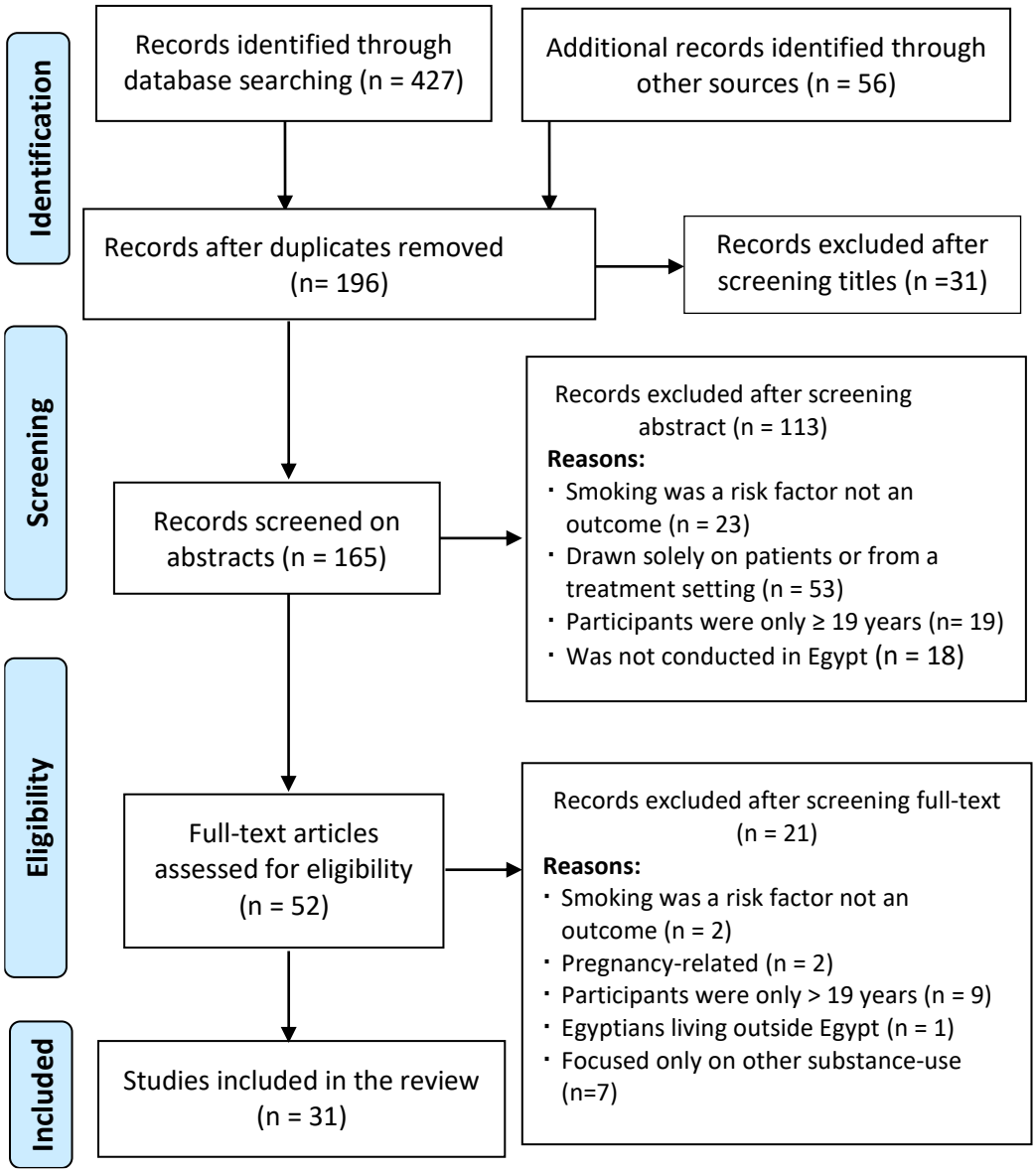
- Medline1996- (Ovid)
- Web of Science
- Pubmed (Ovid)
- Cinahl (Ebsco)
- Global Health 1973- (Ovid)
- Embase (Ovid)
- PsycINFO 1996- (Thomson)
- Popline (K4 Health)

3.2.3 Search strategy

All databases were searched as far back as they allowed, Appendix A summarises the key-terms used. Databases searches were supplemented by searching relevant 'grey' literature, including the CDC, GYTS, WHO, MOPH, DHS and Population Council websites and documents. Checking reference lists (backwards and forward) was also used to identify more articles, as recommended by Gough et al (2017). Additionally, the Egyptian universities union database was searched to identify locally published articles and active researchers on adolescents' smoking. Researchers and professionals in the field of adolescents' smoking were also contacted through their official webpages and researchers networking channels such as linked-in and research-gate to obtain more studies and full-text articles.

A stepwise approach was used to identify relevant articles; titles screening was used first to exclude duplicates and clearly irrelevant articles followed by abstracts screening then full-texts reviews. The process of screening the identified studies are illustrated in the PRISMA diagram, Figure 8, based on Moher et al (2009), using eligibility checklist. Key findings were then extracted from the identified articles using a data extraction form.

Figure 8 PRISMA diagram for searching influencing factors of adolescents' smoking in Egypt



3.2.4 Methodological Quality Assessment

In order to assess the quality of the included studies, various assessment tools were considered among many available (Tacconelli, 2010). The Mixed Methods Appraisal Tool (MMAT) (Hong et al., 2018) was considered appropriate for assessing for assessing the quality of the included articles in this study because of the following reasons: Firstly, It assesses quality through a checklist (allows three options yes or no or Not clear for each criterion) rather than giving scale. This is unlike other tools such as Crowe Critical Appraisal Tool (CCAT) and Quality Assessment Tool (QATSDD) that give numerical value for each criterion. Using a checklist is highly recommended in guidelines for assessing quality as transparency is criticized in scale methods (Tacconelli, 2010, Higgins and Green, 2008, Liberati et al., 2009). Secondly, MMAT is highly recommended by the National Institute of Excellence in Health Services in Quebec and the National Collaborating Centre for Methods and Tools and has been widely used by researchers (National Collaborating Centre for Methods Tools, 2015, Souto et al., 2015). Thirdly, there are available tutorials describing each criterion and provide relevant examples which facilitates the appraisal process and make it more consistent (Pluye et al., 2011).

The MMAT is a comprehensive tool that includes 21 criteria that assess different types of research design. The criteria are divided into four groups. The first group included two questions that are used to screen any study design, while each of the other groups includes questions specific for assessing the quality of qualitative, quantitative or mixed methods studies respectively. Questions related to quantitative studies as well as the first group of question were used in this review to assess the quality of the included studies, Appendix B shows the quality assessment form used in this review. The form was used to assess whether the included studies: have clear research questions, collected data allowed addressing these research question, used sampling strategy relevant to address the research question (randomly selected), selected a representative sample (in sizes and inclusion and exclusion criteria), used appropriate measurements of smoking behaviour, have low risk of nonresponse bias and used appropriate statistical analysis. The answer to each of these questions was "Yes", "No", or "Can't tell". Authors were contacted to verify any information about the methodological quality assessment if not identified in the published articles. If the available data is insufficient to judge the quality regarding the aspect assessed by this criterion, then the answer "Can't tell" is selected. The answer "Yes" was selected when the study meets that quality criterion, which means the quality is high regarding the aspect assessed by this criterion. In contrast, the answer "No" in selected when the study did not meet that quality criterion, which means the quality is low regarding the aspect assessed by this criterion. A guideline was used for coding each quality assessment criterion as this is recommended to increase the reliability and consistency of the quality assessment process (Reitsma et al., 2009). Section 0 discusses the quality of the included studies.

3.3 Results on the characteristics of the included studies:

In total 196 publications were returned after removing duplications, of which 52 were retained after reviewing titles and abstracts for relevance. After reading the full text, 31 articles met the eligibility criteria and included in this review, Figure 8 summarises the study selection process. The reviewed studies included a number of national and local studies that investigated influencing factors of smoking among Egyptian adolescents. Twelve national studies were included: the Global Youth Tobacco Survey (GYTS), a school-based survey of 13-15 years old pupils, that was conducted in 2001, 2005, 2009 and 2014; the Demographic Health Survey (DHS), a household survey that included variables on smoking among people aged 15-59 years, that was conducted in 2000, 2005, 2008 and 2015; the GSHS, a school-based survey of 13-15 years old pupils, that was conducted in 2011; the Population Council Survey of Young People in Egypt (SYPE), a household survey of people aged 13-35 years, that was conducted in 2009 and 2015; the Population Council's Adolescence and Social Change in Egypt (ASCE) survey, a household survey of adolescents aged 10-19 years, conducted in 1999.

All the identified studies were cross-sectional quantitative studies. The review identified only one comparative study and no longitudinal or qualitative study that researched the predictors of adolescents' smoking in Egypt. Sixteen of the included studies were school-based. None of the included studies researched adolescents in private and faith-based schools. Seven of the included studies researched males only because of the low smoking rate among females. All the included studies relied only on self-reporting in assessing the participants' smoking behaviour as no biological markers were used to validate the result of self-reporting of smoking. Most (29) of the reviewed studies used the GYTS definitions, of never (not even a puff), ever (even a puff or two) and current (at least once in the last 30 days) smoking (CDC, 2016b) but two studies used slightly different definitions of these indicators. Indicators of SES were inconsistent across studies, see section 3.4.2.6.

3.3.1 Methodological Quality of the Included Studies

The result of the Methodological quality assessment of the included studies is represented in Table 2. All the included studies have clear research questions/objectives and collected data that allow addressing these research questions/objectives. The majority of the included studies (25/31) selected representative random samples with appropriate sample size that was clearly explained and justified in the included articles while three studies (Radwan et al., 2003b, Abolfotouh et al., 2007, Ahmed et al., 1999) used convenient samples that are relatively small and unjustified. One study (Tessier et al., 1999) did not provide enough information to allow evaluating the quality of the sample size and sampling strategy involved. Another study (Refaat, 2004) justified the sample size without explaining the sampling strategy. One study included large number of unrepresentative sample (Labib et al., 2007) while one study (Allam and Abd Elaziz, 2007b) selected a small number of a representative sample of adolescents using stratified random sampling strategy. All the included studies used appropriate measurements of smoking behaviour except one study (Ahmed et al., 1999) that did not explain how adolescents' smoking behaviour was measured. There were no statements on the response rate in eight studies but the rest of the included studies have a low risk of nonresponse bias. The majority of the included studies (28/31) used appropriate statistical analysis. However, three studies (Allam and Abd Elaziz, 2007b, Labib et al., 2007, Tessier et al., 1999) did not specify either the P value or the CI of the findings to allow explaining the significance of the findings.

Overall, six of the included trials reported a low quality in at least one of the seven MMAT criteria for assessing the methodological quality in quantitative non comparative studies (Hong et al., 2018). The majority of the included studies (25/31) have no indication of any low quality of the research questions, collected data, sample size, sampling strategy, measuring smoking behaviour, response rate and data analysis. The ratio of a low methodological quality in Table 2 indicates the number of criteria coded as low methodological quality out of the seven MMAT criteria for assessing the methodological quality in each study. Low methodological quality in this review is appraised as moderate as two third (20/31) of the included studies have high quality in all the seven MMAT criteria for assessing the methodological quality while about a third (11/31) of the included studies have either unclear or low methodological quality in at least one criteria and a fifth (6/31) of the included studies used low quality methods in recruiting participants or analysing data, see Figure 9.

Table 2 Summary of the methodological quality of the included studies

Study ID (1st author, year)	Clear research questions	The collected data allow address the research question	Random sampling strategy	Representative sample	Appropriate measurements of smoking	Low risk of nonresponse bias	Appropriate statistical analysis	Ratio of low methodological quality [5]
1. (Abolfotouh et al., 2007)	☺	☺	☹	☹	☺	?	☺	2/7
2. (Ahmed et al., 1999)	☺	☺	☹	☹	?	?	☺	2/7
3. (Allam and Abd Elaziz, 2007)	☺	☺	☺	☹	☺	?	☹	2/7
4. (Boulos et al., 2009)	☺	☺	☺	☺	☺	?	☺	0/7
5. (CDC, 2009)	☺	☺	☺	☺	☺	☺	☺	0/7
6. (Dous, 2001)	☺	☺	☺	☺	☺	☺	☺	0/7
7. (El-Awa F, 2010)	☺	☺	☺	☺	☺	☺	☺	0/7
8. (El-Gilany et al., 2008)	☺	☺	☺	☺	☺	☺	☺	0/7
9. (Gadalla et al., 2003)	☺	☺	☺	☺	☺	☺	☺	0/7
10. (Harbour, 2011)	☺	☺	☺	☺	☺	☺	☺	0/7
11. (Harbour, 2012)	☺	☺	☺	☺	☺	☺	☺	0/7
12. (Ibrahim and Ahmed, 2006)	☺	☺	☺	☺	☺	☺	☺	0/7
13. (Ibrahim et al., 2000)	☺	☺	☺	☺	☺	?	☺	0/7
14. (Islam and Johnson, 2005)	☺	☺	☺	☺	☺	☺	☺	0/7
15. (Khafagy, 1996)	☺	☺	☺	☺	☺	☺	☺	0/7
16. (Labib et al., 2007)	☺	☺	☹	☺	☺	?	☹	2/7
17. (MOHP et al., 2009)	☺	☺	☺	☺	☺	☺	☺	0/7
18. (MOHP, 2015)	☺	☺	☺	☺	☺	☺	☺	0/7
19. (Nassar, 2003)	☺	☺	☺	☺	☺	☺	☺	0/7
20. (Population Council, 2015)	☺	☺	☺	☺	☺	☺	☺	0/7
21. (Radwan et al., 2003)	☺	☺	☹	☹	☺	☺	☺	2/7
22. (Refaat, 2004)	☺	☺	?	☺	☺	☺	☺	0/7
23. (Singh et al., 2012)	☺	☺	☺	☺	☺	?	☺	0/7
24. (Sitrin and Bishai, 2008)	☺	☺	☺	☺	☺	?	☺	0/7

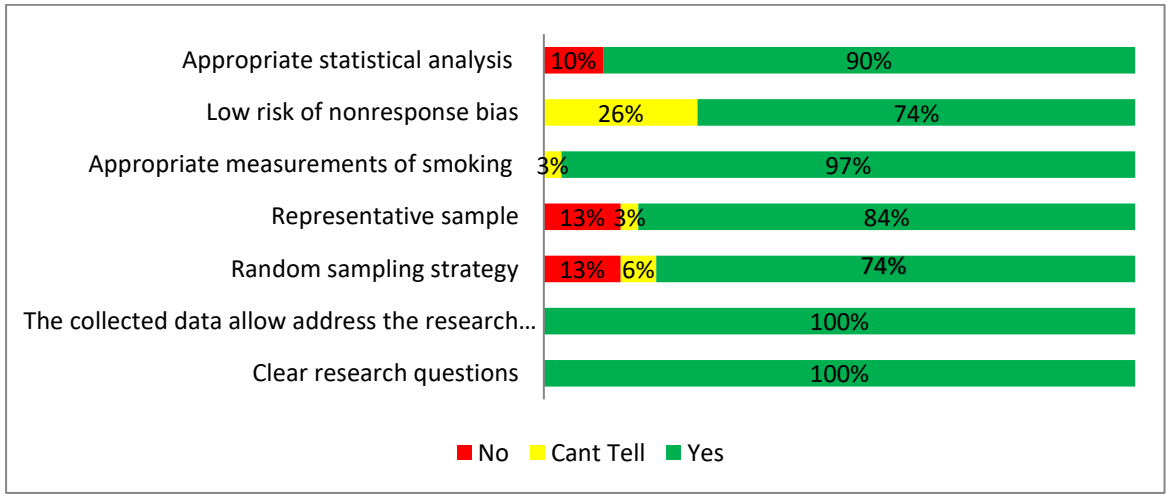
[5] The ratio of the low methodological quality equals the number of criteria coded as low quality in each study out of the seven criteria used for assessing the methodological quality.

25. (Tessier et al., 1999)	☺	☺	?	?	☺	☺	☹	1/7
26. (WHO and CDC, 2005)	☺	☺	☺	☺	☺	☺	☺	0/7
27. (WHO and CDC, 2009a) (WHO and CDC, 2009b)	☺	☺	☺	☺	☺	☺	☺	0/7
28. (WHO and CDC, 2014a)	☺	☺	☺	☺	☺	☺	☺	0/7
29. (WHO and CDC, 2014b)	☺	☺	☺	☺	☺	☺	☺	0/7
30. (Youssef et al., 2002)	☺	☺	☺	☺	☺	☺	☺	0/7
31. (Youssef et al., 2003)	☺	☺	☺	☺	☺	☺	☺	0/7

☺= Yes, ? = Cant tell , ☹ = No

Source: the form was adapted from: (Tacconelli, 2010, Pluye et al., 2011, Reitsma et al., 2009).

Figure 9 The proportion of the methodological quality criteria met across all the included studies



3.4 Results Results on factors that influences adolescents' smoking in Egypt

Key findings that were extracted from the identified articles about factors that influence adolescents' smoking in Egypt are classified using Blum's framework, was explained in section 2.2, into five levels: individual, peers, household, school and macro-environment. Factors at each level are discussed in the subsections below.

3.4.1 Individual factors

The individual factors that positively influence adolescents' smoking in Egypt are: increasing age, male sex, low educational level, working outside houses, having regular pocket money, poor awareness of smoking hazards and the religious prohibition of smoking, having positive attitude and beliefs about smoking, having intention to smoke in the future, physical inactivity, absence of hobbies or practicing other risky behaviours. This section explains the association between these factors and adolescents' smoking in Egypt.

3.4.1.1 Age

All the studies that searched the association between age and smoking (nine) concluded that Egyptians' smoking starts at adolescence age and increases by age. The national average age of initiating daily smoking among Egyptian adults is 16.8 (CI=16.6-17.1) years old (MOHP et al., 2009). The mean age of initiating smoking in general (not only the daily smoking) was only specified in an old study and was estimated to be 15 years (Tessier et al., 1999).

Five national and local surveys consistently concluded that smoking rates increase with age (Asma et al., 2015, WHO and CDC, 2009b, Nassar, 2003, MOHP, 2015, Islam and Johnson, 2005). None of the national surveys estimated the odd-ratio of smoking with age which was only estimated in two local studies. One was a big study in Mansoura, used the GYTS's two-stages cluster sampling design in secondary schools, which identified that the risk of current-smoking among pupils aged over 18 years is three times more the risk among those aged 16-17 (OR=3.1, 95% CI=1.7-5.5, P-value= 0.001) (El-Gilany et al., 2008). The other study was a household survey in rural Upper-Egypt (Minya) which showed that the risk of smoking is triple among males aged 18-20 years than those aged 15-17 years (OR=3.59, 95% CI=2.41– 5.34, P-value<.001)(Harbour, 2012). The relative risk of Egyptians' smoking in different age groups remains unclear because none of the included studies is a prospective study.

3.4.1.2 Sex

All the identified studies that researched adolescents' smoking per sex (13) emphasise that Egyptians' smoking at early ages markedly varies by Sex. Male adolescents try and use cigarettes more than girls (WHO and CDC, 2014b). Over a third (36.7%) of boys had ever-used smoked or smokeless tobacco before completing 15 years old compared with almost a quarter of girls (24.6%) (WHO and CDC, 2014b). Boys currently smoke and use tobacco more than girls by over five and two folds respectively (16.3% and 18.1% versus 3.1% and 8.2%)(WHO and CDC, 2014a, WHO and CDC, 2014b). Furthermore, male sex is one of the independent predictors of smoking by secondary school pupils, aged 14-19, in Mansoura where the risk of current-smoking is 12.2 times more in males than females (95% CI = 6.9-21.7, P-value= 0.001) (El-Gilany et al., 2008). These findings on sex disparity in adolescents' smoking are in agreement with all the identified studies (Dous, 2001, Nassar, 2003, Youssef et al., 2003, WHO and CDC, 2005, El-Gilany et al., 2008, WHO and CDC, 2009a, El-Awa F, 2010, Harbour, 2011, Harbour, 2012, WHO and CDC, 2014a, MOHP, 2015, Islam and Johnson, 2005), particularly in rural areas (Gadalla et al., 2003).

Females' smoking was identified as unacceptable behaviour in Egyptian society and considered as male behaviour (Gadalla et al., 2003). Because of social and family restriction of females' smoking, young females initiate smoking later than males; as confirmed by a community-based survey in Alexandria which found that the average age of initiating smoking was 22.6 and 18.1 years old among current-smoker women and men respectively (Youssef et al., 2002). This social restriction also limits Shisha-smoking by females, especially in rural areas where one quarter (26%) of male pupils at secondary schools of Qualyobia reported that they tried Shisha compared with only 5% of female pupils (Gadalla et al., 2003).

Three studies (Nassar, 2003, Islam and Johnson, 2005, El-Gilany et al., 2008) acknowledged that girls were reluctant to participate in smoking-related surveys which may have affected the validity of their answers to questions related to their smoking status although confidentiality was considered in using self-administered questionnaires. Biochemical validations such as measuring saliva cotinine (a metabolite of nicotine) value which is used to confirm the smoking status (Prokhorov et al., 2000) was not used in any study to confirm the actual rates of boys or girls' smoking status.

Although the current tobacco-use rate among girls is low (8.2%), it has been doubled countrywide since 2009, as it was 3.8% (WHO and CDC, 2009). Before 2009, girls' tobacco-use was consistently reducing every four years by half whereas boys' tobacco-use was fluctuating and then slightly declined to 18.1% in 2014, see Figure 1, page 3. Furthermore, girls are 14 times as likely as adult women to currently use tobacco products (MOHP et al., 2009). This reflects the increasing trend in girls' smoking.

3.4.1.3 Place of residence

It was identified that the age of smoking initiation varies by place of residence. Among adults, who aged 18-34 and ever-smoked daily, Upper-Egypt has the highest rates (65%) of initiating daily-smoking before the age of 17 years compared with lower-Egypt (55.6%) and Cosmopolitan area[1](46.6%) (MOHP et al., 2009). However, one local study, in Mansoura, concluded that living in urban or rural settings has a similar impact on adolescents' smoking status (OR=1.2, 95% CI=0.9-1.6, P-value> 0.05)(El-Gilany et al., 2008)

The statistics of the sex-difference in adolescents' smoking by place of residence was not explained in any of the national surveys. However, an old survey (2,120 participants above the age of 14) in the second big Egyptian city (Alexandria) concluded that males start smoking earlier (a mean age of 18.8, CI = 17.78-18.43) than females (a mean age of 22.64, CI = 17.80 - 27.48) (Youssef et al., 2002). These ages are older than the national average age of initiating daily smoking among adults is 16.8 (CI=16.6-17.1) years old (MOHP et al., 2009).

In conclusion, adolescents in Upper-Egypt initiate smoking earlier than those in other parts of Egypt. additionally smoking by girls is delayed in all parts of Egypt compared with boys, especially in Upper-Egypt and rural areas, probably due to the social restrictions of smoking by females which are prominent in these areas. the gender-difference in smoking initiation was explained in details in the previous section.

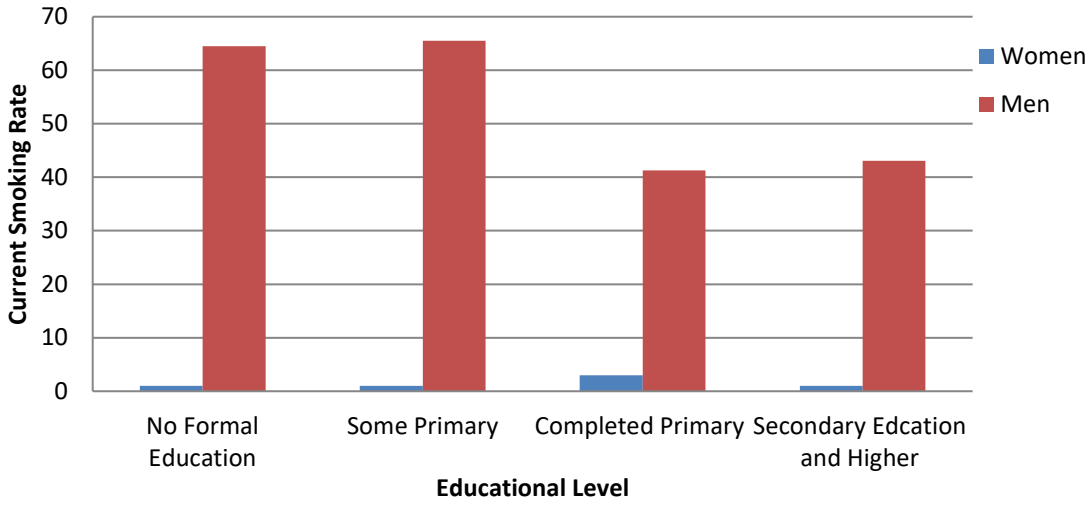
3.4.1.4 Educational level

Seven studies explained the association between smoking and the educational level. In the household-based national surveys, which included adolescents among adults, this association was not disaggregated by age group (MOHP, 2015, MOHP et al., 2009, Ibrahim et al., 2000). In all these surveys, smoking rates were higher among illiterates compared with university

[1] includes big cities such as Cairo and Alexandria

graduates. For example, the GATS findings showed that smoking is more prevalent among illiterate adults (21.4%, CI=19.6–22.4) compared with university graduates (16%, CI=14.6-17.7) (MOHP et al., 2009). However, the sex-difference of this association was only explained in one of these surveys (MOHP, 2015) probably because of the low females' smoking rates. This survey demonstrated that the current-smoking rate increases from 43.1% among males (over 14 years old) with at least secondary education to 64.5% among those with no formal education while females' smoking is slightly different among different educational levels, see Figure 10.

Figure 10. Prevalence of current-smoking among Egyptians (aged ≥15 years) by educational levels and sex, 2015



Source: (MOHP, 2015)

One local household survey, of 1162 male and 958 females aged over 15 years, in Alexandria, identify that the risk of smoking significantly increases 2.62 times (CI=1.83-3.75, P-value<0.001) among males who are illiterate or just able to read and write compared with university graduate males. While this trend is reversed among females, as the risk of smoking is positively associated with females' educational level to be 15 times (3.05 – 77.14, P-value <0.001) among university graduates compared with illiterate females. The confidence-interval of this relationship is wide because only 14 female participants were current-smokers, 6 of them were university educated (Youssef et al., 2003).

In all school-based surveys that disaggregated smoking rates by school-grades (two), smoking is more prevalent in high than low school-grades. The risk of current-smoking was higher in grade-three of secondary schools of Mansoura compared with grade-one (OR= 1.9, 95% CI = 1.4-2.8 P-value= 0.001)(El-Gilany et al., 2008). Almost half of grade-three pupils (49%) had ever- smoked compared with a quarter (27%) of grade-one pupils (P-value<0.05) in secondary schools of Qualyobia (Gadalla et al., 2003).

Although, increasing age is a very important confounding factor in the association between smoking and educational status, especially in school-based surveys where pupils are enrolled in schools, none of the included studies adjusted for age, except one household survey (Harbour, 2012). This survey concluded that smoking by youths (aged 5-24 years)is negatively associated with higher educational level; the risk of smoking is lower among male youths with at least secondary education (OR=0.70., 95% CI=0.54–0.90, P-value=0.006) than those who are illiterate or have not completed secondary education (Harbour, 2012).

3.4.1.5 Employment and accessibility to money

All the studies that explored the association between smoking and employment and accessibility to money (six) concluded that adolescents' work and accessibility to money increase adolescents' smoking. A multivariate analysis of a national representative survey (Sitrin and Bishai, 2008) after adjusting for age, Socio-Economic Status (SES), place of residence, and having a smoker-friend, identified that the ever and current smoking rates are higher among adolescents (aged 10-19 years) who ever-worked than those who never-worked (OR=1.57, 95%CI =1.17-2.12 and 1.46, 95%CI=0.99-2.25 respectively). Also, the risk of ever and current smoking increases if adolescents get a paid job (OR=1.36, 95%CI= .00-1.85 and =1.68, 95%CI=1.07-2.65 respectively) (Sitrin and Bishai, 2008). Similar findings were identified in rural areas: where employed male youths, aged 15-24, have triple risk of smoking than unemployed males (OR= 3.79, 95% CI = 2.44 – 5.88, P-value <.001) in Upper-Egypt (Minya) (Harbour, 2012), and the ever-smoking rate was higher among working adolescents in secondary schools (43%) than those who never worked (36%, P-value <0.01) in Qualyobia (Gadalla et al., 2003).

Having a year-round job duplicates the risk of current smoking (OR=2.6, 95% CI=1.6-4.1, P-value=0.001) school but even working only in summer increases smoking risk compared with never working among secondary pupils (El-Gilany et al., 2008). Nevertheless, doing voluntary job protects adolescents from trying smoking (OR=0.86, 95%CI 0.63-1.19), having unpaid involuntary job increases the risk of current smoking among Egyptian adolescents (OR=1.08, 95%CI 0.69-1.67) (Sitrin and Bishai, 2008).

Over two-thirds (65%) of smokers youths buy their own cigarettes while one quarter (26.3%) take cigarettes from other people (Refaat, 2004). Accordingly, having pocket money encourages adolescents to initiate and maintain smoking as emphasised by 79.8% of male pupils, aged 14-18 years, who smoke and 60.7% of those who never-smoked, P-value =0.001 (Ibrahim and Ahmed, 2006). Pupils (median age 18 years old) who have monthly allowance more than 100 Egyptian pounds have triple the risk of tobacco-use compared with those who get less than 100 Pounds per month (OR=3.4, 95% CI=2.3-5.6, and P-value<0.001) (Refaat, 2004).

3.4.1.6 Awareness of smoking harms

Nine studies explore adolescents' awareness of smoking consequences. One-in-five pupil, aged 13-15 years, believes that cigarettes and Shisha-smoking do not affect their health however, the majority of pupils (72% and 74%) are aware of at least one health consequence of smoking (cigarettes and Shisha respectively) (CDC, 2009). Many Egyptian youths believe that Shisha is less harmful than cigarettes-smoking, even among those who study medicine, mean age 17.8+1.2, as 37.2% and 45.4% of them who never or ever smoked respectively believe in that, P-value=0.04 (Labib et al., 2007).

Only five studies (Harbour, 2012, Ibrahim and Ahmed, 2006, Singh et al., 2012, Islam and Johnson, 2005, Allam and Abd Elaziz, 2007b) specified adolescents' awareness of different smoking consequences and its association with smoking status. The impact of smoking on the respiratory system is well-known by all, smokers and non- smokers, pupils, aged 14-18 years, in secondary schools of Assiut city, while only 45.5% of them know the impact on the gastrointestinal system. Pupils' awareness of other consequences of smoking is low, regardless of their smoking status; for example, only 22.5% of pupils know the consequences of smoking on gum, teeth and cardiovascular system and just 11% know renal problems caused by smoking (Ibrahim and Ahmed, 2006). The mean awareness level regarding smoking hazards is lower (70.2 ±24.4) among smoker university pupils, mean aged 18 years, than non-smokers

(83.6 ±17.4, P-value< 0.01) (Allam and Abd Elaziz, 2007b, Allam and Abd Elaziz, 2007a). Smokers and non-smokers have different information on smoking hazards. For example, more non-smoker pupils (72%) know that smoking cause cancer than smokers (62%); this small difference is statistically significant, P-value <0.001. While smoker pupils know more about psychological dependence, physical tiredness and deaths caused by smoking (73%, 76% and 24%) compared with non-smokers (48%, 60% and 11%), these differences are statistically significant (P-value=0.001) (Ibrahim and Ahmed, 2006).

The economic impact of smoking, at individual and family level, is three-time more recognised by smoker pupils than non-smokers, 35% compared with 10%, P-value= 0.001 (Ibrahim and Ahmed, 2006). Also saving money is a reason for cigarettes-smoker-men to consider quitting (OR=1.89, 95% CI=1.70–2.09) compared with Shisha-smokers (Singh et al., 2012).

Knowing the short-term negative consequences of smoking (such as having yellow teeth and bad smell of clothes and breath) was a protective factor against smoking by females not males (OR=0.8, 95% CI=0.7-0.9) (Islam and Johnson, 2005).

Knowing at least four health consequences of smoking protects male youths, aged 15-24years, against smoking compared with knowing none or less than four health harms of smoking, in rural Upper-Egypt (OR=0.43, 95%0.31–0.61, P-value <.001) (Harbour, 2012).

Over two-thirds (70.6%) of pupils, aged 13-15, definitely think that sitting near (cigarettes or Shisha) smokers harms them; with small and not significant differences between girls (76.6%) and boys (65.8%) (WHO and CDC, 2014a). However, pupils' awareness of the harm of second-hand smoking was better in 2009; 83.3% and 71.6% of pupils knew that sitting near to cigarettes and Shisha-smokers respectively affect their health (CDC, 2009). The difference in the awareness of smoking harms between smokers and non-smokers was not identified in GYTS reports, except in 2001 when it was concluded that never-smokers (77.9%, CI= ±4.1) have better awareness of second-hand smoking harms than current-smokers (63.6% CI= ±14.1) and therefore they support banning smoking in public places (Dous, 2001).

In terms of the source of information on smoking harms, almost two-third (63.1%) of pupils, aged 13-15, received at least one anti-smoking message in mass-media a month before GYTS of 2014 (WHO and CDC, 2014a). Additionally, most (85%) pupils, aged 13-15, who attend social and sporting events received some anti-smoking messages in these events (CDC, 2009). More boys (81%) receive anti-smoking messages in public gatherings than girls (48.7%) (WHO and CDC, 2014a). The warning labels on cigarettes-package seem less convincing, only one-third of current smokers (mainly boys) considered quitting after reading them (WHO and CDC, 2014a).

3.4.1.7 Positive attitude and beliefs on smoking

Nine of the included studies identified that positive false beliefs about smoking are common among Egyptian adolescents and encourage them to initiate smoking. Based on Ajzen (1991) an attitude refers to the degree of having positive or negative feelings toward something while a belief is what people think is right or wrong about something.

One in five (20.9%) adolescents, aged 13-15, believes that smoking makes smokers enjoy celebrations and social gatherings better (WHO and CDC, 2014b); this belief is more common among boys (one in four) than girls (one in seven) (WHO and CDC, 2014a). Two thirds (66.9%) of adolescents, aged 13-15, believe that smoking helps in losing weight (CDC, 2009) but it is unspecified if this belief is influenced by the nutritional status of adolescents. Similarly, 45% of adolescents, mean age 17.8+1.2, who ever-smoked believe that smoking prevents weight gain; this belief is slightly lower (37.2%) among never-smokers, P-value =0.03 (Labib et al., 2007).

Additionally, over a third (33.3%) of adolescents, aged 13-15, trust that smoking enables youths making more friendships (WHO and CDC, 2014b), this finding was not disaggregated by smoking status. However, another study indicates that one in four pupils who never-smoked trust that smoker boys have more friends than non-smokers (Dous, 2001). Although the culture discourages females' smoking, one-in-five pupils who never-smoked think that smoker girls have more friends than non-smoker girls (Dous, 2001). This belief is almost double among current-smoker pupils compared with those who never-smoked, see Table 3. A quarter of pupils, aged 13-15, believe that smoking makes boys more attractive, with no significant difference between smokers and non-smokers, as Table 3 illustrates (Dous, 2001). A fifth (19.1% ±2.3) of never-smoked boys considered that smoking makes girls more attractive, this belief was higher (28.3 ± 8.6) among smoker-pupils (Dous, 2001). However, this belief has been markedly reduced since 2001, instead over a half (54.2%) of adolescents, aged 13-15, think that smoker youths are less attractive and 32% of them believe that smoking does not affect boys or girls attractiveness either positively or negatively (WHO and CDC, 2014b). The above positive expectations from smoking are identified as predictors of adolescents' smoking in other studies (Gadalla et al., 2003, Ahmed et al., 1999, Labib et al., 2007).

Table 3 Positive beliefs about smoking among smokers and non-smoker adolescents, aged 13-15 years, in Egypt, 2001

Beliefs	% of pupils who believe it is definitely true	
	Never smoke	Current smoker
Smoker boys have more friends	24% (± 4)	43% (± 13.7)
Smoker girls have more friends	18.4% (± 3.4)	32% (±12.8)
Smoking makes boys more attractive	25% (±4.9)	23.4% (±8.5)
Smoking makes girls more attractive	20.1% (±2.3)	25.6% (11.5)

Source: (Dous, 2001)

Relieving anxiety, forgetting problems, and body relaxation are other common perceived benefits of smoking among smokers (28.3%, 21.4% and 26.2%) and non-smoker (32%, 25% and 21.4%) adolescents in upper-Egypt (Ibrahim and Ahmed, 2006). Smoking benefits in relieving stress and providing pleasure has been emphasised by 22% and 27% of smoker adolescents in rural Qualyobia respectively (Gadalla et al., 2003). Moreover, a third of male-pupils believe that smokers have more self-esteem than non-smokers with no significant difference in this belief between smokers (37%) and non-smokers (32%), P-value=0.084 (Ibrahim and Ahmed, 2006). Having any of these positive expectations from smoking increases both current (OR=1.3, 95% CI=1.2–1.3, P-value<0.0001) and ever (OR=1.2, 95% CI=1.2–1.2, P-value<0.0001) smoking rates and increases adolescents' susceptibility to smoking in males (OR = 1.2, 95% CI=1.1–1.3, P-value=0.0001) and females (OR=1.2, 95% CI=1.1–1.3, P-value=0.0001) (Islam and Johnson, 2005).

Although a considerable number of adolescents have false-positive beliefs about adolescents' smoking, others have negative attitudes toward adults' smoking. For example, almost all pupils (97.1%) believe smoker men and women are unconfident or stupid or losers (CDC, 2009). This negative attitude may be originated from adolescents' observation of the long-term consequences of smoking on smoker-adults around them.

3.4.1.8 Religious beliefs on smoking

Three studies, none was a national survey, researched the association between adolescents' smoking and their religious beliefs about smoking. This association was not significant in two small local-studies in Qualyobia (Radwan et al., 2003b, Gadalla et al., 2003). while the association was positive in a recent large household-survey in rural areas (Singh et al., 2012). The Egyptian religious leaders issued fatwa explaining that smoking is forbidden in Islam, the religion of 90% of the Egyptian population (Mbiti, 2015), as smoking harm smokers and people around them (Jabbour and Fouad, 2004). Adolescents' awareness of this fatwa and religious beliefs about smoking were explored in three studies.

A large household-survey (Singh et al., 2012), of 4,994 males and 5,167 females aged over 15 years, in rural-Egypt, showed that more non-smokers believe that smoking is a sin "haram" (OR= 2.54, 95% CI=2.26–2.85) than cigarettes-smokers (OR= 1.13, 95% CI=1.01–1.26], and smokers of both cigarettes and Shisha (OR=0.36, 95% CI= 0.31–0.42); also more non-smokers are aware of the religious forbiddance of smoking (OR=1.71, 95% CI=1.59–1.83) than cigarettes-smokers (OR=0.90, 95% CI=0.84-0.97), and smokers of both cigarettes and Shisha (OR=0.43, 95% CI= 0.38-0.48). The study concluded that awareness of the religious prohibition of smoking is associated with smoking avoidance among those aged above 15 from smoking, This might be also applicable to those under-15-years who are usually influenced by adult relatives and society members.

A study in rural-Qualyobia (Radwan et al., 2003b, Radwan et al., 2003a) showed that 81.4% of pupils (mean age of 15.5 years±0.9 SD) know the Fatwa on smoking forbiddance; this awareness is significantly higher among boys (87.4%) than girls (69.9%), P-value<0.01. Pupils obtained their information on this fatwa from religious-leaders (directly or through TV/Radio) and reading religious books whereas school curriculum was not a source of this information. Among participants, 98.4% believed that smoking is a sin and knowing this fatwa strengthened this belief among boys (from 94.3% to 99.7%, p-value=0.024) and girls (from 91.5% to 98.5%, P-value=0.039). Nevertheless, the study showed no significant differences in the awareness of smoking prohibition (83% vs. 84.9% P-value>0.05) and believing that smoking is a sin (100% vs. 99.1% P-value=1) between current-smokers and never-smokers respectively (Radwan et al., 2003b, Radwan et al., 2003a). In the same governorate (Qualyobia), another study identified no statistical difference between ever and never smoked-pupils in terms of their exposure to anti-smoking messages from religious leaders (Gadalla et al., 2003).

The majority of adolescents, mean age 17.8+1.2, accept the Fatwa on smoking prohibition whereas small proportions of them, 16.8% of never-smokers and 20.6% of ever-smokers, P-value=0.2, disagree with this Fatwa (Labib et al., 2007).

3.4.1.9 Intention (susceptibility) to smoke

This section explains the identified information on the intention of adolescents to smoking which indicates their susceptibility to initiate smoking. Adolescents' susceptibility to smoke is measured by the absence of a firm decision not to smoke and adolescents who are susceptible to smoking are those who do not rule out smoking in future (Asma et al., 2015, CDC, 2016a, Ng et al., 2014).

Five studies explored the intention to smoke among Egyptian adolescents who never smoked. In the last GYTS, one in seven Egyptian adolescents, aged 13-15, (13.7% of boys and 13.4% of girls) who never-smoked reported that they are likely to smoke in the future (WHO and CDC, 2014a). This ration was higher (one in five) in 2005 (WHO and CDC, 2005). A study of a big representative sample (2,150) in Alexandria identified a significantly higher rate of

susceptibility to smoking among male pupils (51%) aged, 13-19, than females (26%, ×2 = 127.13, Degree of Freedom= 1, P-value<0.0001) (Islam and Johnson, 2005). Among secondary-school pupils in rural Qualyobia, more females (96%) intend not to smoke in the future than males (79%) and more males (20%) than females (2%) were unsure about their intention to smoke (Gadalla et al., 2003). Reasons for this gender-difference in the intention to smoke was unexplained in the two studies.

Adolescents' susceptibility to smoke is markedly increased by having positive beliefs on smoking or a smoker friend, sibling or parent (Islam and Johnson, 2005). Among students-union leaders, smokers had statistically significant lower mean of attitude toward smoking (35.5 ±16.0), which included intention not-to-smoke or to-quit, intention to participate in smoking prevention activities and intention to advise friends to avoid smoking, than non-smokers (mean of 66.6 ±18.7, P-value=0.001) (Allam and Abd Elaziz, 2007b, Allam and Abd Elaziz, 2007a).

3.4.1.10 Curiosity and refusal self-efficacy

Five studies explored the psychological factors behind adolescents' smoking in Egypt. these studies concluded that curiosity and poor refusal self-efficacy, inability to refuse tobacco offered by others including friends, are reasons behind smoking initiation.

Three quarters (76.7%) of smokers boys, aged 14-18 years in Assiut city, initiated smoking because of curiosity and two-thirds of non-smoker boys (64.3%) believe that feeling of curiosity encourages their peer to initiate smoking, P-value=0.00 (Ibrahim and Ahmed, 2006). Similar findings were identified in rural Qualyobia (Gadalla et al., 2003).

The majority (86.6%) of adolescents, aged 13-15, trust their ability to refuse smoking offers by their best friends (WHO and CDC, 2009b). High refusal self-efficacy, is a protective factor against, both sexes, adolescents' smoking in Egypt (OR=0.8, 95%CI=0.7-0.9, P-value<0.0001 in boys and OR=0.8, 95%CI=0.8-0.9, P-value<0.001 in girls) (Islam and Johnson, 2005). However, having smoker friends significantly reduce adolescents' refusal self-efficacy; as 50% of adolescents, aged 13-15, who have smoker friends believe they would smoke if their close-friends offered them cigarettes (CDC, 2009).

3.4.1.11 Physical inactivity and no hobbies

Only two studies explored the association between smoking and poor practice of exercises and other hobbies, this association was positive. Adolescents' who do not practice any exercises are more likely to smoke (currently) than those who practice any type of exercise (OR=1.4, 95% CI=1.1-2.0 P-value< 0.05) (El-Gilany et al., 2008). Moreover, physical inactivity increases the perception of poor health status which is significantly associated with smoking by Egyptian youth, aged 17 to 25 years (Abolfotouh et al., 2007). Practicing hobbies is a protective factor against adolescent' smoking (OR=0.5 , 95% CI=0.3-0.8, P-value< 0.05) (El-Gilany et al., 2008).

3.4.1.12 Shisha and cigarettes smoking

Three studies explored the association between shisha and cigarette smoking and all identified that the risk of cigarettes-smoking is significantly associated with Shisha-smoking among Egyptian adolescents. The majority (83%) of secondary school pupils in rural Qualyobia who currently smoke cigarettes have tried Shisha and 40% of those who ever-smoked cigarettes have tried Shisha compared with the minority (8%) who never-smoked cigarettes but tried Shisha (Gadalla et al., 2003). In Mansoura, one in five (19.9%) of male adolescents, aged 14 to 19 years, who are current-smokers of cigarettes smoke also Shisha and similar proportion

(20%) of male adolescents who ever-smoked cigarettes have also experimented Shisha, this association is statistically significant, P-value<0.05 (El-Gilany et al., 2008). Moreover, year-one medical students who ever-smoked cigarette before the age of 18 are more likely to experiment Shisha (49.5%) and become current-smoker of Shisha (27.5%) than those who never-smoked cigarette, this association is statistically significant, P-values<0.001 (Labib et al., 2007).

3.4.1.13 Using alcohol and other substances

The available evidence, although limited, indicates that using alcohol and other substance-use are not prevalent among Egyptian youths. In a national household-survey, very few (1.9% and 1%) of Egyptian youths, aged 13–35, reported that they ever-tried alcohol (1.9% of males and 0.1% of females) or other substances (3.6% of males and 0.1% of females) respectively (Population Council, 2015). Likewise, only 2% and 1% of year one medical students, mean age 17.8+1.2, stated they are currently using alcohol or other substances respectively (Labib et al., 2007). An old school-based survey, of a national representative sample of 14,656 male pupils at secondary schools, showed higher rates of experimenting cannabis and alcoholic beverages in urban areas than rural areas; and 21% and 8% of those who experimented synthetic drug or alcohol, respectively, are still using them (Soueif et al., 1990). The use of alcohol and other substances is probably under-reported in the above studies because of their relying only on self-reporting and illegality of alcohol and substance use in Egypt. Studies that did not use self-reporting methods, showed higher rates of substances-use in Egypt. For example, a survey that used urine screening indicates that the prevalence of tramadol-use by adolescents, aged 13-18 years, is 8.8% in the Zagazig governorate (Bassiony et al., 2015). Also, in a national survey, 3.8% and 7.6% of Egyptian youths, aged 13–35, reported that their relatives or friends, respectively, had tried other substances and 3.5% of their friends had ever-tired alcohol (Population Council, 2015) (Population Council, 2015). There is a strong association between adolescents' use of psychoactive substances and the exposure to these substances through friends or family members (Soueif et al., 1990, Soueif et al., 1985).

The age of initiating substances-use ranges between 12 and 16 years (Soueif et al., 1990) and the mean age of initiating tramadol use specifically is 16.5± 1.1 SD (Bassiony et al., 2015). Weed (Hashish) is the most commonly used substances (77.7%) among those who reported other substance use in SYPE 2014, followed by marijuana (Bango) (40.2%), and pills (20.8%)(Population Council, 2015).

The illegality of using alcohol and other substances in Egypt challenged researching the association between smoking and using these substances. Only four of the included studies researched the association between adolescents' smoking and use of alcohol or other substances which was only estimated by self-reporting. In these studies, the small number of self-reported cases of using these illegal substances restricted the statistical explanation of how alcohol and substance use may lead to smoking among adolescents. Instead, the four studies compared the use of alcohol or other substances among smokers and non-smoker adolescents to allow statistical demonstration of this relationship but none of these studies explored if adolescents started with smoking or using alcohol or other substances. These studies' findings are explained below.

Smoker adolescents (current and ever) have a higher risk of using alcohol and psychoactive substances than those who never-smoked (Soueif et al., 1990, Soueif et al., 1985). One in four (23%) and one in eight (12%) of the daily Shisha-smokers, mean age 17.8+1.2, also use alcohol and other substances respectively every day (Labib et al., 2007). Smoking by youths, median

age 18 years, is significantly associated with alcohol-use (Refaat, 2004). The risk of ever and current use of alcohol is significantly higher (18.4% and 6.4% respectively) among adolescents who ever-smoked cigarette, mean age 17.8+1.2, compared with those who never-smoked cigarettes (1.4% and 0.5% respectively), P-value<0.001 (Labib et al., 2007). Similarly, other substance-use among university students, median age of 18 years, is significantly associated with cigarettes-smoking (Refaat, 2004). Likewise, the risk of ever and current use of other substance use is significantly higher (11.9% and 3.7% respectively) among adolescents who ever-smoked cigarettes, mean age 17.8+1.2, compared with those who never-smoked cigarettes (0.3% and 0.2% respectively), P-value<0.001 (Labib et al., 2007).

3.4.1.14 Overestimation of smoking rates among peers and adults

Adolescents' over-estimation of prevalence rates of smoking among peers and adults increases the risk of smoking initiation by adolescents in Egypt. The association with the overestimation of smoking by peers was explored in two studies. Islam and Johnson (2005) identified that overestimation of peers' smoking prevalence increases the risk of ever-smoking (OR=1.3, 95% CI=1.2–1.4, P-value<0.0001) and current-smoking rates (OR=1.3, 95% CI=1.2–1.5, P-value<0.0001) among adolescents, aged 13-19 years, but does not affect their susceptibility (intention) to smoke in both sexes. Moreover, a small study (302 convenient sample of pupils aged 14-18) in Cairo, Giza and Qualyobia (Ahmed et al., 1999) identified that overestimation of peers' smoking prevalence is a predictor of adolescents' smoking. The association with the overestimation of smoking by adults was explored in one study only which showed that overestimation of adults' smoking rates increases the risk of ever-smoking (OR=1.7, 95% CI=1.6–1.9, P-value<0.0001) and current-smoking rates (OR=1.2, 95% CI=1.1–1.4, P-value=0.0002) among adolescents, aged 13-19 years, and increases the susceptibility to smoking in both males (OR=1.1, 95% CI=1.1–1.2, P-value=0.002) and females (OR=1.2, 95% CI=1.1–1.3, P-value= 0.0005) (Islam and Johnson, 2005).

3.4.2 Household-related factors

Adolescents, in different contexts, are usually affected by their housemates and relatives, especially parents and siblings, due to modelling, approval and availability issues (Hoffman et al., 2006, Lau et al., 1990, Simons-Morton et al., 2004, Simons-Morton, 2002, Villanti et al., 2011). This section discusses household-related factors that influence adolescents' smoking in Egypt which include: exposure to smoking at home; smoking by family members, parents and siblings; parents' education and occupation; plus family's bonding, size, characteristics and socio-economic status.

3.4.2.1 Smoking by family members

Thirteen of the included studies researched the association between adolescents' smoking and smoking by family members in the Egyptian context. This relationship was positive in the 13 studies.

The reviewed studies identified a strong association between adolescents' smoking and household adults' smoking. The exposure of Egyptian adolescents to smoking behaviour at home is high in general, 31.7% among males and 38.6% among females aged 13-15 years, according to GYTS (WHO and CDC, 2014a). In the DHS, about half of those aged 10-14 (49%) and 15-19 (52.2%) reported living with a smoker (MOHP, 2015). Moreover, 30.9% and 35% of youths, aged 13-15 years, reported having a smoker father and at least one smoker sibling respectively (Population Council, 2015). Current-smokers are more exposed (54.3±12.4) to smoking behaviour at home than never-smokers (26.2 ±2.4), based on the GYTS which represents adolescents aged 13-15 years in public-schools across Egypt (Dous, 2001). Having

family members who smoke is an important independent predictor of adolescents' smoking (Islam and Johnson, 2005). In a logistic regression, having at least one family member who smoke increases the risk of current smoking three times (OR = 3.6, 95% CI = 2.4-5.4, P-value= 0.001) and the risk increases to 12 times when more than one family member smoke (OR = 12.7, 95% CI = 10.4-22.1, P-value< 0.001) (El-Gilany et al., 2008). Also, living with a smoker adult increases the risk of youths' smoking 2.73 times than living with non-smoker adults (95% CI=1.84–4.07, P-value<.001) (Harbour, 2012). Additionally, 21.2% of male adolescents who smoke Shisha, mean age 17.8+1.2, stated that they are encouraged by family members to initiate Shisha-smoking (Labib et al., 2007).
Only one study discussed the gender difference in the influence of relatives' smoking on adolescents' smoking. In this study, 15.7% of female adolescents, mean age 17.8+1.2, who currently smoke stated that smoking by their relatives encouraged them to smoke compared with only 8.4% of male smokers, P-value<0.001 (Labib et al., 2007). The SES and educational levels were not explained in this study. The gender-difference was not explained in other studies because of including male participants only or the small number of self-reported females' smoking cases.

3.4.2.1.1 Parents' smoking or approval of smoking

All the studies (6) that explored smoking by adolescents and their parents concluded that adolescent's smoking is significantly associated with parents' smoking or approval of smoking. About half (54% in 2005 and 47% in 2009) of the Egyptian adolescents, aged 13-15, have at least one smoker parent (WHO and CDC, 2005, WHO and CDC, 2009b). Adolescents whose parents smoke have a high risk of trying or continue smoking, OR is 2.3 (95% CI=1.6–3.2, P-value<0.0001) and 2.1 (95% CI=1.4–3.1, P-value=0.0007) respectively in multivariate analysis (Islam and Johnson, 2005). Smoking among male adolescents is significantly affected by fathers' smoking, especially in rural areas where over half (55%) of adolescents have smoker fathers (Gadalla et al., 2003). The smoking rate is higher (56%) among male adolescents whose father smoke compared with those whose fathers never-smoked (44%), P-value=0.001 (Ibrahim and Ahmed, 2006). Moreover, parents' smoking significantly increase adolescents' susceptibility to smoking in both sexes (males OR=2.3, 95% CI=1.7–3.1, P-value=0.0001) (females OR= 2.8, 95% CI =1.9-4.0, P-value=0.0001) (Islam and Johnson, 2005). Over two thirds (72.6%) of male adolescents, aged 14-18 years, who smoke stated that their fathers' smoking encouraged them to smoke (P-value=0.001) and 42.9% of those who never-smoked believe that fathers' smoking encourages their peer to initiate and continue smoking (P-value=0.001). Contrariwise, mothers' smoking play a minor role in smoking by male adolescents, as only 8.8 % of male adolescents who smoke stated that their mothers' smoking encouraged them to smoke (P-value=0.001) and 14.3% of those who never-smoked believe that mothers' smoking encourage their peer to initiate and maintain smoking behaviour (P-value=0.001) (Ibrahim and Ahmed, 2006).

Adolescents' smoking is also influenced by parental approval of smoking. Over three quarters (82%) of male adolescents, aged 14-18 years, who smoke stated that parental approval of smoking encouraged them to smoke (P-value=0.001) and about a third (32%) of those who never-smoked believe that parental approval of smoking encourages their peer to initiate and maintain smoking behaviour (P-value=0.001) (Ibrahim and Ahmed, 2006). The last GYTS showed that 42.4% of adolescents, aged 13-15 years, who are current-smokers usually smoke at home (WHO and CDC, 2014b) which may indicate either parents' agreement or parents' inability to change their children's smoking behaviour. This rate has increased since 2005 when only 19.8% of adolescents smoked at home (WHO and CDC, 2005). These findings were not

disaggregated by area/governorates or rural/urban settings. So it is unclear if they are applicable to entire Egypt or varies across regions.

3.4.2.1.2 Siblings' smoking and approval of smoking

Three studies explored smoking by adolescents and their siblings and concluded that adolescent's smoking is significantly associated with siblings' smoking or approval of smoking.

Adolescents, aged 13-19 years, whose siblings smoke are 3.5 more likely to try smoking (95% CI= 2.3–5.2, P-value<0.0001) and 3.9 more likely to continue smoking (95% CI=2.6–6, P-value<0.0001) compared with adolescents whose siblings never-smoked, in a multivariate analysis after adjusting for age, sex and SES (Islam and Johnson, 2005). Moreover, over a half (56.7%) of current-smoker male adolescents, aged 14-18 years, stated that their smoker siblings encouraged them to smoke (P-value is =0.001) and over a quarter (28.6%) of those who never-smoked believe that siblings' smoking encourages their peers to initiate and maintain smoking (P-value=0.001) (Ibrahim and Ahmed, 2006). Additionally, siblings' smoking significantly increases adolescents' susceptibility to initiate smoke, in male (OR = 3.5, 95% CI=2.2-5.6, P-value=0.0001) and female adolescents (OR=2.9, 95% CI=1.7–4.8, P-value 0.0001)(Islam and Johnson, 2005). However, a study in rural Qualyobia found that siblings' smoking is less influential when parents smoke as only 7% of smoker adolescents whose fathers and brothers smoke stated they smoke to copy their smoker siblings (Gadalla et al., 2003).

Adolescents' smoking is also influenced by sibling' approval of smoking behaviour. Over a half (56.7%) of smoker male adolescents stated that their siblings' smoking encouraged them to smoke (P-value=0.001) and 28.6% of those who never-smoked believe that sibling' smoking encourage their peer to initiate and maintain smoking (P-value=0.001) (Ibrahim and Ahmed, 2006).

None of the included studies explained the gender-difference in the influence of siblings on adolescents' smoking.

3.4.2.2 Exposure to smoking at home

Apart from smoking by family members, three studies explored adolescents' exposure to smoking at home and emphasised its association with adolescents' smoking. About 70% of Egyptian adults allow smoking in their houses (MOHP et al., 2009), which expose their children and young relatives to smoking early in their life. Over a third (34.9%) of adolescents, aged 13-15, are exposed weekly to smoking at their home (WHO and CDC, 2014a); this exposure was worse (47.6%) in 2009 (WHO and CDC, 2009b). Over half (59.7%) of boys who smoke currently were first exposed to smoking behaviour at their houses (Dous, 2001).

3.4.2.3 Parents' education

Three studies explored the association between adolescents' smoking and parents' education. The risk of current smoking is higher among adolescents of illiterate fathers compared with those of university-educated fathers (OR= 2.2, 95% CI=1.4-3.6, P-value =0.001) (El-Gilany et al., 2008). This association has been confirmed in other local studies, especially among male adolescents (Gadalla et al., 2003, Ibrahim and Ahmed, 2006).

In two studies, there is also an inverse association between mothers' education and adolescents' smoking. Adolescents, aged 14 to 19 years, of illiterate mothers are more likely to be current-smokers than those of university-educated mothers (OR= 2.0, 95% CI=1.2-3.3, P-value<0.05) in Mansoura (El-Gilany et al., 2008). Also, current-smoking rate among male

adolescents, aged 14-18 years, increases significantly with the low educational level of mothers in Assiut city, 72% among those with illiterate-mothers compared with 26% among university-educated mothers (P-value=0.001) (Ibrahim and Ahmed, 2006). In Qualyobia, the association between mothers' education and adolescents' smoking was not significant (Gadalla et al., 2003).

3.4.2.4 Parent's occupations

Four studies explored the association between adolescents' smoking and parents' occupation. It was concluded the occupations of fathers, not mothers, is a predictor of adolescents' smoking unless if mothers work abroad or outside houses for long times.

The risk of current-smoking is higher among adolescents whose fathers are farmers (OR=3.1, 95% CI=1.7-5.6, P-value=0.001), have manual jobs (OR=2.5, 95% CI=1.6-3.8, P-value=0.001) or other unprofessional jobs (OR=2.1, 95% CI=1.2-3.6, P-value=0.001) compared with those of fathers with professional and semi-professional jobs (El-Gilany et al., 2008) . Likewise in Assiut, the smoking rate is significantly higher among male adolescents whose fathers have unprofessional jobs (58%) compared with those whose fathers have professional jobs (38%) and those of engineers, teachers or lawyers fathers (40%), P-value=0.001 (Ibrahim and Ahmed, 2006). Additionally, non-daily smoker adults with unprofessional jobs are less likely to smoke in the presence of their children than heavy smokers with professional jobs (Boulos et al., 2009), which is expected to prevent transmitting this habit to their children. None of these findings were adjusted for parents education or income.

Contrariwise, mothers' occupation is not associated (positively or negatively) with adolescent's smoking (Ibrahim and Ahmed, 2006) even if mothers are house-wife (OR=1.5, 95% CI=0.98-2.3, P-value>0.05) (El-Gilany et al., 2008). However, smoking is more prevalent among adolescents whose parents (fathers or mothers) work abroad or outside their house for a long period (Nassar, 2003), the statistical significance of this association was unexplained in this study.

The insignificant association between adolescents' smoking and mothers' occupation could be explained by the existence of other confounding factors such as mothers' education and family income. Working mothers are assumed to be busy and have less time to discuss smoking with their children and monitor their behaviour. However, this varies by type of mothers' work, the number of working hours and location. Additionally, mothers' work usually increases family income but this does not necessarily mean the family is not poor or adolescents have more money to spend as working mothers spend more money on childcare and transportation for example and they have limited money to save if any. None of these confoundings was explained in the included studies. Another confounding factor which was not explained, in the included studies, in relation to mothers' occupation is the educational level of mothers which is identified as a protective factor of adolescents' smoking, as discussed in section. There is a need for further studies to explore these confounding factors in more depth and fill this gap in the available evidence.

3.4.2.5 Family's bonding, size and characteristics

Four studies explored the association between adolescents' smoking in relation to family's bonding, size and characteristics and all concluded that poor family-bonding, self-evaluated by participants, increases the risk of adolescents' smoking in Egypt.

Bad relationships between adolescents and their parents and between parents themselves were important reasons behind initiating smoking by 43% and 45% respectively of current

smoker adolescents (P-value=0.001) (Ibrahim and Ahmed, 2006). Also, 60.7% and 28.6% of non-smoker adolescents believe that bad parents relationships with each other and their children respectively were reasons behind initiating smoking by their peers (P-value=0.001) (Ibrahim and Ahmed, 2006). Moreover, the proportion of current smoking is lower among adolescents who spent their free time with their families (15.5%) than those who spend their free time with friends (24.3%) (El-Gilany et al., 2008).

The probability of smoking increases if adolescents live in a single-parent-family. In logistic regression, adolescents of single-parent-family have a higher risk of smoking than those of families with both parents (OR=3.7, 95% CI=1.5-8.9, P-value<0.05)(El-Gilany et al., 2008). Over half of smokers (59.5%) and non-smoker (53.8%), adolescents believe that separation of parents is an important reason for initiating and maintaining smoking by adolescents (P-value<0.05) (Ibrahim and Ahmed, 2006). Also, 35.7% and 39.3% of non-smokers and 29.5% and 24.3 % of smoker adolescents believe that bad relationships between adolescents and either father-in-law or mother-in-law respectively encourage adolescents to smoke (P-value<0.05) (Ibrahim and Ahmed, 2006). Male youths, aged 15-24 years, who live with single-mothers have a higher risk of smoking than those who live in a household with at least one non-smoker male adult (OR=2.13, 95% CI=1.43 –3.18, P-value<.001) (Harbour, 2012). Father's death encouraged 31% of smoker adolescents to continue smoking and 25% of ever-smoked adolescents to initiate smoking, as they stated (P-value<0.05) (Ibrahim and Ahmed, 2006). Smoking is more prevalent among adolescents of at least one parent who is working or had worked abroad, even if parents are not separated (Nassar, 2003). This association could be explained by the poor parental supervision, increased family problems and exposure to stress in single-parent-families (El-Gilany et al., 2008).

A last adolescent among sibling is more likely to smoke (OR=1.7, 95% CI=0.8-3.6) than the first (OR= 1.0, 95% CI=0.5-2.0, P-value>0.5), also those in between first and last among siblings are more protected than others (OR= 0.8, 95% CI=0.4-1.5) (El-Gilany et al., 2008). Although current-smoking status is not associated with being a single child for parents (El-Gilany et al., 2008), a single male youth in the family has higher risk of smoking than male youths who live with another non-smoker males (OR=1.70, 95% CI=1.28 –2.26, P-value<.001) (Harbour, 2012). The single male and last child are usually treated special and are given what they want with inadequate supervision which could expose them to smoking (El-Gilany et al., 2008).

Egyptian adolescents who live with more than five family members have a slightly higher risk of smoking than those in small families (OR=1.7, 95% CI=1.1-2.7, P-value <0.05) (El-Gilany et al., 2008).

3.4.2.6 Socio-economic status (SES)

Contradictory evidence has been identified in the association between family-income and adolescents' smoking in Egypt. An economic study, aimed at identifying the economics of tobacco-use in Egypt, concluded that adolescents' smoking is more prevalent in high-income families because of the high accessibility to money in these families which enables adolescents to buy cigarettes (Nassar, 2003). Also, in Assiut city, half of smokers (58.8%) and non-smokers (50%) adolescents, aged 14-18 years, believe that high SES enhances adolescents' affordability and accessibility to tobacco (P-value=0.006) (Ibrahim and Ahmed, 2006). Contrarily, youths' smoking, aged 15-24, is negatively (statistically significant) associated with high family-income (OR=0.94, CI=0.89– 0.99, P-value=0 .01) in rural Upper-Egypt (Harbour, 2012). In Mansoura, the risk of current-smoking is higher among adolescents, aged 14-19, of low (OR=2.4, 95%CI=1.3-4.5, P-value<0.01) or very low SES (OR=2.5, 95% CI= .5-4.2 P-value<0.01) compared with those of high SES (El-Gilany et al., 2008). However, in the last two studies, young people

were asked to identify their family-income by selecting specific categories which is a subjective and biased method for assessing income, as youths might not know the exact family-income.

3.4.3 Peer influence

Peers usually having similar interest and background and may influence each other's behaviours and attitude through modelling of behaviour, pressure, reinforcement and offers, in many contexts (Hoffman et al., 2006, Lau et al., 1990, Kobus, 2003, Otten et al., 2009, Simons-Morton and Farhat, 2010, Simons-Morton, 2002, Simons-Morton et al., 2004, Urberg et al., 2003, Villanti et al., 2011, Becerra et al., 2014) including the Arabic context (Ibrahim et al., 2000, Khafagy, 1996, El-Gilany et al., 2008, Bawazeer et al., 1999, Moradi-Lakeh et al., 2016, Bahaj et al., 2010, Al-Damegh et al., 2004). This section discusses the influence of peers on adolescents' smoking in Egypt.

3.4.3.1 Friends' smoking

Ten of the included studies explored friends' smoking and the findings stress the influence of friends' smoking on adolescents' smoking in Egypt. A national representative survey (included 4354 boys and 4773 girls aged 10-19 years) revealed that adolescents with a smoker friend are 6 and 7.99 times more likely to try smoking (95% CI=4.49–8.04) and been current-smokers (95% CI=4.82–13.23) respectively than those who do not have any smoker friend (Sitrin and Bishai, 2008). Adolescents, aged 13-19 years, with at least one smoker friend are 2.1 more likely to experiment smoking (95% CI=1.4–2.9, P-value=0.0002) and 2.6 more likely to be current-smokers (95% CI=1.4–4.6, P-value=0.001) compared with adolescents who do not have any smoker friend, after adjusting for age, sex and SES in a multivariate analysis (Islam and Johnson, 2005). Among secondary school pupils in Mansoura, those who have one or few smoker friends are more likely to be current smokers (5.1 times 95% CI=3-7.8, P-value< 0.001 and six times 95% CI=3.7-10.3 respectively) while those who have only smoker friends are 10.6 times more likely to be current smokers (95% CI=6.2-18.2) (El-Gilany et al., 2008). In rural Qualyobia, the ever-smoking rate is higher (43%) among adolescents' who have at least one smoker friend compared with those who do not have any smoker friend (29%). The risk is higher among males than females (OR=3, 95%CI=2-5, P-value<0.001)(Gadalla et al., 2003).

Moreover, peers' smoking significantly increases the susceptibility to smoking in male (OR=2.1, 95% CI=1.5–2.9, P-value=0.0001) and female adolescents (OR=1.7, 95% CI=1.1–2.5, P-value=0.009)(Islam and Johnson, 2005). Moreover, 14% of never-smoked adolescents, aged 13-15, and 50% of those who have a smoker friend trust they would smoke if their close-friends offered them cigarettes as a national representative survey concluded (CDC, 2009). Even youths who study medicine, mean age 17.8+1.2SD, find difficulties in preventing themselves from the exposure to smoking by peers; as over a third (35.55%) of them felt unable to ask their friends to stop smoking in their presence with no significant difference between never-smokers (30.8%) and ever-smokers (40.3%) (Labib et al., 2007).

Having smoker friends is common among adolescents in Egypt, as shown in all the national representative household surveys that explored this issue[2] (Population Council, 2015, WHO and CDC, 2009b, WHO and CDC, 2009a). For example: in the GYTS a third (33.5%) of adolescents, aged 13-15 years, reported having at least one close friend who smokes (WHO and CDC, 2009b) and 7% of them have only smoker friends (WHO and CDC, 2009a). The gender difference was not reported in the GYTS but was reported in other surveys. For example, a national representative household survey identified that almost a quarter (23%) of males aged

[2] See section 3.2.4 for the information on the national representative surveys

10-19 years, reported having at least one smoker friend (Ibrahim et al., 2000). This proportion increases with widening the age group to reach 74.2% of males aged 13-15 years (Population Council, 2015). Having smoker friends is uncommon, or under-reported, among female adolescents in Egypt as only 8.1% of females aged 13-15 aged reported having a close friend who smokes in a national survey (Population Council, 2015).

3.4.3.2 Pressure, free offers and encouragement to smoke by friends

Three studies explored peer-pressure and encouragement to smoke among adolescents. Peer-pressure is the most important reason that smoker adolescents identified (55%) for initiating smoking and friends' home is the second most common place where adolescents smoke (Gadalla et al., 2003). About a half of female (49%) and male adolescents (48.5%), mean age 17.8+1.2, who currently smoke stated that their friends encouraged them to smoke, P-value<0.00 (Labib et al., 2007). Additionally, three quarters (76.2%) of male adolescents who smoke reported an exposure to peer-pressure to smoke (P-value=0.001) and the majority (90.5%) of those who never-smoked believe that peer-pressure plays an important role in initiating and maintaining smoking among adolescents (P-value=0.001) (Ibrahim and Ahmed, 2006). Also, over a third (33.8%) of male adolescents who smoke Shisha, mean age 17.8+1.2, stated that they are encouraged by friends to initiate Shisha-smoking (Labib et al., 2007).

Two studies researched free smoking offers by friends to Egyptian adolescents. Receiving smoking offers (cigarettes and Shisha) from friends is common in Egypt which enhances adolescents to the ability to afford smoking (MOHP et al., 2009). Over a quarter (26.3%) of current-smoker adolescents, median age 18 years, usually take their cigarette from their neighbours and friends and rarely buy their own cigarette (Refaat, 2004).

3.4.3.3 Attachment to friends

Two studies explored the impact of attachment to friends on adolescents' smoking in Egypt. Adolescents who spent their free time with friends are more likely to smoke (currently) than those who spend their free time with family or alone (OR=0.8, 95% CI=1.3-2.4, P-value=0.001) (El-Gilany et al., 2008). Moreover, youths who get their general and health information from their friends have the highest risk of smoking (OR=6.3, 95% CI=2.3-18.9, P-value<0.001), followed by those who depends on the media, compared with those who rely only on information obtained from their family or study (Refaat, 2004). The above studies did not explain if this risk depends on the smoking status of peers or not.

3.4.4 School influences

This section discusses the influence of the following school-related factors on adolescents' smoking in Egypt: school type, school education on smoking, anti-smoking school policy and teachers' smoking.

3.4.4.1 School type

Six studies explored the relationships between school type and adolescents' smoking, see section1.5.2 1.5.1 for the explanation of the types of schools in Egypt. It was concluded that attending single-gender school protects adolescents from smoking. In rural areas, boys who attend boys' schools have a lower risk of smoking than those attending mixed-gender school (OR=0.4, 95% CI=0.2–0.8, P-value<0.05) (Gadalla et al., 2003). Adolescents' beliefs that smoking makes boys more attractive to girls (CDC, 2009) which encourage male adolescents in mixed-gender schools to smoke to be attractive to their female schoolmates (Gadalla et al., 2003, Harbour, 2011). Technical education is an independent predictor of current-smoking (OR=3.9, 95% CI=2.7-5.8, P-value=0.001) (El-Gilany et al., 2008). In Egypt, higher smoking rates

are reported among male youths, aged 18-20 years, who attend public schools (23.4%) followed by private (22.9%) then foreign language secondary schools (11.1%). Whereas the highest rate of current-smoking is reported among female adolescents who attend foreign-language secondary schools (Nassar, 2003). The author argued that foreign-language schools empower females to overcome cultural constrains on women behaviour and raise pupils' awareness of smoking hazards. However, it is unclear how pupils' awareness of smoking was raised in these schools. Furthermore, youths who study agriculture-related subjects at the university have 2.7 are more likely to smoke than those who study health-related subjects (Refaat, 2004). However, none of these studies clearly explained the reasons behind the association between adolescents' smoking and type of schools and education. It is also unclear what school policy and educational activities are used in different schools to prevent adolescents from smoking. Furthermore, many confounding factors affect this association, for example, high-income families send their children to foreign language and private schools while those of low-income families mainly study technical and agricultural specialties. Without adjusting for these confounding factors, these associations cannot be confirmed.

3.4.4.2 School-education on smoking

Five of the included studies explored smoking-related information received by adolescents in schools and apparently preparatory schools do not emphasise education against smoking sufficiently. Only less than half (46%) of pupils were taught about smoking hazards in preparatory schools, more boys (49.9%) were taught than girls (40.9%) (WHO and CDC, 2014a). However, it was not explained if this teaching was done through curricular or extracurricular activities. In the past, schools played slightly better roles in educating pupils against smoking. For example, over half of preparatory schools pupils (61.4%) in 2009 and (57.7%) 2005 were taught in classrooms about smoking hazards (WHO and CDC, 2005, WHO and CDC, 2009b). Also, reasons for adolescents' smoking were explained to 54.1% of pupils in classroom discussions at preparatory schools (WHO and CDC, 2009a). This drop in smoking education at schools may be due to the recent political instability in the country that disturbed school attendance and caused incompleteness of the curriculum, as there is no evidence of recent changes in the curriculum. In rural Qualyobia, never-smoked pupils are more exposed to anti-smoking messages at secondary schools (92%) than ever-smokers (83%), this difference is statistically significant (P-value<0.05), although both groups are highly exposed to these messages (Gadalla et al., 2003). Five years later, GYTS found that about a third (32.5%) of pupils did not have an opportunity to discuss with their teacher what encourage young people to smoke and how they could protect themselves from the impact of those stimulators (WHO and CDC, 2009b). None of the included studies explained the impact of school education on smoking initiation or explained the quantity or quality of smoking-related schools education.

3.4.4.3 School policy on smoking

Only three of the included studies explored the association between adolescents' smoking and anti-smoking school policy. This association was explored indirectly in the three studies and none of the identified studies explored this issue directly or in-depth. One of these studies targeted adolescents who are members of the university students union (Allam and Abd Elaziz, 2007b, Allam and Abd Elaziz, 2007a).

Over two-thirds of preparatory schools pupils (69.9%) reported that they commonly witness people smoking inside schools building, 68.6% in males and 71.2% in females (WHO and CDC, 2014a). This indicates absence or weak enforcement of anti-smoking school policies, although it was not specified if the witnessed smokers are pupils, teachers, parents or visitors. About one fifth (19.4%) of current-smoker pupils in preparatory schools can easily purchase

cigarettes near to their schools whereas over a third (37.1%) of them stated that they cannot purchase cigarette near to their schools (WHO and CDC, 2014b); but it was unspecified if schools monitor pupils purchases of cigarettes or pupils are just afraid to be seen by teachers. Even when anti-smoking policies exist in educational institutes, the poor publication of this policy minimizes awareness and adherence to these policies. For example: although Ain-Shams University in Cairo bans smoking in campus, 27.8% of students-union members (who lead students' activities and organize events) believe that smoking is permitted in campus and over a third of them (38.9%) are unaware of the university anti-smoking policy (Allam and Abd Elaziz, 2007b, Allam and Abd Elaziz, 2007a). Lack of awareness of anti-smoking policy among students' leaders may reflect poor awareness among students and could lead to organizing social events that may be sponsored by tobacco companies and distributing smoking promotion materials which increase students' susceptibility to smoking, especially when the majority (85%) of members believe that students' union does not play any role in smoking prevention among students (Allam and Abd Elaziz, 2007b, Allam and Abd Elaziz, 2007a).

The above findings, although came from three studies only, indicate either absence or week enforcement of school policy that restricts smoking by adults inside school premises. The anti-smoking school policy in Egypt needs to be explored in more depth, which will be done in study-3, as school policy is identified as a key factor in preventing adolescents' smoking based on systematic reviews included SBSPIs in European and non-European countries (Schreuders et al., 2017, Nishio et al., 2018, Das et al., 2016, Park, 2006). Anti-smoking school policy was also commonly used in the effective SBSPIs that were implemented in LMICs, as identified in study-2 of this thesis (see section 4.4.8). However, the association between adolescents' smoking and anti-smoking school policies varied over time in some countries. For example, in 2001 a UK-based study (Moore et al., 2001) identified an association between the strength and enforcement of anti-smoking school policy and the prevalence of adolescents' smoking. These findings suggested introducing antismoking school smoking policies in order to reduce adolescents' smoking in the UK. However, a multi-level logistic regression analysis from a recent nationally representative cross-sectional survey that included a representative large (7376) sample of adolescents (aged 11–16 years) in Wales identified that there was no evidence of an association of antismoking school policies with adolescents' smoking (Hallingberg et al., 2016). The study concluded that antismoking school policy currently exert less influence on adolescents' smoking than they did in the past when adolescent smoking prevalence was more prevalent in the UK. The changes in this association suggest the need for longitudinal studies to examine the potential influence of antismoking school policies on adolescents' smoking in the Egyptian context and explain this association over time.

3.4.4.4 Teachers' smoking

Only two of the included studies researched the association between teachers' smoking and adolescents' smoking in Egypt. One study identified that having a smoker teacher slightly increases the risk of current-smoking among pupils (OR=1.5, 95% CI=1.1-2.0, P-value<0.05) (El-Gilany et al., 2008) but an old study found that this association is not significant (OR=1.0, 95% CI=0.75-1.38)(Khafagy, 1996). The findings were not disaggregated by sex in any study.

3.4.5 Factors related to the macro-environment

The review identified the following macro-environmental factors that influence adolescents' smoking in Egypt: the high exposure to smoking behaviour in public places, transportation and the visual media, smoking affordability and accessibility, the overestimation of adults' smoking rates and exposure to tobacco advertisements and promotion, as this section discusses.

3.4.5.1 Smoking exposure

Adolescents are highly exposed to smoking behaviour in the Egyptian society as over a third (38.9% CI=31.2-47.1) of adolescents, aged 13-15, reported that people smoke in their presence at least once a week (MOHP et al., 2011). Section 3.4.2.2 discussed adolescents' exposure to smoking at home and this section discusses the exposure at public places; this was explored in three studies. Adolescents' exposure to smoking in public places is high as about half of adolescents, aged 13-15, are exposed to smoking in enclosed (55.2%) or any outdoor (50.4%) public spaces at least once weekly (WHO and CDC, 2014a). In rural Qualyobia, 62.5% of secondary-school pupils who regularly use public transportation were exposed to smoking while travelling, 43% of them are exposed to smoking at home and transportation (Gadalla et al., 2003). Living in an environment with high smoking rates increases the risk of youths' smoking in Egypt (OR=1.38, 95% CI=1.22–1.56, P-value<.001) (Harbour, 2012).

The high exposure to smoking gives impressions that smoking is acceptable. For example: in rural Qualyobia, over a quarter (26%) of secondary-school pupils who have ever-smoked Shisha initiate smoking at a cafe because they believe this is acceptable (Gadalla et al., 2003). In an interclass correlation coefficient analysis, Harbour (2012) has identified that living at environments with high smoking prevalence is associated with a small (3.1%) but statistically significant increase in the risk of youths' smoking in Egypt.

3.4.5.2 Accessibility, offers and affordability of smoking

Nine of the included studies explored the accessibility and affordability of tobacco products among Egyptian adolescents. In 2009, only one quarter (25.4%) of smoker adolescents, aged 13-15, were able to purchase cigarette from shops and supermarkets (WHO and CDC, 2009a). But the accessibility to cigarettes has increased afterwards as the majority (84.5%) of smoker adolescents (and 88.9% of smoker boys), aged 13-15, regularly buy their cigarettes from near stores, shop or street vendors or kiosks (WHO and CDC, 2014a). The rate of accessibility to cigarettes among Egyptian adolescents has been doubled over the last 10 years (WHO and CDC, 2005, WHO and CDC, 2014a). The gender-difference in the accessibility of Egyptian adolescents to tobacco-products was unexplained in any of the included studies probably because a small number of girls admitted smoking.

According to The Egyptian Parliament (2002) the age of legal purchase of tobacco products in Egypt is 18 years. This age is similar to the legal age of purchasing cigarettes in many developing and western countries (Nuyts et al., 2019) including the UK which raised this age from 16 to 18 years old (Millett et al., 2011) and considers increasing this age to 21 similar to the United States of America (USA) (Nuyts et al., 2019).

Despite the legal restriction of selling tobacco products to adolescents, it is common that Egyptain parents send their children to buy groceries, including cigarettes, on their behalf (Dous, 2001). This may encourage children to try smoking cigarettes in their way back. Additionally, the majority (92%) of secondary school pupils, aged 16-18, in rural Qualyobia who bought cigarettes either for themselves or someone else were not asked about their age (Gadalla et al., 2003), although it is illegal to sell tobacco products to anyone younger than 18 years (The Egyptian Parliament, 2002). Similarly in other countries, many smoker adolescents manage to purchase tobacco products despite the legal restriction of selling tobacco products to adolescents. For example in the UK, 80% of smokers who are younger than 16 manage to purchase their cigarettes from independent retailers despite being under the legal smoking age (Anderson et al., 2002).

The majority (69.1%) of smoker adolescents in Egypt, especially boys (71.5%), could easily buy one cigarette instead of the whole packet (WHO and CDC, 2014a) which makes cigarettes-smoking more affordable and easy to hide. As discussed in sections 3.4.1.5 and 3.4.2.6, having paid job or high SES improves adolescents' affordability of tobacco products. Receiving smoking offers (cigarettes and Shisha) from relatives and friends is common in Egypt which enables adolescents to overcome the dilemma of unaffordability to buy tobacco products (MOHP et al., 2009). For example, while 65% of current-smoker students, median age 18 years, buy their own cigarettes, over a quarter (26.3%) of them usually take their cigarettes from their neighbours and friends and rarely buy their own cigarettes (Refaat, 2004). The impact of receiving free smoking offers by tobacco companies is discussed in section 3.4.5.4.

3.4.5.3 Exposure to smoking behaviour in the media

All the included studies that explored Egyptian adolescents' exposure to smoking behaviour in the media (three) concluded that Egyptian adolescents are highly exposed to smoking behaviour through visual media such as television, videos and movies. There is no statistically significant gender-difference in this high exposure, 93.7% in boys and 89% in girls (WHO and CDC, 2014a). A lot of the drama and movies watched by 63.4% of adolescents, aged 13-15, show actors while they smoke (CDC, 2009) and only 8.6% of adolescents, aged 13-15, did not observe smokers in visual media in the month preceding the last GYTS (WHO and CDC, 2014a). The GYTS findings do not specify if this exposure is through domestic or international movies and television channels. However, a survey among adolescents, mean age of 15.2±1.4 SD, In Alexandria showed that Egyptian adolescents with higher levels of exposure and receptivity to Western-media are 40% more likely to experiment cigarette-smoking than those with lower levels (OR=1.4, 95%, CI=1.4–1.5). Furthermore, the exposure and receptivity to Western-media significantly among Egyptian adolescents increases the risk of current-smoking in both sexes, after adjusting for demographic factors (OR=1.5, 95%, CI=1.4–1.6 in males and OR=1.3, 95%, CI=1.2–1.4 in females) (Islam and Johnson, 2007). Western-movies are popular and accessible to Egyptian adolescents in both sexes (Islam and Johnson, 2007). Considerable proportions of male and female Egyptian adolescents observe smoking behaviour in movies in general (CDC, 2009). However, after adjusting for demographics and psychosocial smoking risk factors, exposure to western-media increases the risk of current-smoking among Egyptian males, but not females (Islam and Johnson, 2007). This study is old and there is a need for recent evidence on this issue as things might have changed in the western media due to the global pressure to restrict adolescents' exposure to smoking and tobacco advertisements in media (WHO, 2015c).

3.4.5.4 Exposure to tobacco advertisements and promotion

All the included studies that explored adolescents' exposure to tobacco promotion and advertisements in Egypt (eight) emphasizes that Egyptian adolescents are not well-protected against tobacco promotion. Approximately two thirds (64.3%) of adolescents, aged 13-15, noticed tobacco products advertisements at sales points at least once monthly (WHO and CDC, 2014a) and about a third of them (31.5%) observes many cigarettes advertisements at sale points monthly (WHO and CDC, 2009b). The proportion of adolescents, aged 13-15, who recognized cigarettes advertising on billboards is increased by 12.4% since 2005 to be 66.4% in 2009 (WHO and CDC, 2005, WHO and CDC, 2009a). Boys' observation of tobacco advertisements at sales points more than girls (2:1 ratio)(WHO and CDC, 2014a) which expose males more than females to the risk of smoking (Nassar, 2003), especially in rural Egypt (Gadalla et al., 2003). Over half of adolescents (55.4%), aged 13-15, are exposed to tobacco

marketing message in newsletters or magazines accessible to them (CDC, 2009). However, it is unclear if these newsletters and magazines are international or local.

The GYTS showed that three-quarters (75%) adolescents, aged 13-15, who attend sports or community events usually observes cigarettes advertisements during these events (CDC, 2009). Over a quarter (29%) of those who frequently attend sports and social event recognized the presence of numerous tobacco advertisements in these events (CDC, 2009). In contrast, over two-third (68.2%) of adolescents, aged 13-15, noticed anti-tobacco message at sports and community events held the month before the last GYTS (WHO and CDC, 2014a). This observation has increased since 2009 when only 43% of adolescents recognised anti-tobacco messages during their attendance of public gathering events (CDC, 2009).

One in 12 (7.8%) adolescents, aged 13-15 years old, owns something with tobacco brand logo on it (WHO and CDC, 2014a); this proportion was higher (13.2%) in 2005 (WHO and CDC, 2005). Although there is minor, statistically significant, gender-difference in adolescents' ownership of items with tobacco-brand-log, 8.8% of males and 6.7% of females, the proportion of female adolescents who own items contain tobacco-brand-logo (6.7%) is double the proportion of female adolescents who smoke (3.1%) (WHO and CDC, 2014a). This may indicate that more girls are willing to smoke but unable to do that, probably because of cultural barriers, as has been identified in other studies (MOHP et al., 2009, Sreeramareddy et al., 2018). The GYTS report in 2014 did not specify if this ownership is higher among smokers or non-smokers. However, the GYTS in 2001 explains that about one in five (18%, CI±3.5) of adolescents who never-smoked own at least one object with tobacco-brand-log on it compared with a quarter (25.8%, CI±7.2) of smoker adolescents (Dous, 2001). The GYTS did not explain if these objects were bought by adolescents or freely distributed to them during events.

One in five (5%) adolescents, aged 13-15, is ever been offered free tobacco products by a tobacco-company representative, more males (6.2%) receive these offers than females (3.6%) (WHO and CDC, 2014a). This proportion was double (10.2%) in 2009 (WHO and CDC, 2009b). The smoking status of adolescents who received these offers was unspecified; except in 2001 GYTS which illustrates that one in four (20.4%, 95% CI=17.3-23.5) adolescents who never-smoked has ever received free cigarettes by tobacco-company representatives compared with over half (60%, 95% CI=47.6-73.4) of smokers (Dous, 2001).

3.5 Discussion and conclusion

Factors that influence adolescents' smoking in Egypt are summarised in Figure 11, based on findings from 31 studies included in this review. As this thesis focuses on SBSPIs, this section discusses adolescents' smoking influencing factors that could be addressed through schools to prevent adolescents from smoking initiation.

Egyptians start smoking at adolescence *age* as the national average age of initiating daily smoking in Egypt is 16.8 (CI= 16.6-17.1) years. Adolescents are expected to experiment smoking before this age, estimated to be 15 years in an old study (Tessier et al., 1999), but the national age of experimenting smoking was unspecified in more recent national studies. Similarly, in many LMICs adolescents start irregular smoking early. For example, in India one third (36.8%) of pupils, aged 13-15 years, initiate tobacco-use before the age of 10 (Stigler et al., 2011). Smoking rates in Egypt increases with age. In a neighbouring Arabic country, Jorden, increasing age is as an independent predictor of smoking progression among boys (Jaber et al., 2016). Accordingly, SBSPIs should target adolescents before the age of 15 in order to prevent adolescents' smoking initiation.

The review concluded that adolescents' smoking in Egypt is markedly influenced by sex as boys tend to try and continue smoking more than girls, particularly in rural areas. This sex disparity is different from other contexts, especially non-Arabic countries, where male to female smoking ratio is similar (Wellman et al., 2016). Females' smoking is identified as unacceptable behaviour in Egyptian society that considers smoking as male behaviour. This restricted smoking (Shisha and cigarettes) by girls and delayed the age of initiating smoking among females. The identified low rates of girls' smoking may be a reflection of the cultural taboo or could be an underestimation of the real prevalence since many girls might be reluctant and embarrassed to admit smoking in self-administered questionnaires which was the only methods used to research smoking status in the identified studies. Although girls' smoking rate is low countrywide, it is doubled since 2009. Additionally, girls are 14 times as likely as adult women to currently use tobacco products. If this girls' smoking trend continues, the prevalence of smoking among females will be high in the near future. Therefore, both boys and girls should be targeted in SBSPIs.

The review concluded that Egyptian adolescents mainly smoke cigarettes but the risk of cigarettes-smoking by Egyptian adolescents is significantly associated with *Shisha-smoking* which shows an alarming increase among Egyptians aged 13-15 years (El-Awa F, 2010). A similar significant association is also identified in other Arabic countries that face a similar raise in adolescents' smoking of Shisha (Kheirallah et al., 2016a, Al-Haddad and Hamadeh, 2003, Khader et al., 2009, McKelvey et al., 2013). Therefore, SBSPIs should focus on preventing smoking initiation of both Shisha and cigarettes. Designers of behaviour change interventions are recommended to specify factors that could be addressed in the targeted environment because not all causes are modifiable and could be addressed at all levels. The predictors of adolescents' smoking that could be addressed through schools are explained in the next section.

3.5.1 The influencing factors that could be addressed in SBSPIs

The Egyptian adolescents' smoking influencing factors identified in this review, see Figure 11, were screened to identify factors that could be addressed through SBSPIs to prevent adolescents' smoking initiation. Following the guide on designing behaviour change interventions (Michie et al., 2014a), factors that could be addressed through schools were classified into two groups (promising and very promising), see Table 4, then reorganized, in Table 5, using the COM_B model to identify the modifiable factors that influence adolescents' capability, opportunities and motivations to initiate smoking in Egypt. The process of identifying factors that could be addressed through SBSPIs included the following stages. First, the researcher used the guide by Michie et al. (2014a) to theoretically classify the identified predictors in Figure 11, into either modifiable or unmodifiable. Although this theoretical classification of the predictors is subjective, it is recommended to be used when there is lack of evidence relevant to the targeted context (Michie et al., 2014a). Second, another post-graduate researcher who knows and used the BCW guide to develop behaviour change intervention was involved in the classification process of the influencing factors to ensure that the researcher's perspective does not dominate the analysis. Initially, both researchers independently classified the factors then discussed and agreed on the theoretical classifications. Any disagreements were resolved by consensus or recourse to the supervisors. The above approaches were used in the decisions on the factors that could be addressed through schools because there are no published articles explain which predictors are or could be addressed through schools in the Egyptian context. Third, in order to minimize subjectivity of the theoretical classification of the predictors, the classified factors were revised after completing study-2, which explored factors that were addressed in SBSPIs in Arabic and/or LMICs. For example, all family-related factors were initially considered unmodifiable through schools but during study-2, parents' smoking was considered modifiable through schools because few SBSPIs involved awareness activities and quitting services that targeted parents in order to reduce adolescents' exposure to smoking at home. Similarly "accessibility to tobacco products close to school" was initially considered unmodifiable through schools as it is a micro-environmental factor , however, findings from study-2 identified that schools were able to put pressure on restricting selling tobacco products in shops closed to schools in few LMICs. Accordingly, this factor was considered modifiable based on the evidence from LMICs. The applicability of these findings to the Egyptian context needed to be explored further. Therefore, and finally, the modifiability of adolescents' smoking influencing factors through the Egyptian schools was further explored in Study-3, from the perspectives of school staff and pupils, in order to prioritise the influencing factors that should be addressed in SBSPIs in Egypt.

Table 5 represents factors that could be modified through schools based on the research's point of view and her understanding of the Egyptian context, the opinion of another postgraduate researcher who used the BCW in designing behaviour change intervention as well as findings of study-2 about factors that were addressed in the SBSPIs that were implemented in Arabic and/or LMICs. The summary of the findings on the predictors of adolescents' smoking that could be addressed through schools is summarised in Table 6. Wherase, the predictors of adolescents' smoking that could be addressed through schools in the Egyptian context will be discussed in chapter eight based on findings of the three sub-studies and summarised in Table 25, page 223.

Figure 11 A conceptual framework of factors that influence adolescents' smoking in Egypt

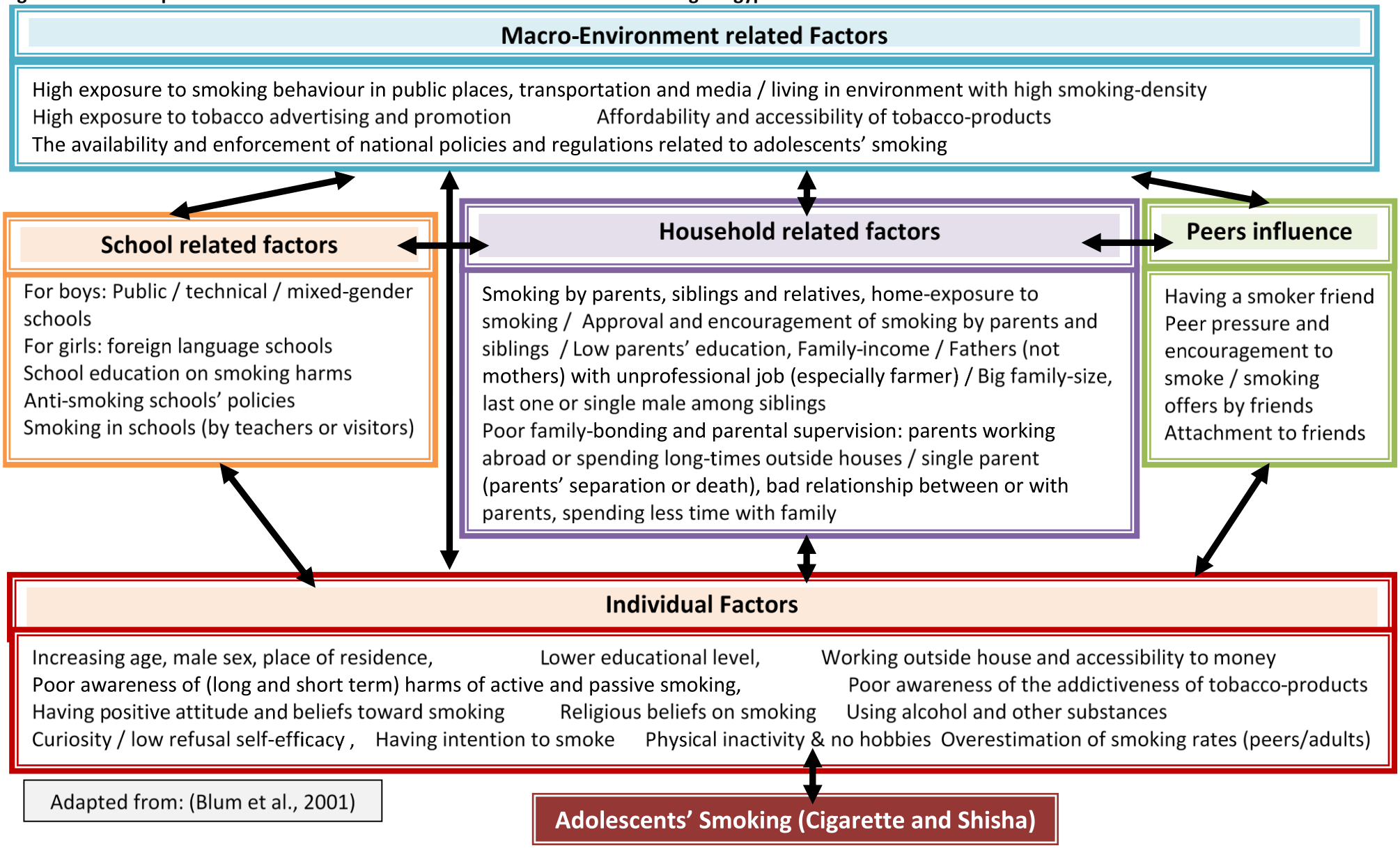


Table 4 Classification of the influencing factors of Egyptian adolescents' smoking according to the addressability through schools

The identified factors	Significant association with adolescents' smoking	Studies that reported Significant association Study ID (1st author, year)	Addressability through schools
Individual factors			
Age	Yes	(El-Gilany et al., 2008) (Harbour, 2012) (Islam & Johnson, 2005)(MOHP et al., 2009)(MOHP, 2015) (Nassar, 2003)(Tessier et al., 1999) (WHO and CDC, 2009)	Unmodifiable
sex	Yes	(Dous, 2001) (El-Awa F, 2010) (El-Gilany et al., 2008) (Gadalla et al., 2003) (Harbour, 2011) (Harbour, 2012) (Islam and Johnson, 2005) (MOHP et al., 2009) (MOHP, 2015) (Nassar, 2003) (WHO and CDC, 2005) (WHO and CDC, 2009a) (WHO and CDC, 2014a) (WHO and CDC, 2014b)(Youssef et al., 2002) (Youssef et al., 2003)	Unmodifiable
Place of residence	Yes in some studies	(El-Gilany et al., 2008) (MOHP et al., 2009) (Youssef et al., 2002)	Unmodifiable
Lower Educational Level	Yes	(El-Gilany et al., 2008)(Gadalla et al., 2003) (Harbour, 2012) (Ibrahim et al., 2000) (MOHP, 2015) (MOHP et al., 2009)(Youssef et al., 2003)	Unmodifiable by schools if adolescents are unrolled
Employment and accessibility to money	Yes	(El-Gilany et al., 2008)(Gadalla et al., 2003) (Harbour, 2012) (Ibrahim and Ahmed, 2006) (Refaat, 2004)(Sitrin and Bishai, 2008)	Unmodifiable by schools
Poor awareness of the long and short term harms of active and passive smoking	Not strong association	(Allam and Abd Elaziz, 2007) (CDC, 2009) (Dous, 2001) (Harbour, 2012) (Ibrahim and Ahmed, 2006) (Islam and Johnson, 2005) (Singh et al., 2012) (WHO and CDC, 2014a)	Very promising
Poor awareness of the addictiveness of tobacco products	Not strong association	(Allam and Abd Elaziz, 2007) (CDC, 2009) (Dous, 2001) (Ibrahim and Ahmed, 2006) (Islam and Johnson, 2005) (WHO and CDC, 2014a)	Very promising
Having positive attitudes & beliefs on smoking	Yes	(Ahmed et al., 1999)(CDC, 2009)(Dous, 2001)(Gadalla et al., 2003)(Ibrahim and Ahmed, 2006)(Islam and	Very promising

		Johnson, 2005) (Labib et al., 2007))(WHO and CDC, 2014a) (WHO and CDC, 2014b)	
Poor awareness /beliefs about the religious prohibition of smoking	Not a strong association	(Gadalla et al., 2003) (Labib et al., 2007) (Mbiti, 2015) (Radwan et al., 2003) (Singh et al., 2012)	Promising
Having an intention to smoke	Yes	(Allam and Abd Elaziz, 2007) (Gadalla et al., 2003) (Islam and Johnson, 2005) (WHO and CDC, 2014a)	Promising
Curiosity	Yes	(Gadalla et al., 2003)(Ibrahim and Ahmed, 2006)	Promising
Poor refusal self-efficacy	Yes	(CDC, 2009)(Islam and Johnson, 2005)(WHO and CDC, 2009b)	Very promising
Lack of practising hobbies / Physical inactivity	Yes	(Abolfotouh et al., 2007)(El-Gilany et al., 2008)	Very promising
Overestimation of smoking rate among peers and adults	Yes	(Ahmed et al., 1999)(Islam and Johnson, 2005)	Very promising
Household-related factors			
Smoking by family members or at home	Yes	(Dous, 2001)(El-Gilany et al., 2008)(Gadalla et al., 2003)(Harbour, 2012)(Ibrahim and Ahmed, 2006) (Islam and Johnson, 2000) (Labib et al., 2007))(MOHP et al., 2009)(MOHP, 2015) (Population Council, 2015)(WHO and CDC, 2005)(WHO and CDC, 2009b) (WHO and CDC, 2014a)(WHO and CDC, 2014b)	Promising by awareness and quitting services
Parents' education or occupation or SES	Yes	(Boulos et al., 2009)(El-Gilany et al., 2008)(Gadalla et al., 2003)(Ibrahim and Ahmed, 2006) (Nassar, 2003)	Unmodifiable by schools
Family's bonding, size and characteristics	Yes	(El-Gilany et al., 2008)(Harbour, 2012)(Ibrahim and Ahmed, 2006)(Nassar, 2003)	Unmodifiable by schools
Peer-related factors			
Having a smoker friend	Yes	(CDC, 2009)(El-Gilany et al., 2008)(Gadalla et al., 2003)(Ibrahim et al., 2000)(Islam and Johnson, 2005)(Labib et al., 2007)(Population Council, 2015)(Sitrin and Bishai, 2008)(WHO and CDC, 2009a)(WHO and CDC, 2009b)	Promising
Peer-pressure /encouragement to smoke	Yes	(Gadalla et al., 2003)(Ibrahim and Ahmed, 2006) (Labib et al., 2007)(MOHP et al., 2009) (Refaat, 2004)	Very promising
Smoking offers by friends	Yes	(Gadalla et al., 2003)(Ibrahim and Ahmed, 2006)	Very promising

		(Labib et al.,2007)(MOHP et al., 2009) (Refaat, 2004)	
Attachments to friends		(El-Gilany et al., 2008) (Refaat, 2004)	Promising
School-related factors			
Type of school	yes	(CDC, 2009)(El-Gilany et al., 2008)(Gadalla et al., 2003)(Harbour, 2011)(Nassar, 2003)(Refaat, 2004)	Unmodifiable
Poor school education on smoking harms	Yes	(Gadalla et al., 2003)(WHO and CDC, 2005)(WHO and CDC, 2009b)(WHO and CDC, 2014a)	Very promising
Poor anti-smoking school policy	Yes	(Allam and Abd Elaziz, 2007)(WHO and CDC, 2014a)(WHO and CDC, 2014b)	Very promising
Accessibility to tobacco products close to school	Yes	(WHO and CDC, 2014b)	Promising
Teachers' smoking	yes	(El-Gilany et al., 2008)(Khafagy, 1996)	Very promising
Macro-environmental factors			
Exposure to smoking in public places	yes	(Gadalla et al., 2003)(Harbour, 2012)(MOHP et al., 2011)(WHO and CDC, 2014a)	Unmodifiable by schools
Accessibility & affordability of smoking and public smoking offers	Yes	(Gadalla et al., 2003)(MOHP et al., 2009) (WHO and CDC, 2009a) (WHO and CDC, 2014a) (WHO and CDC, 2005)	Unmodifiable by schools
Exposure to smoking behaviour in media	Yes	(CDC, 2009)(Islam and Johnson, 2007)(WHO and CDC, 2014a)	Very promising
Exposure to smoking advertisements & promotion	yes	(Dous, 2001)(WHO and CDC, 2005) (WHO and CDC, 2009a) (CDC, 2009)(WHO and CDC, 2009b)(WHO and CDC, 2014a)	Unmodifiable by schools

Table 5 The influencing factors of Egyptian adolescents' smoking that could be modified through schools according to COM_B model

COM-B model Component	The relevant influencing factors that could be addressed in SBSPIs
Psychological capability	- Poor awareness of the long and short term harms of active and passive smoking, the religious prohibition of smoking and the addictive effect of tobacco products - Poor school education on smoking harms - Poor refusal self-efficacy
Physical opportunity	- Smoking by family members or at home (due to accessibility) - Smoking offers by friends - Accessibility to tobacco products close to school - Tobacco offers by friends, relatives and others - Having smoker friends, parents, siblings and relatives (increase access to tobacco products)
Social opportunity	- Smoking by family members or at home (due to modelling) - Having a smoker friend / Attachments to friends - Peer-pressure /encouragement to smoke - Overestimation of peers' smoking rates - Teachers' smoking - Poor anti-smoking school policy - Overestimation of adults' smoking rate
Reflective motivation	- Having positive attitudes and beliefs on smoking - Having religious beliefs on Smoking prohibition - Having an intention to smoke - Curiosity
Automatic motivation	- Lack of practising hobbies / Physical inactivity - Exposure to stress and anxiety

3.5.2 Limitations of this review and implications for future research

All the identified studies were cross-sectional quantitative studies that only could identify associations because the exposure and smoking are measured simultaneously. Whereas a temporal sequence between the exposure and smoking onset is fundamentally required in causal inference (Bowling, 2014, Kumar, 2011). The review identified only one comparative study and no longitudinal or qualitative study that researched the predictors of adolescents' smoking in Egypt. The majority of the included studies relied on proportion and P-value in explaining findings while adjusting for known correlates was rarely used in multivariate analyses. Only few studies reported CI of the identified findings and used strong statistical tests in the analysis, such as odd-ratio and logistic regression. More powerful statistical tests and methodology are required for a more accurate estimation of the predictors of adolescents' smoking in Egypt (Armitage et al., 2008); this could include secondary analysis of the existing national representative data, such as GYTS, using robust statistical tests. Longitudinal studies are also needed to examine the potential influence of the identified factors on adolescents' smoking over time in the Egyptian context and explain changes in these association as some of the included studies were old.

Half (16 out of 33) the included studies were school-based which excludes out-of-school adolescents who may have higher smoking rates and different predictors. Private and faith-based schools were not researched in any of the included studies. Although minority (8%) of Egyptian adolescents attend these schools (CAPMS, 2017), they might have different predictors than those attending public schools.

Although school-based surveys are limited to students, the findings in Egypt could represent the majority of adolescents aged 13-15 because of the high regular school attendance rate among Egyptians at this age group. For example: when the last GYTS was conducted, the net enrolment rate[8] in all types of preparatory school among children aged 12-14 years was 98% (UNESCO, 2016) and 84% after excluding faith schools (Al-Azhar)(UNICEF, 2014, Ghoneim et al., 2014). Another limitation of school-based surveys is the data apply to pupils who attended the school on the survey day. Pupils' response rates were high (89.2% in 2014, 97.1% in 2009, 85.4% in 2005, and 100% in 2001) in all the GYTS in Egypt (Dous, 2001, WHO and CDC, 2005, WHO and CDC, 2009a, WHO and CDC, 2014a) which minimizes biases attributable to non-response or absence. Considering the above strengths and limitations of school-based surveys, GYTS is considered the best national survey in estimating adolescents' smoking behaviour and attitude in Egypt. Although household-surveys represent all adolescents, some researchers argue that adolescents' smoking is underestimated in household surveys because the presence of adult relatives at home during the survey could make adolescents denial smoking in the Egyptian context (Ibrahim et al., 2000).

All the included studies relied only on self-reporting in assessing the participants' smoking behaviour as no biological markers were used to validate the result of self-reporting of smoking, probably due to limited funds, as two studies acknowledged (El-Gilany et al., 2008, Harbour, 2011). Although self-reporting of smoking is considered as a valid and stable indicator of smoking behaviour in many contexts (Wills and Cleary, 1997, Bauman and Koch, 1983), a meta-analysis of 26 studies that compared the result of self-reporting and biochemical measures of smoking status indicates that sensitivity of self-reporting is 87.5% (ranged from 6% to 100%) and specificity is 89.2% (ranged from 33% to 100%)(Patrick et al., 1994). The sensitivity and specificity of self-reporting vary across culture, sex and age (Dolcini et al., 1996). In some contexts, young people and females might under-report their smoking status because their smoking is culturally unacceptable (Valladolid-Lopez et al., 2015, Dietz et al., 2015, Patrick et al., 1994). In other context, adolescents might over-report their smoking behaviour because they consider smokers are mature, cool and impressive people (Ng et al., 2006, Mermelstein et al., 2002, Al-sheyab et al., 2016, Arora et al., 2011, Dolcini et al., 1996). The sensitivity and specificity of the self-reporting of smoking in the Egyptian context has not been identified. Accordingly, it is possible that participants of the included studies over or under reported their smoking status which may have influenced the findings. Measuring biochemical markers among a random sample of participants to cross-validate the result of self-reporting of smoking is recommended for accurate estimation of smoking status, especially in limited resources (Prokhorov et al., 1993, Patrick et al., 1994). In the GYTS, specific test-retest results for similar tobacco related questions were used to increase the reliability (Warren et al., 2008).

Most of the reviewed studies used the GYTS definitions of never (not even a puff), ever (even a puff or two) and current (at least once in the last 30 days) smoking (CDC, 2016b) but two studies used

[8] The net enrolment rate means the number of children enrolled in preparatory school who are in the official age of preparatory school (12-14 years), divided by the total population aged 12-14 years.

slightly different definitions of these indicators. In future research, using the validated GYTS tools and definition of smoking indicators would ensure consistency, comparability and generalizability of findings.

Seven of the included studies researched males only because of the low smoking rate among females. More studies are required for a better understanding of gender-differences in the factors that influence adolescents' smoking in Egypt.

Indicators of SES were inconsistent across studies. Some studies used adolescents' pocket money beside parents' education and occupation while others used family size and income as indicators of SES. Other studies did not explain how SES was assessed and classified. In this review, accessibility to pocket-money and parents' occupation and education were discussed separately and other indicators were discussed under SES predictors as in-depth analysis of the association between SES and adolescents' smoking was beyond the scope of this review.

Studies on religious beliefs focused mainly on peoples' awareness of the religious Fatwa that bans smoking. However, the perception of religious messages and influences of religiosity and participation in religious activities on adolescents' smoking were not well-explored.

There is some evidence on the impact of the anti-smoking social-norm and polices in preventing tobacco promotion among Egyptian youths but limited evidence is available on how adolescents' smoking in Egypt is influenced by the social normative environments and the psychological predictors of adolescents' smoking in Egypt.

None of the included studies explore the confounding factors that are related to adolescents smoking and mothers' occupation such as type of work, working hours, mothers' education, family income and expenditure. There is a need for further research to fill this gap in the available evidence.

None of the included studies used qualitative methods to explore how and why some of the identified predictors influence adolescents' smoking in Egypt.

The included studies looked at different factors in different parts of Egypt over different years using various designs and sampling methods. The inconsistency in searching factors that influence adolescents' smoking limited a comprehensive analysis of the changes in the predictors of smoking over time and challenged explaining the trend in smoking behaviour by adolescents, shown in Figure 1. In order to explain reasons behind the changes in adolescents' smoking rates, there is a need to track changes in predictors of adolescents smoking across time, which is important for understanding why adolescents decision to smoke or not is changing over time and to inform behaviour changes interventions. To achieve that there is a need for using a consistent study design and data collection tools, such as the GYTS, which could be adapted as needed to research predictors of adolescents' smoking across different areas and years. Additionally, there is a need for a qualitative study to explores in more depth how adolescents smoking is influenced, positively or negatively, by different factors over the years. These findings would enrich the design of behaviour change interventions.

3.6 Chapter summary

This chapter has discussed the aim, objectives, methodology, findings and discussion of study-1 which review the literature on factors that influence adolescents' smoking in Egypt. The chapter is concluded with a list of factors that influence adolescents' smoking in Egypt and could be addressed through schools. In order to learn from the experiences of countries with a similar context in preventing adolescents smoking through schools, study-2 is conducted. The next chapter discusses the aim, objectives, methodology, findings and discussion of study-2 which systematically review the available evidence on SBSPIs that were implemented in Arabic and/or LMICs in order to highlight what schools in the context of Arabic and LMICs should consider/implement to prevent adolescents from smoking initiation.

Chapter 4 - School-Based Smoking Prevention Interventions in Arabic and/or Low-Middle Income Countries : a Systematic Review (Study-2)

4.1 Introduction

School-based interventions have been used, over the past three decades in many countries, to prevent adolescents from smoking initiation (Thomas et al., 2013). Designing SBSPI is an important step toward controlling the smoking-epidemic in Egypt as there is no evidence that one is available, as discussed in section 1.5. In order to provide an opportunity to learn from other interventions' designers and obtain an insight into what needs to be considered to enhance the effectiveness of School-Based Smoking Prevention Interventions (SBSPIs) in Arabic and Low and Middle income countries (LMICs), this systematic review was conducted.

This systematic review **aims** to develop an understanding of school-based smoking prevention interventions that were implemented in Arabic and/or LMICs countries and what influenced the effectiveness of these interventions in terms of theoretical constructs, intervention functions, methods of implementation and cultural-appropriateness. The review concludes with what needs to be considered in implementing SBSPI in Arabic and/or low-middle income settings in terms of contents, interventions' functions, cultural-appropriateness and delivery methods. The outcome of this systematic review will be used to make recommendations about SBSPI in Egypt, see chapter 8.

Many RCTs have been implemented worldwide to evaluate the effectiveness of SBSPIs and some systematic reviews explored factors influencing the effectiveness of SBSPIs (Shackleton et al., 2016b, Onrust et al., 2016, Schreuders et al., 2017, de Kleijn et al., 2015, Thomas et al., 2013, Thomas and Perera, 2006, Thomas, 2002, Georgie et al., 2016, Isensee and Hanewinkel, 2012, Wiehe et al., 2005, Bauld et al., 2009, Buhler, 2016, Shackleton et al., 2016a). However, none of the identified systematic reviews focused on RCTs of SBSPI that are implemented in Arabic or LMICs. One identified review was focused only on SBSPI in African countries which was not limited to RCTs (Nishio et al., 2018). This review (study-2) is important because: **a)** there is no other systematic review of the literature on SBSPIs focused on RCTs that were implemented in Arabic and/or LMICs and explored the cultural-appropriateness of these interventions. **b)** There is no other systematic review used the Behaviour change wheel (BCW), Capability Opportunity Motivation –Behaviour (COM-B) model and Theoretical Domain Framework (TDF) to explore the literature on school-based smoking prevention interventions (SBSPIs). The following theoretical perspectives were used to review the included interventions in order to get a comprehensive understanding of factors that influence the effectiveness of SBSPIs in Arabic and/or LMICs. 1) The middle layer of BCW was used to specify intervention functions of the included SBSPIs. 2) The Theory coding scheme was used to identify the theoretical-underpinning of the included studies. 3) the TDF which was then used to explain the theoretical constructs of the included interventions. 4) The findings from the above steps were discussed using the inner layer of BCW, COM-B model, to explain what intervention functions, smoking prevention curricula and theoretical constructs were used in SBSPIs to enhance the capability, opportunity and motivation of pupils to avoid smoking in Arabic and/or LMICs. This chapter discusses the aim, objectives, methods and findings of this systematic review.

4.2 Study Objectives

1) To determine the *effectiveness* of school-based interventions in preventing adolescents' smoking in Arabic and/or LMICs;
2) to explore the *cultural-appropriateness* of school-based smoking prevention interventions that are implemented in Arabic and/or LMICs;
3) to determine the *theoretical constructs, intervention functions and smoking prevention curriculum* that have been used in Arabic and/or LMICs to prevent adolescents' smoking through schools;
4) to identify the association between the effectiveness of SBSPIs in Arabic and/or LMICs and the involved: approach and strategies for ensuring cultural- appropriateness; intervention functions, smoking prevention curriculum and theoretical-constructs.

4.3 Methods

This systematic review was informed by the Cochrane handbook for systematic reviews of interventions (Higgins and Green, 2008) and the Centre for Reviews and Dissemination guidance for undertaking review in health care (Tacconelli, 2010). Also, 15 systematic reviews related to smoking prevention in schools were reviewed to inform the search strategy and to identify relevant studies. Furthermore, help was obtained from an information specialist at the University of Leeds to develop the search strategy to ensure appropriate key terms were used for each database searched. This review was registered on 26th of October 2018 in the International Prospective Register of Systematic Reviews (PROSPERO) of the National Institute of Health Research (NIHS).

4.3.1 Eligibility Criteria

The following criteria were used for considering studies for this review:

4.3.1.1 Types of Studies

❖ **Inclusion criteria**

- RCTs as they are strong sources of evidence on effectiveness (Bowling, 2014);
- Baseline smoking was measured before starting the intervention;
- The Intervention was implemented in either an Arabic country, regardless of the country income, or in a country classified as a low or middle (lower-middle, or upper-middle) income country at the time of implementing the intervention; according to the World Bank (WB) classification of countries by income (WB, 2017a). This criterion was used to identify issues related to the context of Arabic and LMIC that should be considered in SBSPIs in Egypt which is an Arabic country with lower-middle-income (WB, 2019).
  A. The Arabic countries were selected because: 1) Egypt is an Arabic country that is allocated in the middle of the geographic location of the Arabic World (Haeri, 2003); 2) In addition to the spoken language, Arabic countries share many common cultural issues, norms and values, called the Arabic culture (Haeri, 2003, Wilson, 1996); 3) Smoking behaviour is markedly influenced by the culture (Steptoe et al., 2002, Wellman et al., 2016) and many of predictors of adolescents' smoking are influenced (positively and negatively) by the Arabic cultural issues (El-Awa F, 2010).
  B. LMICs were considered because the income and the development level of a country determine the available resources at school and capacity of schools to design and

implement school-based interventions within the available resources and thus affect the effectiveness of SBSPIs (Peirson et al., 2016) as well as other behaviour change interventions (Bamberger et al., 2019, Castro et al., 2010, Elliott and Mihalic, 2004). Some school-based interventions need specific resources to be implemented which might not be available in LMICs, the review focused on LMICs in order to identify the evidence related to LMICS. Some systematic reviews of school-based behaviour change intervention recommended conducting systematic reviews that focus on developing countries or LMICs as many effective strategies might not be feasible, accessible and affordable in LMICs (Shackleton et al., 2016b, Nishio et al., 2018, Thomas et al., 2013) where resources limitations are important barriers there (Bauld et al., 2009). For example: using interventions based on the internet, computer or mobile phone might not be applicable for poor countries, like Egypt, where electricity and internet are not accessible at most schools, totally or partially (CAPMS, 2017).

NB: The World Bank classification of countries by income is selected because it is not only an indication of the relative wealth of a country as it is also used as an indirect indication of the country development, as the significant change in the global economic landscape challenge using the old classification of developing countries (Fantom and Serajuddin, 2016).

❖ **Exclusion criteria**

- Full-text articles are not available in English or Arabic language (after contacting the author).

4.3.1.2 Types of participants

❖ **Inclusion criteria**

- Pupils at adolescence age (10-17 years), according to WHO (2014c) definition of adolescence age, were targeted at any stage of the intervention. Adolescence age was considered because many articles only include the mean or median of age without specifying the range of age-targeted by the intervention; smoking initiation age varies across countries therefore different age groups were targeted by SBSPIs that aim to prevent smoking initiation; school enrolment age varies across countries. Although most SBSPIs in high-income countries target pupils at the age of 13-15 years (Thomas et al., 2013), this review was not limited to interventions that target pupils aged 13-15 years and SBSPIs that targeted pupils at all adolescence years were considered to avoid bias and missing important information related to preventing smoking initiation through schools.

❖ **Exclusion criteria**

- School-based Intervention that only targeted the smoking behaviour of teachers or parents.

4.3.1.3 Types of interventions

❖ **Inclusion criteria**

- School-based interventions or programs that aim to prevent smoking among pupils, regardless of:
  - ✓ The complexity of the intervention and if the intervention targets smoking alone or in addition to other tobacco-use or risky behaviour
  - ✓ Who delivered the intervention (teachers, peers, parents, researchers, health professionals, undergraduate or graduate students or others)
  - ✓ What the control groups received (no intervention, the standard or regular school education activities, different type of intervention, others). Studies with no control groups were not included, see section 4.3.1.1.

❖ **Exclusion criteria**

- Pregnancy-related intervention
- Clinical-based interventions
- Interventions that focus only on smoking cessation, passive smoking, alcohol or illicit drug
- If the intervention activities are based on colleges, university or nursery setting
- Intervention that only involves family-based or community-based activities even if pupils were recruited through schools.

4.3.1.4 Types of outcome measures

❖ **Inclusion criteria**

- The primary outcome was the impact of the intervention on the smoking status of pupils who were never-smokers at baseline
- The smoking status was assessed using either self-reported smoking or any bio-medical validation test such as Saliva thiocyanate or cotinine or expired air carbon monoxide levels (Prokhorov et al., 1993, Patrick et al., 1994).
- The outcome was measured after a minimum follow-up of six months after completion of the intervention. The six month follow-up period was considered because 1) this is the minimum period recommended for assessing changes caused by complex health interventions (Higgins and Green, 2008); 2) it has been used in all Cochrane reviews of SBSPI (Thomas et al., 2013, Thomas and Perera, 2006, Thomas, 2002). 3) This period was used in nine of the 15 systematic reviews that were used to inform the search strategy of this review. Whereas different periods were used in six reviews as follow: three reviews considered six months follow-up period after starting the intervention (Peirson et al., 2016, Hale et al., 2014, Hefler et al., 2017) but none of them was a Cochrane review or provided justification for this selection; one review required at least one-year follow-up after the intervention ended (Wiehe et al., 2005) and two reviews considered studies with short follow-up period, at least six weeks after intervention completion (Georgie et al., 2016, Sussman et al., 2014).

❖ **Exclusion criteria**

- No smoking outcome data were reported for example: only reporting changes in awareness or intention to smoke;
- Data on pupils' smoking status before implementing the intervention was unavailable, after contacting the authors.

4.3.2 Information source

Based on relevant systematic reviews, the following databases were searched, using several search filters[9]:

- Medline (Ovid)
- Embase (Ovid)
- PubMed (Ovid)
- Global Health (Ovid)
- PsycINFO (Ovid)
- CINAHL(Ebsco)

[9] Indicated between brackets

- Web of Science (Thomson),
- Popline (K4 Health)
- Cochrane Central Register of Controlled Trials –CENTRAL (Wiley)
- ERIC (Education Resources Information Centre)
- WHO Regional Databases
- PubMed central (PMC)
- Cochrane Database of Systematic Reviews
- ProQuest Middle East & Africa Database
- SCOPUS
- CENTRAL (Cochrane Central Register of Controlled Trials)
- ICTRP International Clinical Trials Registry Platform (WHO) (International)
- Tobacco control 1992-
- Journals of Smoking-Related Disorders
- ICTRP International Clinical Trials Registry Platform (WHO) (International)
- DARE (Database of Abstracts of Reviews of Effects)
- Centre of review and dissemination
- TRIP database
- ASSIA (Applied Social Sciences Index And Abstracts)
- ProQuest dissertations and theses
- Electronic thesis online services (ethos)
- DART –Europe- E – theses portal
- South African thesis and dissertation (SATD)

Databases searches were supplemented by searching the following websites:

- ASSIST (A Stop Smoking In School Trial) intervention model in UK
- Action on Smoking and Health (ASH)
- The National Institute for Health and Care Excellence (NICE) website
- Centre for Tobacco Control Research
- Cochrane Tobacco Addiction review Group
- Trials Register of Promoting Health Interventions (TRoPHI)
- UK Public Health Association
- The European Smoking prevention Framework Approach (EFSA)

4.3.3 Search strategy

The search was conducted in January 2017 and then updated in November 2019. All databases were searched as far back as they allowed. Appendix C summarises the key-terms and literature mapping concepts using PICO framework. Terms related to countries were not included in the used key terms because countries' names are not always stated in the published articles. Therefore, eligible articles were filtered later to identify if the intervention was implemented in an Arabic country or a country with low or middle income. Appendix D shows the full electronic search strategy employed in Medline database, as an example.

Checking reference lists was used to identify more articles, as recommended by Gough et al (2017). Moreover, authors are contacted to obtain full-text, when unavailable in Arabic or English languages through the University of Leeds Library, or details of interventions, when unclearly explained in the published articles. Furthermore, individual Medline and Web of Science searches were run to track 60 authors who published articles on adolescents' smoking in LMICs or Arabic countries, with no

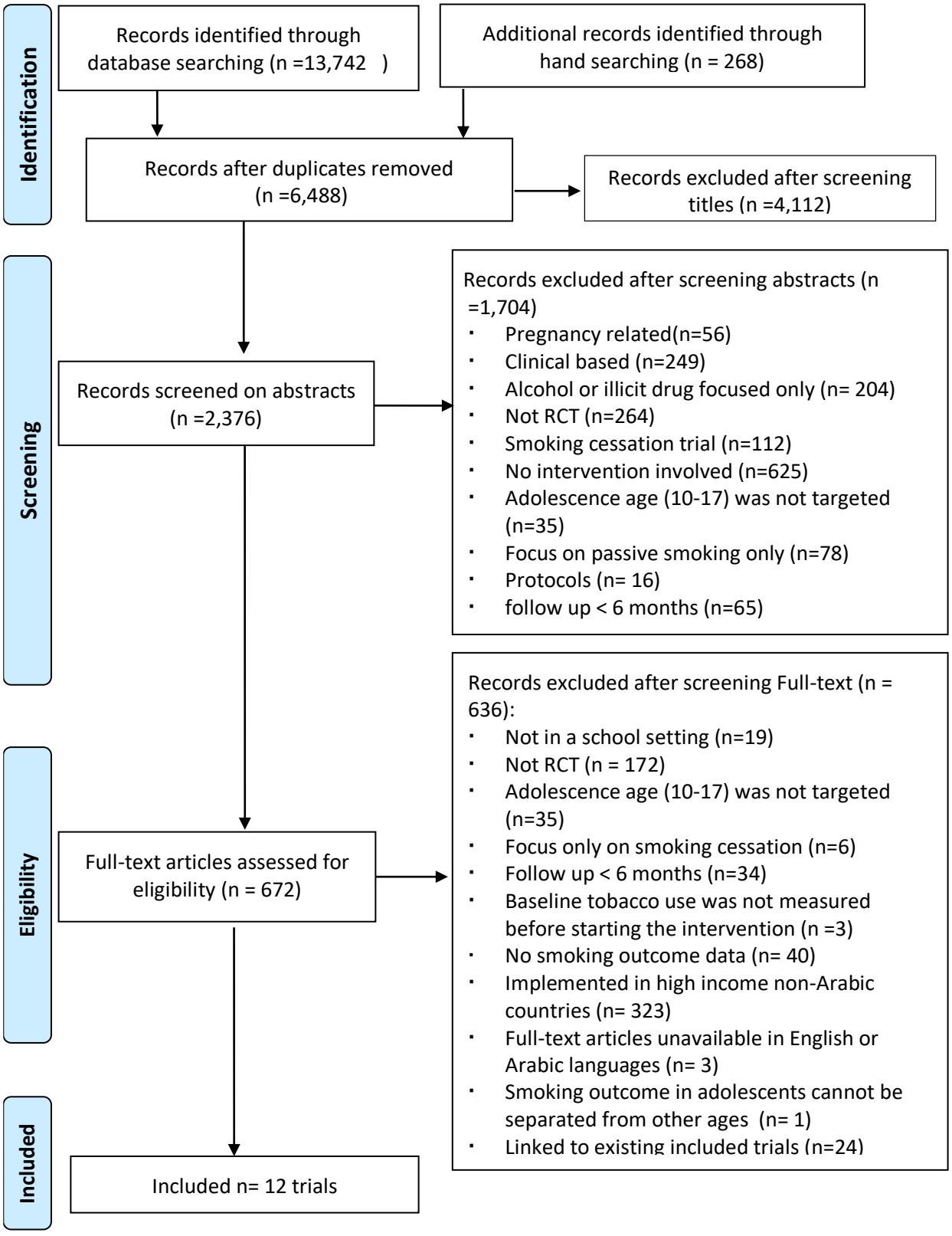
date restriction. Grey literature search was limited to understanding contexts where the interventions were implemented.

4.3.4 Selection process

A stepwise approach was used to identify relevant articles; titles screening was used first to exclude duplicates and clearly irrelevant articles followed by abstracts screening. The eligibility checklist used to screen abstracts is attached in Appendix E, if the answer to the included questions was yes or unclear, then the full-text was reviewed. The process of screening the identified studies and reasons for exclusion are illustrated in the PRISMA diagram, Figure 12, based on Moher et al (2009). The researcher independently screened all titles, abstracts and full-text for inclusion and exclusion criteria. Thereafter a random sample (10%) of all titles and abstracts of the included and excluded studies were independently screened by another postgraduate researcher. An agreement rate of 90% was achieved and any disagreement was resolved through discussion. Any study that the researcher was unsure about inclusion was collectively discussed with supervisors. Blinding procedures, of authors' name, institutions and journals, was not used in sampling studies for double screening. Studies that were identified through alternative ways, such as checking references list of included studies, were subject to the same inclusion and exclusion criteria and screening process as studies that emerged from database searches.

No study was excluded based on the year of publication. Only three studies were excluded, one from Brazil, China and Mexico each, because the full-text was only available in Portuguese, Chinese and Spanish languages respectively. Another SBSPI trial (Al-sheyab et al., 2016) was excluded although it was implemented in an Arabic country (Jordan) with low-income (during the intervention period) because pupils were followed for four-months only after completion of the intervention, see the inclusion critieria in section 4.3.1.4.

Figure 12 PRISMA diagram for searching SBSPIs in Arabic and/or LMICs



4.3.5 Assessment of risk of bias in included interventions

The Cochrane Collaboration's tool for assessing risk of bias in intervention studies (Higgins and Green, 2008) was used to assess whether the included studies have high, low or unclear risk of selection bias, performance bias, detection bias, attrition bias, reporting bias and other bias such as an extreme baseline imbalance between the arms of each study. As recommended by Higgins and Thomas (2018), data were extracted on randomisation, blinding, allocation concealment, selective and incomplete outcome reporting and other bias concerns. Authors were contacted to verify any risk of bias information if not identified in the published articles. If the available data is insufficient to judge the risk of bias, then unclear risk of bias is selected. High risk of bias is selected when the available evidence indicates plausible bias that seriously weakens confidence in the findings. A guideline was used for coding the identified risk of bias; adapted from Glasziou et al. (2001), Higgins and Green (2008), Ryan R (2013) and Higgins and Thomas (2018).

Scaling risk of bias was not used in this review, although it offers attractive simplicity, because it involves giving weight to different criteria in the scale and it is difficult to justify the weight assigned to each criterion (Higgins and Green, 2008). Furthermore, scaling risk of bias showed unreliable assessments of validity and it is not supported by empirical evidence, therefore, it is discouraged in systematic reviews (Higgins and Thomas, 2018).

The researcher independently assessed the risk of bias then another postgraduate researcher independently checked the risk of bias in a random sample (25%) of the included articles. Any disagreements (one case) were resolved by consensus or recourse to the supervisors.

4.3.6 Data extraction and management

Data extraction was informed by the Cochrane strategy for data extraction (Higgins and Green, 2008). A data extraction form was adapted from the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) Statement (Moher et al., 2010) and TIDieR (Template for Intervention Description and Replication) checklist (Hoffmann et al., 2014). This form was used to extract data from each intervention on the following: 1) study design, aim and objectives, number of arms in the trial, interventions contents, smoking prevention curriculum, intervention functions, theoretical-underpinning and constructs, and what the control group received (what). 2) Participants' number, age, sex and ethnicity, attrition and response rate (Who). 3) delivery methods, intervention deliverer and any training provided for them (how). 4) The year (when) and country of implementation, intervention setting (inside school only or also included activities outside school) and school types (where). 5) the intervention duration, number of sessions, frequency of contact, duration of follow-up after intervention completion and booster sessions (how much). 6) Risk of bias, country of interventions' origin and cultural-appropriateness of intervention, quality of implementation, fidelity and any reported facilitators, challenges or barriers (how well). 7) Justification for using SBSPI (why). 8) Smoking behaviour outcome data, definitions of the identified outcome and main conclusions.

Several theoretical perspectives were used to review the included interventions in order to get a comprehensive understanding of SBSPI that could be effective in an Arabic and LMIC like Egypt. The following theoretical perspectives were used in this study to review SBSPIs that were implemented in Arabic and/or LMICs: **1)** The middle layer of BCW (Michie et al., 2014a) was used to specify intervention functions of the included SBSPIs. **2)** The Theory coding scheme (Michie and Prestwich, 2010) was used to identify the theoretical-underpinning of the included studies. **3)** Griffin and Botvin (2010) classification of smoking prevention curriculum was used to adapt the Theoretical Domain Framework (TDF) (Atkins et al., 2017) which was then used to explain the theoretical constructs of the included interventions. **4)** The findings from the above steps were discussed using the inner layer of BCW, the capability, opportunity, motivation and behaviour (COM-B) model. **5)** The cultural- appropriateness of the included interventions

was assessed using Kreuter et al. (2003) and Castro et al. (2010) classifications of approaches, dimensions and strategies of cultural- appropriateness, see section 2.3.4 for the definition of cultural appropriateness. The above theoretical perspectives were explained in chapter 2. Using these theoretical perspectives allowed identifying the approaches and dimensions of cultural- appropriateness, intervention functions, implementation methods, theoretical-constructs and smoking prevention curriculum that were commonly used in effective SBSPIs in Arabic and/or LMICs to enhance pupils' capability, opportunity and motivation to avoid smoking initiation. This provided a full-range of potential options for SBSPIs that were used in Arabic or low-middle-income settings and facilitated providing rationales for selecting among those options for SBSPI in the Egyptian context.

The data extraction form included function checklists that were used in this review to identify the presence or absence of each of the nine intervention functions, the 17 theoretical-domains and the smoking prevention curriculum in each arm of the included SBSPI in Arabic and/or LMICs. More than one function, theoretical-domain and curriculum were allowed to be selected for one intervention or activity. For example classroom discussion of the advantages and disadvantages of smoking was coded under the 'education' and 'persuasion' function. To explore cultural- appropriateness of the included SBSPIs, the checklist identified interventions country of origin plus approaches, dimensions and strategies used in adapting each intervention's arm to the culture of the targeted population. To explore the theoretical-underpinning of the included interventions, the checklist included the following five questions: **1)** was a theory mentioned at any stage of the intervention; **2)** were the relevant theoretical constructs targeted by the interventions; **3)** was the theory used to select recipients or tailor interventions; **4)** were the relevant theoretical constructs measured; **5)** was the theory tested or refined in the interventions. Answers to these questions were coded as yes, no or unclear based on the available information in the included articles. Thereafter, all the named theories in the included interventions were listed.

Authors were contacted to get more information on their interventions and data was coded only based on the existing evidence on each of the identified criteria/elements. Key findings were summarised in tables to facilitate validity checking and comparison across studies. All data were extracted by the researcher then a randomly selected sample (25%) of the included articles was checked independently by another postgraduate researcher. Any disagreements were resolved by consensus or recourse to the supervisors. Time and resources limitation of this study as well as the university restriction of shared work in PhD thesis restricted fully double screening of the included articles.

Based on the recommendations by Michie et al. (2014a) and Francis et al. (2012), the reviewers referred to the definitions and examples of each intervention function and theoretical-domain to ensure effective utilization of these frameworks in coding the intervention functions and theoretical-domains that were used in SBSPIs. Additionally, a discussion of these definitions and examples was organized before starting data extraction in order to clarify boundaries between intervention functions and domains and thus achieve better inter-coder agreement on the extracted data.

4.3.7 Data synthesis

In systematic reviews, data synthesis means the process of organizing, combining and summarising the findings of the included studies (Tacconelli, 2010). In this review, data synthesis was informed by the Cochrane handbook for systematic reviews of interventions (Higgins and Green, 2008) and the Centre for Reviews and Dissemination guidance for undertaking review in health care (Tacconelli, 2010) and ESRC guidance on conducting narrative synthesis in systematic reviews (Popay et al., 2006). The data extraction form, discussed aboveData extraction and management, was used to assess the possibility of conducting a quantitative synthesis of the findings. According to Cochrane guidance for systematic reviews of interventions (Higgins and Green, 2008), meta-analysis and regression are used to pool the findings of homogenous studies in order to increase sample size and obtain a better estimation of the impact of interventions. In this review, there is heterogeneity across the included studies in defining, measuring,

assessing and presenting outcomes of the included interventions, see section 4.4.4. Separating the included studies into subgroups that used similar definitions, measurements and ways of reporting outcomes would have resulted in a very small sample size in each group that might not make significant changes in the findings on effectiveness. Therefore, quantitative synthesis, including meta-analysis and meta-regression, was considered inappropriate in this review and a narrative synthesis of the findings was used. However, the effect size of the interventions was calculated, using the guidance by Borenstein et al. (2009) and Chinn (2000), in order to outline the effect of SBSPIs in preventing smoking initiation as this is recommended to facilitate comparing the effectiveness of intervention when different statistical test and parameters were used across studies included in systematic reviews (Nakagawa and Cuthill, 2007, Fritz et al., 2012). The effect estimates of the include interventions was presented in a funnel plot, see While **Error! Not a valid bookmark self-reference.** shows the funnel plot of the included interventions which demonstrates the effect estimate of each intervention against the sample size of this study, in which the study size is plotted on the horizontal axis. According to the Cochrane handbook for systematic reviews of interventions (Higgins and Green, 2008, Shuster, 2011), the funnel plot presented in **Error! Not a valid bookmark self-reference.** is asymmetrical funnel with the presence of bias because of some smaller studies with lower methodological quality which produced exaggerated intervention effect estimates of these interventions. According to (Sterne et al., 2011), **Error! Not a valid bookmark self-reference.** suggested the presence of publication bias which could be due to delayed publication, selective outcome reporting, selective analysis reporting or the language of the publication language. As explained in section 4.3.1.1, two studies were excluded in this review because the study published in langue other than English and Arabic languages. Variation in sample sizes and heterogeneity in the intensity of the included intervention could be other reasons for the asymmetry of the funnel plot (Sterne et al., 2011).

If there is no publication bias and the included interventions were effective in preventing adolescents from smoking initiation, then most of the dots are expected to be located in the top left of the funnel plot as negative effect size is what influence adolescents' smoking behaviour positively.

Figure 13, which demonstrates the effect estimate of each of the included intervention against the sample size of this study. The Revman software version 5.1, which was provided for free by the Cochrane for systematic reviews of interventions (Higgins and Green, 2008, Shuster, 2011), was used to calculate the effect size and draw the funnel plot, in consultation with a professional statistician.

The following steps were followed to synthesis the data: **1)** after extracting the data from each study, all findings were summarised in tables, see the results section. **2)** To achieve the first four objectives of this review, the extracted data was used to produce a narrative descriptive summary of the intervention functions, theoretical-underpinning and constructs and smoking prevention curriculum, that were used in the included interventions in addition to the cultural- appropriateness and effectiveness of these interventions in preventing smoking initiation among pupils. These issues will be discussed in the results section. **3)** Thereafter, patterns among the included interventions were identified and discussed in terms of the intervention functions, theoretical constructs and smoking prevention curriculum involved and the effect of these interventions on preventing pupils from smoking initiation. **4)** To achieve the fifth objective of this review, interventions' effectiveness was discussed in relation to variance or similarity between interventions in terms of the included intervention functions, theoretical-constructs, smoking prevention curriculum and cultural- appropriateness of interventions and other implementation issues. **5)** Lastly, the above findings were discussed, in the discussion section, using the framework that links COM-B model with TDF and the matrix that links COM-B model with intervention functions, see Figure 6 and Figure 7, as they were developed by behaviour change specialists to facilitate discussing and designing behaviour change interventions (Michie et al., 2014a). The review was concluded with how effective SBSPIs in Arabic and/or LMICs enhanced pupils' capability, opportunity and motivation to avoid smoking initiation. The outcomes of the data synthesis process are explained in the results sections.

4.4 Results

In total 13,742 potentially relevant articles were identified which were then reduced to 6488 after removing duplications, of which 675 were retrieved after reviewing titles and abstracts for relevance. After reading the full-text, 36 articles, representing 12 trials of SBSPIs, met the eligibility criteria and included in this review, Figure 12 summarises the study selection process. A random sample (25%) of these full-texts were double screened for eligibility by another postgraduate researcher with 90% an agreement rate. Disagreements were resolved through discussion with the other coder or supervisors.

4.4.1 Characteristics of participants

Table 6 summarises the characteristics of pupils who were targeted in the included SBSPI in Arabic and/or LMICs. The review represents a total of 39,455 pupils (mean 3,288 pupils per trial, SD=3,388 and range of 170-12,484) and their age ranged from 11 to 15 years. Only one trial did not target females because females' smoking was identified to be very low in the targeted context (Mohammed et al., 2018). Females represented at least 45% of targeted pupils in all trials, except in one trial as females represented only 11% of the included pupils (Seal, 2006). Family-income was reported only in one trial (Mohammed et al., 2018) and findings were adjusted for family income in two trials only (Mohammed et al., 2018, Resnicow et al., 2010). Seven trials did not report if the included schools were public or private. When school type was reported, public schools were targeted more than private schools; two trials targeted only public schools (Resnicow et al., 2010, Marsiglia et al., 2015).

4.4.2 Interventions characteristics

The review identified 12 school-based clustered RCTs that aimed to prevent adolescents in Arabic and/or LMICs from smoking initiation. As explained in section 4.3.1.1, only RCTs were selected in this review as RCTs are strong sources of evidence on effectiveness (Bowling, 2014). Eleven of the included trials were conducted in the following LMICs: two in India (Perry et al., 2009, Reddy et al., 2002), two in South-Africa (Motamedi et al., 2016, Resnicow et al., 2010), three in China (Chou et al., 2006, Chen et al., 2014, Wen et al., 2010), one in Romania (Lotrean et al., 2013), one in Thailand (Seal, 2006) , one in Indonesia (Tahlil et al., 2015) and one in Mexico (Marsiglia et al., 2015). Only one trial (Mohammed et al., 2016) was conducted in an Arabic country, Saudi Arabia, which is a high-income country since 2004 (WB, 2017a). Table 7 summarises the characteristics of the included trials. The available literature did not include clear explanations for the limited number of the RCTs on SBSPIs on Arabic countries, which have been identified in other systematic reviews (Thomas et al., 2013, Thomas et al., 2015, Wiehe et al., 2005, Shackleton et al., 2016b, Uthman et al., 2009, Thomas, 2002, Thomas and Perera, 2006, de Kleijn et al., 2015, Langford et al., 2014). The limited number of SBSPIs in Arabic countries may reflect that Arabic countries haven't considered using SBSPIs to prevent smoking initiation at early ages or allocating enough time, money and resources to research the effectiveness of SBSBIs using high-quality RCTs with at least 6 months follow up to be included in this review. It is also possible that some SBSPIs have been implemented in Arabic countries but their effectiveness hasn't been evaluated through RCTs or the result of the evaluations studies haven't been published in the available literature. In all-cases, this review indicates the need for implementing and publishing more high-quality RCTs about SBSPIs in Arabic countries in order to build more evidence on the effectiveness of SBSPIs in Arabic countries toward control smoking epidemic.

All the included trials comprised one intervention arm except two trials included two intervention arms (Reddy et al., 2002, Resnicow et al., 2008) and one trial included three intervention arms (Tahlil et al., 2015). Resnicow et al. (2008) included two control arms, once for each intervention. So a total of 16 intervention arms were included in this review. All the 12 trials included control groups who received a regular school curriculum. However, only five studies discussed school curriculum in relation to smoking prevention: three trials reported that school curriculum did not include contents or activities related to

smoking prevention (Mohammed et al., 2016, Reddy et al., 2002, Tahlil et al., 2015) and two studies also reported absence of anti-smoking school policy (Wen et al., 2010, Perry et al., 2009). The control group only in one trial received the same but delayed intervention after intervention completion (Perry et al., 2009). Only four trials included booster-sessions after completing interventions' activities.

All trials included a component about smoking prevention but one trial also included components on smoking cessation (Perry et al., 2009) and four trials also included components on other substances-use (Marsiglia et al., 2015, Seal, 2006, Reddy et al., 2002, Motamedi et al., 2016). Interventions contents and activities in relation to smoking prevention will be discussed in section 4.4.8. All interventions were delivered through face-to-face activities inside schools. Fours interventions arms also implemented activities outside schools such as: sending educational materials to parents/relatives at home (Reddy et al., 2002, Wen et al., 2010, Perry et al., 2009); home-work activities for pupils and their parents (Lotrean et al., 2013, Reddy et al., 2002, Wen et al., 2010); setting community smoking policies aimed at creating smoke-free neighbourhood, in one arm (Perry et al., 2009); persuading sellers in stores around schools to stop selling cigarettes to minors, only in one arm (Wen et al., 2010); conducting No Smoking Day ceremonies outside schools, only in one arm (Wen et al., 2010); involving mass-media in publishing school activities on smoking prevention, such as pupils' signatures of contracts not-to-smoke and results of animals' experiments on smoking, and interviewing interventions' participants and deliverers, only in one arm (Wen et al., 2010). Only three arms considered enhancing or developing anti-smoking school-policy (Wen et al., 2010, Perry et al., 2009, Chen et al., 2014), whereas pupils were informed about national anti-smoking policies in three arms (Tahlil et al., 2015, Chou et al., 2006).

Justification for addressing adolescents' smoking through school was explained in all the included trials. All interventions mainly targeted pupils, only three interventions addressed teachers' smoking as well through raising teachers' awareness of smoking hazards; preventing teachers from smoking inside schools to create smoke-free school-norm (Wen et al., 2010, Chen et al., 2014); and helping smoker teachers to quit smoking (Perry et al., 2009). Four interventions arms also targeted parents or relatives of pupils through: assessing their smoking status, awareness of smoking harms and intention to smoke, only in one arm (Lotrean et al., 2013); raising their awareness of smoking harms, in three arms (Perry et al., 2009, Wen et al., 2010, Reddy et al., 2002); asking them to discuss smoking harms with their relatives pupils, in two arms (Lotrean et al., 2013, Reddy et al., 2002); preventing them from smoking inside schools, only in two arms (Wen et al., 2010, Perry et al., 2009); helping smoker relatives to quit smoking, only in one arm (Perry et al., 2009); explaining to them how adolescents are influenced by adults' smoking before asking them to sign contracts not-to-smoke and to assist their relative pupils to refuse smoking offers, only in one arm (Wen et al., 2010).

4.4.3 Intervention Implementation

Teachers were the main deliverers of all interventions, except in two trials which were implemented only by outsiders health professionals (Chou et al., 2006, Mohammed et al., 2016). Five trials also used peer-education, all these trials used both formal peer-education which involved running classroom educational-sessions by pupils and informal peer-education which included open-discussion led by peer leaders and activists during free time in informal situation (Perry et al., 2009, Lotrean et al., 2013, Reddy et al., 2002, Wen et al., 2010, Chen et al., 2014). Active participation of pupils in interventions' activities was encouraged in nine interventions (Reddy et al., 2002, Mohammed et al., 2016, Perry et al., 2009, Motamedi et al., 2016, Lotrean et al., 2013, Tahlil et al., 2015, Resnicow et al., 2010, Marsiglia et al., 2015, Seal, 2006). The majority (10/12) of studies mentioned that interventions deliverers received training, related to interventions' activities and contents, before the intervention started, except two studies that did not mention any training (Motamedi et al., 2016, Seal, 2006). Only four (six-arms) of the trials clearly indicated that interventions' deliverers were supported by manual or booklet that summarises key

messages and issues on contents or activities (Perry et al., 2009, Reddy et al., 2002, Lotrean et al., 2013, Resnicow et al., 2010).

All trials reported the follow-up duration but only five trials specified for how long the intervention activities were implemented. Interventions duration, when reported, ranged from 5-13 weeks, as shown in Table 7. All trials used face-to-face training sessions to deliver interventions contents, alone or with other activities. Two trials did not specify the number of the delivered sessions (Wen et al., 2010, Chen et al., 2014). The number of sessions, when reported, ranged from 5-20 sessions. One trial (Lotrean et al., 2013) reported that intervention activities were implemented over two months which included running five sessions weekly but the total number of sessions was not specified. Similarly, one trial reported that educational-sessions were implemented twice-a-year without specifying the total number of sessions delivered during the intervention (Chen et al., 2014). One trial reported that ten educational-sessions were delivered without specifying how frequent and for how long these sessions and the intervention were delivered (Seal, 2006). None of the intervention's duration, frequency of contact and number of sessions was specified in one trial (Wen et al., 2010).

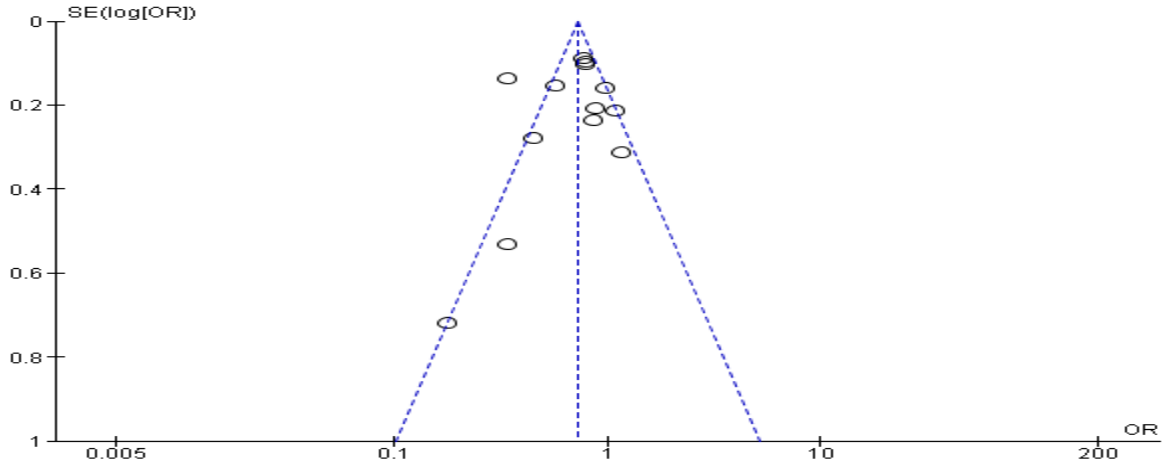
Only three trials discussed if the intervention was implemented as planned or something was changed during the implementation process (Resnicow et al., 2008, Wegner et al., 2008, Caldwell et al., 2010, Motamedi et al., 2016, Reddy et al., 2002) but full-explanations for why fidelity was not-kept were often missing. There is limited information available on the quality of implementing the included interventions. Only five studies reported that process-evaluation was conducted and published some of the findings in English (Perry et al., 2008, Lotrean et al., 2010, Resnicow et al., 2008, Motamedi et al., 2016, Reddy et al., 2002), one trial (Wen et al., 2007) published findings of process-evaluation only in Chinese language, therefore cannot be read by the reviewer. The available information on the implementation process of two interventions was limited to the proportion of pupils who participated in each of the interventions' activities (Chen et al., 2014, Wen et al., 2007).

4.4.4 Primary-outcomes

The effectiveness of each intervention arm was assessed by comparing the smoking behaviour of adolescents in the intervention and control arms, before and after the interventions. All the three trials that included more than one intervention arm also compared the smoking behaviour of adolescents across interventions arms. The outcome of all the included trials was assessed after at least six-months of follow-up, which ranged from six-months to three-years. Half (6/12) of the included studies identified the long-term impact of SBSPI, at least after one year of completing interventions, see Table 7. A summary of the primary outcome of the included studies illustrated in Table 8. While **Error! Not a valid bookmark self-reference.** shows the funnel plot of the included interventions which demonstrates the effect estimate of each intervention against the sample size of this study, in which the study size is plotted on the horizontal axis. According to the Cochrane handbook for systematic reviews of interventions (Higgins and Green, 2008, Shuster, 2011), the funnel plot presented in **Error! Not a valid bookmark self-reference.** is asymmetrical funnel with the presence of bias because of some smaller studies with lower methodological quality which produced exaggerated intervention effect estimates of these interventions. According to (Sterne et al., 2011), **Error! Not a valid bookmark self-reference.** suggested the presence of publication bias which could be due to delayed publication, selective outcome reporting, selective analysis reporting or the language of the publication language. As explained in section 4.3.1.1, two studies were excluded in this review because the study published in langue other than English and Arabic languages. Variation in sample sizes and heterogeneity in the intensity of the included intervention could be other reasons for the asymmetry of the funnel plot (Sterne et al., 2011).

If there is no publication bias and the included interventions were effective in preventing adolescents from smoking initiation, then most of the dots are expected to be located in the top left of the funnel plot as negative effect size is what influence adolescents' smoking behaviour positively.

Figure 13 The effect size of the included interventions in a funnel plot



Self-reporting of smoking status, using self-administered questionnaires filled by pupils inside schools, was the only method for assessing outcomes of all the included interventions due to financial constraints, as indicated by authors. All the included trials discussed procedures of obtaining pupils' consent and ensuring the confidentiality of collected data. None of the included studies used biological measures to check the validity or reliability of self-reporting findings of smoking status. In general, response rates (in baseline and final evaluations) were very good in all the included trials, response rates in final-evaluation ranged from 100% to 84%. The attrition rate was unreported in five interventions whereas attrition-analysis was only conducted in seven (out of 16) arms. One study reported a higher attrition rate in intervention groups than controls without specifying the exact rates in each arm (Chen et al., 2014). When reported, attrition rates ranged from 7.9% to 41% in interventions arms and attrition rates were higher in four intervention arms compared with the controls (Resnicow et al., 2008, Chou et al., 2006, Wen et al., 2007), see Table 7.

Although all the included studies aimed to prevent smoking initiation by adolescents, different indicators were used across these studies to assess the impact of interventions on participants' smoking status and there was inconsistency in defining and measuring these indicators. The outcome of most (9/12) interventions was assessed by measuring changes in life-time never-smoking rates (Chen et al., 2014, Mohammed et al., 2016, Chou et al., 2006, Resnicow et al., 2010, Lotrean et al., 2010, Reddy et al., 2002, Wen et al., 2010, Tahlil et al., 2015) using the GYTS definition of never-smokers, those who never tried smoking in their life even a puff or two (CDC, 2016a). However, one study (Motamedi et al., 2016) considered those who smoked a puff or two as never-smokers. The outcome of two studies was assessed by measuring changes in never-smoking rates in the past 30-days (Marsiglia et al., 2015) or two-months (Seal, 2006) before the survey. Whereas the outcome of one intervention was assessed by measuring changes in the past-month ever-smoking rate, the rate of any smoking even a puff or two anytime in the 30-days before the final-evaluation (Perry et al., 2009).

Most studies separated the findings on cigarette-smoking from other tobacco-use but findings on cigarette smoking in two studies were combined with findings on either smoking other tobacco products, like Bidi (Reddy et al., 2002) or using any tobacco products (smoked or smokeless) (Seal, 2006). Furthermore, different reference periods were used to assess current smoking status across the included studies. While most studies used smoking behaviour in the past-30 days before the survey as a reference period for assessing current smoking behaviour of particpnats, few studies referred to smoking in the past two (Seal, 2006) or three months before the survey (Wen et al., 2010). Accordingly, even when the same definitions used across some of these studies their findings can not be pooled in a meta-analysis because they represent different smoking behaviours that are measured over different periods of time.

Additionally, there was a discrepancy in presenting findings on the main outcomes of the included interventions. Some studies measured the prevalence of ever-smoking among those who never smoked before and after the intervention (Perry et al., 2009, Mohammed et al., 2016, Resnicow et al., 2010) (Seal, 2006) whereas other studies calculated odd-ratio of ever-smoking rates between intervention and controls (Chou et al., 2006, Chen et al., 2014, Motamedi et al., 2016, Reddy et al., 2002, Wen et al., 2010, Tahlil et al., 2015) to indicate the intervention's effectiveness on preventing smoking initiation. One study presented the findings only as changes of means of eight scores (0= none, 1=one puff, 2=one cigarette or part, 3=two or three cigarettes, 4= four or five cigarettes, 5=six to ten cigarettes, 6=elevn to twenty cigarettes, 7=one to five packs) that are used to assess current-smoking status; these scores are not the real number of cigarettes smoked by participants in the past-30-days before the survey. Changes in means of these scores were represented in a growth-curve-model of four waves to estimate intervention's effects on frequency and amounts of cigarettes used (Marsiglia et al., 2015). Three studies measured the transition from never-smoking at baseline to recent-smoking, smoked at least once in the past-30-days, (Chou et al., 2006) or ever-smoking (Wen et al., 2010) or regular-smoking, smoke at least once a week, (Lotrean et al., 2010) at the end of the follow-up period. Although it is recommended to use growth-curve-analysis in behaviour changes interventions to illustrate the growth and change patterns of the targeted behaviour over-time (McArdle and Nesselroade, 2003), only one of the included studies (Perry et al., 2009) used the growth-curve , which is derived from a three-levels, linear, random coefficients-regression-model, to demonstrate the intervention's effectiveness over-time (Perry et al., 2009) in addition to the other study described earlier (Marsiglia et al., 2015) that used means of scores, not real numbers of smoking time or frequency, to estimate changes in smoking status over-time.

The conclusion on interventions' effectiveness was based on the significance of the identified findings on preventing smoking initiation among participants, using P-value and 95% confidence-intervals. When confidence-intervals were unreported in the articles, it was calculated from the published information, when possible (Seal, 2006). In one study (Marsiglia et al., 2015), calculating confidence-intervals was difficult because the findings were only presented in growth-curve-model for tobacco-use. In this case, the authors' conclusion that this intervention was ineffective in preventing pupils from smoking initiation was considered in this review.

According to the discussion above, the findings of the included studies can not be pooled together because they represented changes in different smoking indicators which are differently defined, measured, assessed and reported. Separating the included studies into subgroups based on using similar definitions, reference period of assessment and ways of presenting findings would have resulted in small sample-size in each group that might not make significant changes in the findings on effectiveness. Accordingly, narrative data-synthesis was used in this review.

Only five of the included SBSPIs (Lotrean et al., 2013, Reddy et al., 2002, Mohammed et al., 2016, Perry et al., 2009, Motamedi et al., 2016) showed effectiveness in preventing adolescents at schools in Arabic and/or LMICs from smoking initiation.

Table 6 Summary of the characteristics of participants of the included studies (at baseline)

The study ID (1st author, year, country)	The effectiveness of the intervention in smoking prevention		Number	Age	Sex (females %)	Ethnicity	School type (public %)	Family income
1. Perry, 2009, India	Effective		12484	11.9	48.4	Not stated	Not stated	Not stated
2. Motamedi, 2016, South-Africa	Effective		5610	11-12	51	Black 9.5%, White 4.0%, Mixed race (combination race of Asian, European, and African descent) 85.8%	Not stated	Not stated but schools selected in a low income, densely populated urban area
3. Lotrean, 2013, Romania	Effective.		1071	13-15	51	Not stated	Not stated	Not stated
4. Mohammed, 2016, Saudi Arabia	Effective		1383	13.9 ± 0.59	0%	Arabic	77%	High 36.8% Medium 43.6 Low 19.6%
5. Reddy, 2002, India	School intervention	Effective	5752	11.9	49.5	Not stated	40%	Not stated
	School intervention plus family intervention	Effective						
6. Tahlil, 2015, Indonesia	Islamic based intervention	Ineffective	477	11-14	58.5	Not stated	Not stated	Not stated
	Health-based intervention	Ineffective						
	Combined health and Islamic based intervention	Ineffective						
7. Resnicow, 2010 South-Africa,	Harm management	Ineffective	5266	14	49.5	Black 59.7%, Coloured 26.4%, White 9.9%	100	Not stated but findings were adjusted forfamily income
	life skills intervention	Ineffective						
8. Chou, 2006, China	Ineffective		2661	12.5	47.7	Not stated	Not stated	Not stated
9. Seal, 2006, Thailand	Ineffective		170	15.5	11	Not stated	Not stated	Not stated
10. Wen, 2010, China	Ineffective		2343	13.4	45.9	Not stated	50%	Not stated
11. Marsiglia, 2015, Mexico	Ineffective		431	13	55	Mexican	100%	Not stated
12. Chen, 2014, China	Ineffective		1807	14.5 ± 1.1	49.6	Linzhi Tibetan and Guangzhou Han	Not stated	Not stated

Table 7 Summary of the characteristics of the included studies on SBSPI in Arabic and LMICs

The study ID (1st author, year, country)	The effectiveness of the intervention in smoking prevention		Intervention duration	Number of sessions	Frequency of contact	Booster-sessions	Follow-up period	Response rate at final-evaluation	Attrition rate in intervention arm compared with control
Perry, 2009, India	Effective		Not stated	7 in year 1 6 in year 2	One / year	6	2 years	94.7% year 1 84.0% year 2	Not stated
Motamedi, 2016, South-Africa	Effective		Not stated	12	One / year	6	3 years	90%	10% in both arms
Lotrean, 2013, Romania	Effective.		2 months	5 weekly	Weekly	NC	9 months	90.2	11% compared with 9.8% in control
Mohammed, 2016, Saudi Arabia	Effective		5 weeks	5	One/ Week	NC	6 months	98%	1.3% compared with 1% in control
Reddy, 2002, India	School intervention	Effective	Not stated	20	Not stated	NC	1 year	88.3%	Not stated
	School plus family intervention	Effective							
Tahlil, 2015, Indonesia	Islamic based intervention	Ineffective	8 weeks	8	One/ Week	NC	6 months	89.5%	Not stated
	Health-based intervention	Ineffective							
	Combined health & Islamic intervention	Ineffective							
Resnicow, 2010 South-Africa,	Harm management	Ineffective	Not stated	8 per year	One / year	NC	2 years	93%	41.2% compared with 14.2% in control
	life skills intervention	Ineffective							34.2% compared to cohort 15.3%
Chou, 2006, China	Ineffective		13 weeks	13	Once /Week	NC	1 year	97% at baseline	12.5% compared with 7% in control
Seal, 2006, Thailand	Ineffective		Not stated	10	Not stated	0	6 months	100%	Not stated
Wen, 2010, China	Ineffective		Not stated	Not stated	Not stated	2	6 months	90%	7.95% compared with 32.55% in control
Marsiglia, 2015, Mexico	Ineffective		10 weeks	20	Two /week	NC	8 months	86%	Not stated
Chen, 2014, China	Ineffective		Not stated	Not stated	Two / year	2	1 year	99.5%	Rate was not specified but it is stated it is high

Table 7 Summary of the characteristics of the included studies on SBSPI in Arabic and LMICs (cont.)

The study ID (1st author, year, country)	The effectiveness of the intervention in smoking prevention		Components			Targets			settings		The deliverer			Training deliverers	Fidelity checked	Process-evaluation done
			Smoking prevention	Smoking cessation	Preventing substance use	pupils	teachers	Parents / relatives / community	Inside schools	Outside schools	Teachers	peers	Outsider specialists			
Perry, 2009, India	Effective		X	X		X	X	X	X	X	X	X		Y	Y	Y
Motamedi, 2016, South-Africa	Effective		X	X	X	X			X		X			NC	Y	Y
Lotrean, 2013, Romania	Effective.		X	X		X		X	X	X	X	X		Y	NC	Y
Mohammed, 2016, Saudi Arabia	Effective		X	X		X			X				X	Y	NC	NC
Reddy, 2002, India	School intervention	Effective	X		X	X			X		X	X		Y	Y	Y
	School plus family intervention	Effective	X		X	X		X	X	X						
Tahlil, 2015, Indonesia	Islamic based intervention	Ineffective	X			X			X		X		X	Y	NC	NC
	Health-based intervention	Ineffective	X			X			X							
	Combined health & Islamic intervention	Ineffective	X			X			X							
Resnicow, 2010 South-Africa,	Harm management	Ineffective	X			X			X		X			Y	Y	Y
	life skills intervention	Ineffective	X			X			X							
Chou, 2006, China	Ineffective		X			X			X		X		X	Y	NC	NC
Seal, 2006, Thailand	Ineffective		X		X	X			X		NC	NC	NC	NC	NC	NC
Wen, 2010, China	Ineffective		X			X	X	X	X	X	X	X	X	Y	NC	Y[1]
Marsiglia, 2015, Mexico	Ineffective		X		X				X		X			Y	NC	NC
Chen, 2014, China	Ineffective		X			X	X		X		X	X		Y	Y	NC

[1] in Chinese language

Table 8: The primary outcome of the included studies on SBSPI in Arabic and LMICs

The study ID (1st author, year, country)		The primary outcome					Statistical difference after intervention
		The indicator/ the statistical test reported in the article		The result			
				The intervention group (95% CI)	The control (95% CI)	P value of the difference after the intervention	
Perry, 2009, India		Coefficient regression of any tobacco use	Baseline	3.42 (1.95-4.89)	1.38 (- .09 – 2.85)	0.04	Significant
			Linear rate of changes	- 0.59 (1.63-0.45)	0.94 (-0.10-1.98)		
Motamedi, 2016, South-Africa		OR of initiating cigarette smoking in intervention versus control after the intervention		0 .64*		0.02	Significant
Lotrean, 2013, Romania		The OR of smoking initiation in control versus intervention (Logistic regression model)		2.23 (1.29 - 3.85)		<0.01	Significant
Mohammed, 2016, Saudi Arabia		The changes in smoking (any type) initiation rate after the intervention among those who never-smoked at the baseline		Increased by 3.2%*	Increased by 8.8%*	0.019	Significant
		OR of initiating smoking (any type) in control versus intervention group after the intervention (95% CI)		5.60 (1.37–22.80)		*	
Reddy, 2002, India	School intervention	Ever-use of tobacco (mixed-effect regression model, F-test)	Baseline	0.42 (0.30 - 0.54)	0.39 (0.25-0.061)	0.001	Significant
			After the intervention	0.57 (0.42-0.77)	0.94 (0.73-0.12)		
	School plus family intervention	The rate of ever-use of tobacco (mixed-effect regression model, F-test)	Baseline	0.34 (0.22-0.53)	0.39 (0.25-0.06)	0.001	Significant
			After the intervention	0.34 (0.26-0.50)	0.94 (0.73-0.12)		
Tahlil, 2015, Indonesia	Islamic-based intervention	The mean score of life time smoking behaviour rate after the intervention ± SD (1= never to 9 smoked > 100 cigarettes)		1.2 ± 0.07	1.17 ± 1.3	0.16	Insignificant
	Health-based intervention	The mean score of life time smoking behaviour rate after the intervention ± SD (1=never to 9 smoked >00 cigarettes)		2.1 ± 2.2	1.17 ± 1.3	0.84	Insignificant
	Combined health & Islamic intervention	The mean score of life time smoking behaviour rate after the intervention ± SD (1=never to 9 smoked >100 cigarettes)		1.4 ± 1.0	1.17 ± 1.3	0.10	Insignificant

*Statistical details were not provided in the article

Table 8: the primary outcome of the included studies on SBSPI in Arabic and LMICs (cont.)

The study ID (1st author, year, country)		The primary outcome					Statistical difference after intervention
		The indicator/ the statistical test reported in the article		The result			
				The intervention group (95% CI)	The control (95% CI)	P value of the difference after the intervention	
Resnicow, 2010 South-Africa,	Harm management	Intra-class Correlation Coefficients of the rate of ever cigarette smoking	Baseline	30%	30%	*	Insignificant
			After the intervention	40%	45%		
		OR of smoking initiation in intervention versus control after intervention		1.2 (0.9–1.6)		*	
	life skills intervention	Intra-class Correlation Coefficients of the rate of ever cigarette smoking	Baseline	32%	30%	*	Insignificant
			After the intervention	43%	45%		
		OR of smoking initiation in intervention versus control after intervention		1.116 (0.582 - 2.138)		> 0.05	
Chou, 2006, China		Ever-smoking rate	Baseline	34.9%	27.1%	< 0.001	Insignificant
			After the intervention	45.6%	40.2%		
		OR of smoking initiation in intervention versus control after intervention		1.08 (0.71, 1.64)		*	
Seal, 2006, Thailand		Never-smoking rate	Baseline	52%	59%	0.86	Insignificant
			After the intervention	61%	58%		
Wen, 2010, China		Transition from never-smoking at baseline to ever-smoking at follow-up, adjusted OR (95% CI)		0.89 (0.54 -1.38)	1 (ref.)	0.538	Insignificant
Marsiglia, 2015, Mexico		The conditional growth curve model for cigarette use (which estimated treatment effects for frequency and amounts of use of cigarettes used) in the past 30 days	Initial use	-0.20 (SE=0.61)	-0.61 (SE=0117)	> 0.05	Insignificant
			Linear growth	-0.16 (SE=0.154)	-008(SE=0.68)		
		The Ever-smoking rate after the intervention		Increased by 3%*	Increased by 3%*	> 0.05	
Chen, 2014, China		Adjusted OR of the changes in ever-smoking rate in intervention versus control after intervention	In Area 1	0.97 (0.71-1.33)		> 0.05	Insignificant
			In Area 2	0.87 (0.58-1.32)		> 0.05	

*Statistical details were not provided in the article

4.4.5 Risk of bias in included interventions

The result of the risk of bias assessment of the included studies is represented in Table 9. About two-thirds (7/12) of the included RCTs detailed the randomization sequence generation while two studies that reported selection convenient sample of intervention (Marsiglia et al., 2015) or control (Motamedi et al., 2016) schools. Only three trials (Tahlil et al., 2015, Seal, 2006, Wen et al., 2010) clearly reported that interventions and control schools and pupils were adequately concealed and were not identifiable before starting the intervention. One trial (Motamedi et al., 2016) clearly indicated that intervention schools were purposively selected because they are cooperative and were identifiable before starting the intervention. The rest of the trials did not provide sufficient information to judge whether the allocation concealment procedures were appropriate or not. Only three trials clearly reported blinding of intervention participants (Seal, 2006, Wen et al., 2010, Tahlil et al., 2015). Furthermore, there were no statements on blinding of outcomes in all trials, except one (Wen et al., 2010) which clearly reported that neither researchers nor school administrators were blind to intervention allocation. A third (four) of the included studies reported high attrition-rate in interventions groups but none reported a power calculation or full-explanation of reasons for attrition. All trials reported the positive, negative, significant and not-significant changes in the primary-outcomes that were stated in the aim, before and after the interventions across arms but one intervention (Motamedi et al., 2016) did not provide all the findings details in tables.

High risk of other bias was detected in a forth (3/12) of the included trials. Other sources of bias included either implementation difference across schools (Motamedi et al., 2016) or higher reported smoking rates in the intervention than control groups at baseline, although both groups were randomly selected (Chou et al., 2006, Wen et al., 2010).

Overall, six of the included trials reported a high risk of bias in at least one of the six Cochrane criteria for assessing the risk of bias (Higgins and Green, 2008) and a half (6/12) of the included studies have no indication of any high risk of selection, detection, reporting and other biases. The ratio of a high risk of bias in Table 9 indicates the number of criteria coded as high risk of bias out of the six Cochrane criteria for assessing the risk of bias in each study. The ratio of high risk of bias is higher in the ineffective trials than effective trials, as five out of seven ineffective trials reported a high risk of bias in at least one of the six Cochrane criteria for assessing the risk of bias, compared with two out of the five effective trials. The high risk of bias has been identified only in one effective trial; caused by selecting a convenient sample of cohort schools and implementation difference across schools (Motamedi et al., 2016).

Risk of bias across studies in this review is appraised as considerable because all the included trials have either unclear or high risk of bias in at least two of the six Cochrane criteria for assessing risk of bias, half (six) of the included interventions included high risk of bias in at least one of the six Cochrane criteria for assessing risk of bias and none of the included studies has low risk of bias in all these criteria, see Figure 14. Although all trials, except two, randomly selected schools, there is insufficient evidence of blinding participants, deliverer or outcome-assessors in almost all the included trials. Therefore, the assessment suggested that all the included studies might have risks of selection or detection bias. Since the interventions' outcome was only measured by self-reporting of smoking inside schools there are considerable opportunities that the findings have been affected by these biases; although the difficulties in blinding participants, deliverer or outcome-assessors of behaviour change interventions are acknowledged. Moreover, two-thirds (2/3) of the long-term RCTs, those with follow-up period more than one year, have a high risk of bias at least in one of the six Cochrane criteria for assessing the risk of bias.

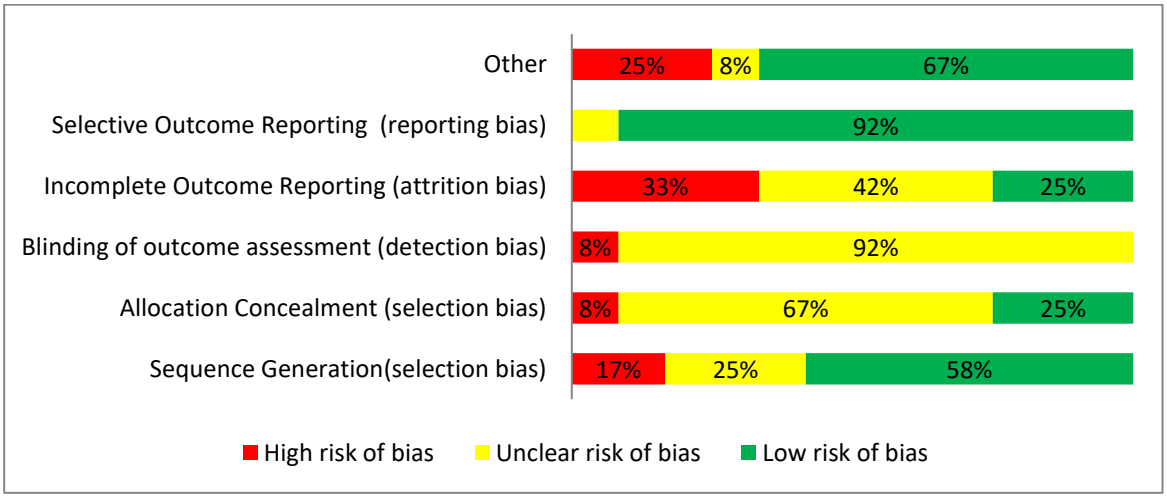
Table 9 Summary of the risk of bias in the included studies

Study ID (1st author, year, country)	Random sequence Generation (selection bias)	Allocation Concealment (selection bias)	Blinding of outcome assessment (detection bias)	Incomplete Outcome Reporting (attrition bias)	Selective Outcome Reporting (reporting bias)	Other	Ratio of high risk of bias[1]
Perry, 2009, India	L	U	U	L	L	L	0/6
Motamedi, 2016, South-Africa	H	H	U	L	U	H	3/6
Lotrean,2013, Romania	L	U	U	L	L	L	0/6
Mohammed, 2016, Saudi Arabia	U	U	U	U	L	L	0/6
Reddy, 2002, India	L	U	U	U	L	L	0/6
Tahlil, 2015, Indonesia	U	L	U	U	L	L	0/6
Resnicow, 2010, South-Africa,	U	U	U	H	L	L	1/6
Chou, 2006, China	L	U	U	H	L	L	1/6
Seal 2006, Thailand	L	L	U	U	L	L	0/6
Wen 2010, China	L	H	H	H	L	H	4/6
Marsiglia, 2015, Mexico	H	U	U	U	L	U	1/6
Chen, 2014, China	L	U	U	H	L	H	2/6

H = high risk of bias, U = unclear risk of bias, L = low risk of bias

Source: the form was adapted from: (Higgins and Thomas, 2018, Higgins and Green, 2008)

Figure 14 The proportion of the risk of bias across all the included studies



[1] The ratio of the high risk of bias equals the number of criteria coded as high risk of bias in each study out of the six criteria used for assessing the risk of bias.

4.4.6 Cultural- appropriateness

Table 10 summarises the approaches, dimensions and strategies used for ensuring cultural appropriateness of the included SBSPI to the targeted contexts. The majority (11/16) of the included interventions' arms were based on SBSPIs originally developed in high-income countries, seven from the USA and three from European countries. Three interventions (5 arms) were not imported from another country but were designed based on literature reviews of local and global evidence of effective SBSPIs. One intervention was based on SBSPI that targeted adolescents from similar ethnicity (Mexican) of the targeted population (Mexico) who live in a high-income country (USA) (Marsiglia et al., 2015). Scanty information is available on the process of adapting the imported interventions to the targeted contexts. Only four of the included studies published separate articles to explain how cultural-appropriateness of interventions was ensured (Wegner et al., 2008, Perry et al., 2008, Tahlil et al., 2013a, Resnicow et al., 2008). The limited information on cultural- appropriateness in the identified articles may reflect poor consideration of cultural- appropriateness of interventions or the words-limits of articles restricted authors from detailing the cultural- adaptation process concisely, as English is not the first language in most Arabic and/or LMICs. Therefore, authors were contacted to obtain more information regarding cultural-appropriateness of their interventions. Only one author (Mohammed et al., 2016) provided more details that were unpublished in the included articles.

All the included interventions allowed local people to participate in designing interventions, mainly through a formal collection of qualitative data on issues related to the feasibility and acceptability of the proposed contents and activities. Only three interventions informally collected this information and another three interventions collected quantitative data on feasibility and acceptability. In most interventions (12/16 arms) both top-down and bottom-up approaches were used for ensuring cultural-appropriateness, regardless of what this involved. Only three studies clearly considered involving developers of original interventions in training local public-health-specialists and researchers on how to adapt the intervention to the targeted-context in order to ensure the balance between fidelity and cultural-appropriateness (Perry et al., 2009, Chou et al., 2006, Marsiglia et al., 2015).

In order to ensure accessibility of contents and activities to the targeted-population, all interventions contents were developed in local or dominant languages (Linguistic cultural-appropriateness) and all interventions activities were delivered by local people (mainly teachers) who speak local languages and share the same culture of the targeted-population (constituent-involving cultural-appropriateness strategy). In 69% of the included interventions arms (11), authors stated that interventions contents and materials were packaged in appropriate ways to the targeted-context in term of: images, colours, clothes and pictures of community members (Peripheral cultural-appropriateness). The socio-cultural cultural-appropriateness strategy was used in 63% of interventions arms (10) while evidential adaptation and cultural-tailoring strategies for ensuring cultural-appropriateness were only used in three and two of the included arms respectively.

4.4.6.1 Interventions' effectiveness and cultural-appropriateness

Based on the available information, the review identified that deep cultural- appropriateness was mainly identified in effective interventions. Deep cultural- appropriateness, defined in section2.3.4, involves incorporating social, cultural, psychological and environmental factors that influence the targeted behaviour of a specific population into the proposed intervention (Castro et al., 2004, Castro et al., 2010). Whereas the available information indicates that all the ineffective interventions, except one (Resnicow et al., 2010), involved either unclear or surface cultural-appropriateness which was mainly limited to amending the language and appearance of interventions' contents to suit the targeted-population (Linguistic and peripheral cultural- appropriateness) and involved local people in delivering intervention activities (constituent-involving strategy) with some (only in three interventions) weak consideration of local socio-cultural predictors of smoking, see Table 10. Surface cultural- appropriateness of intervention was focused only on: translating interventions' contents (Seal, 2006); using local popular games, people and heroes pictures in anti-smoking posters, educational materials and advertisements (Chou et al., 2006, Wen et al., 2010, Marsiglia et al., 2015); discussing local smoking prevalence rates (Chou et al., 2006) and national anti-smoking policies (Chou et al., 2006, Tahlil et al., 2015) with pupils. Even when original and targeted population share same ethnicity (Mexicans) but live in different countries, paying less attention to their cultural difference when implementing the same SBSPI explains why the same intervention was ineffective in one context and ineffective in the other context, as in the SBSPI by Marsiglia et al. (2015) which was originally designed to prevent Mexican adolescents who lived in the USA and then imported to prevent adolescents' who live in Mexico from smoking initiation with limited consideration of the cultural differences between adolescents who live in the USA and Mexico. The contents of one effective intervention were taken from the USA and adapted to the targeted-context but the authors did not clearly explain what has been done and how (Reddy et al., 2002).

Only two interventions considered extensive involvement of the targeted pupils in cultural-appropriateness of the imported interventions. Pupils involvement in these two interventions included the following: 1) Focus group discussions with pupils were conducted during the stage of designing these two interventions to explore their opinion about why and why not adolescents smoke in their context. 2) Pupils participants were educated about smoking consequences to raise their awareness of the importance of preventing adolescents from smoking. after that pupils participants were asked to suggest activities to be delivered in their school to prevent their peers from smoking. pupils' suggestions were considered in designing these two interventions. These two interventions showed effectiveness in preventing adolescents from initiating smoking in India and South-Africa (Perry et al., 2008, Motamedi et al., 2016).

Few authors discussed the approaches and timelines of the implemented interventions in comparison with the original interventions. The findings indicate that using similar approaches to deliver imported interventions does not guarantee effectiveness. In contrast, amendments of intervention implementation could influence effectiveness positively and negatively. Most of the effective interventions replaced approaches used in the original interventions with others suitable for the targeted-context. For example, Mohammed et al. (2016) allowed peer-leaders to manage group-discussions only instead of running peer-education sessions as in the original intervention because formal peer-education is uncommonly used for promoting health in the targeted-culture. Whereas some ineffective interventions clearly incorporate improper cultural- appropriateness of interventions implementation. For example, two ineffective interventions condensed interventions activities over shorter periods in comparison with the original interventions because of restricted time and resources available for extra-curriculum activities especially before exams or end of terms (Marsiglia et al., 2015, Chou et al., 2006).

Table 10 Summary of cultural-appropriateness of the included interventions

The study ID (1st author, year, country)	The effectiveness of the intervention in smoking prevention		Cultural-appropriateness																			
			Intervention country of origin	Dimension			Approach			strategy						Stage			How		
				Surface	Deep	Unclear	Bottom-Up	Top-Down	Both	Linguistic	Peripheral	Evidential	Constituent-involving	Sociocultural	Cultural-tailoring	Design	Implementation	Evaluation	Informally	qualitative data	Surveys
Perry, 2009, India	Effective		USA		X				X	X	X	X	X	X	X	X	X			X	
Motamedi, 2016, South-Africa	Effective		USA		X				X	X	X	X	X	X	X	X	X	X		X	X
Lotrean, 2013, Romania	Effective.		Netherland		X				X	X	X	X	X		X			X		X	
Mohammed, 2016, Saudi Arabia	Effective		5 European countries		X			X		X	X		X	X		X					X
Reddy, 2002, India	School intervention	Effective	Partly from USA			X			X	X	X		X			X	X			X	X
	School& family intervention	Effective				X			X	X	X		X			X	X			X	X
Tahlil, 2015, Indonesia	Islamic based intervention	Ineffective	Indonesia	X					X	X			X	X		X				X	
	Health-based intervention	Ineffective		X					X	X			X	X		X				X	
	Combined health and Islamic based intervention	Ineffective		X					X	X			X	X		X				X	
Resnicow, 2010 South-Africa,	Harm management	Ineffective	Australia		X				X	X	X		X	X		X				X	
	life skills intervention	Ineffective	USA		X				X	X	X		X	X		X				X	
Chou, 2006, China	Ineffective		USA	X				X		X	X		X			X			X		
Seal, 2006, Thailand	Ineffective		USA	X				X		X	X		X			X			X		
Wen, 2010, China	Ineffective		China			X			X	X			X	X		X				X	
Marsiglia, 2015, Mexico	Ineffective		USA	X					X	X	X		X			X				X	
Chen, 2014, China	Ineffective		China			X		X		X			X			X				X	

NB: Presence of a Cultural-appropriateness dimension, approach, strategy, method and time in an intervention arm is indicated with an X.

Source: adapted from (Castro et al., 2010, Kreuter et al., 2003)

4.4.7 Theoretical constructs

This section presents the findings on the theoretical-underpinning of the included interventions, and then discusses the theoretical domains and smoking prevention curriculum used in the included SBSPIs.

4.4.7.1 Theoretical-underpinning

The theoretical-underpinning of the included interventions are summarised in Table 11 which answers the five main questions of the Theoretical Coding Scheme by Michie and Prestwich (2010), see section 2.3.3. Only seven of the included SBSPIs referred to theory in designing or implementing or interpretation evaluations findings of interventions. Four of these studies (Perry et al., 2009, Motamedi et al., 2016, Lotrean et al., 2013) indicated that a theory was used to guide or underpin the intervention without explaining when and how this theory was employed in the intervention; for example, if theory was used to develop contents, select interventions activities or adapt an imported intervention. The constructs of the named theory or part of it were clearly identified and targeted in three interventions only (Mohammed et al., 2016, Chou et al., 2006, Marsiglia et al., 2015). Only two studies used theory to discuss the findings of the intervention evaluation (Wen et al., 2010, Mohammed et al., 2016). Only two trials aimed to test the applicability of the named theory to the targeted context but explanations of how this was done were unexplained (Chou et al., 2006, Wen et al., 2010). None of the included trials clearly indicated refining the stated theory.

None of the trials that used imported interventions indicated using theory in adapting the imported interventions to the targeted-context (Lotrean et al., 2013, Perry et al., 2009, Motamedi et al., 2016, Mohammed et al., 2016, Chou et al., 2006, Marsiglia et al., 2015). However, one of the imported trials clearly indicated that the aim of the intervention is to test the applicability of the theory that underpinned the original intervention to the targeted-context without explaining how this was done (Chou et al., 2006).

All the effective interventions, except one (Reddy et al., 2002), referred to at least one theory that informed designing the intervention. However, there were not enough details on how the named theory was used to design, implement, adapt and evaluate these interventions, except in one (Mohammed et al., 2016). This study identified a construct, social modelling, of the named theory and targeted it in intervention contents and activities and also evaluated changes in this construct after the intervention.

In general one theory, when used, informed each intervention arm but some interventions used two (Mohammed et al., 2016), three (Lotrean et al., 2013) or four (Motamedi et al., 2016, Wen et al., 2010) theories in one arm. The interventions that indicated using more than one theory in each intervention arm (Motamedi et al., 2016, Lotrean et al., 2013, Wen et al., 2010, Mohammed et al., 2016) did not explain if these theories are used together or separately at different stages and if they are integrated how and when.

Thirteen theories were named in the 12 interventions included in this review. The named theories are: Social Cognitive Theory in Mohammed et al. (2016), Lotrean et al. (2013) Perry et al. (2009) and Wen et al. (2010); Youth Development Framework, Flow Theory, Optimal Arousal Theory and Self-Determination Theory in Motamedi et al. (2016); the Integrated Model of Change and the Social Influence Approach/Theory in Lotrean et al. (2013) and Wen et al. (2010); Social Normative Approach/Model in Chou et al. (2006) and Mohammed et al. (2016); Socio-Ecological Framework, the Precede–Proceed Model, Health Belief Model and the

Environment And Skill Model in Wen et al. (2010); and the Communication Competence Theory in Marsiglia et al. (2015).

Table 11 Summary of the theory coding scheme of the included studies

The study ID (1st author, year, country)	The effectiveness	Is theory mentioned?	Are the relevant theoretical constructs targeted?	Is theory used to select recipients or tailor intervention?	Are the relevant theoretical construct measured?	Is theory tested?	Is theory refined?
1. Perry, 2009, India	Effective	Y	U	U	U	N	N
2. Motamedi, 2016 South-Africa	Effective	Y	U	U	U	N	N
3. Lotrean, 2013, Romania	Effective	Y	U	U	U	N	N
4. Mohammed, 2016, Saudi Arabia	Effective	Y	Y	U	Y	N	N
5. Chou,2006, China	Ineffective	Y	Y	U	U	Y	N
6. Wen, 2010, China	Ineffective	Y	U	U	Y	Y	N
7. Marsiglia, 2015, Mexico	Ineffective	Y	Y	U	U	N	N
8. Reddy, 2002, India	Effective	No in both arms					
9. Tahlil, 2015, Indonesia	Ineffective	No in both arms					
10. Resnicow, 2010, South-Africa,	Ineffective	No in both arms					
11. Seal, 2006, Thailand	Ineffective	N					
12. Chen, 2014, China	Ineffective	N					

Source: adapted from: (Michie and Prestwich, 2010)

N = No, U = unclear, Y = yes

4.4.7.2 The theoretical domains and smoking prevention curriculum

The above findings indicate either poor reporting of theoretical-underpinning or little use of theories in the included interventions. This has been also recognized in other behaviour change interventions (Prestwich et al., 2014, Prestwich et al., 2015, Michie and Prestwich, 2010). However, it is still important to understand theoretical constructs of SBSPIs in Arabic and/or LMICs in order to inform and enhance effectiveness of the school-based intervention that aims to prevent adolescents in Egypt from smoking initiation, as recommended by (Prestwich et al., 2017, Michie et al., 2014a, Michie et al., 2014b). Therefore, the included interventions were mapped against 17 theoretical domains based on the TDF and Griffin and Botvin (2010) classification of smoking prevention curricula, explained in section 2.3.3. The presence and absence of these domains in each arm in relation to effectiveness are summarised in Table 12.

The **knowledge domain** was clear in all arms as scientific information on the health consequences of smoking were provided in all educational sessions and some printed educational materials. Seven arms also provided information on how smoking affects social life, (Mohammed et al., 2016, Chou et al., 2006) and (Resnicow et al., 2008), in one arm only, and the environment, (Perry et al., 2009) and (Tahlil et al., 2015), in the three arms. Another four arms informed participants on emotional changes due to smoking, (Wen et al., 2010) and (Resnicow et al., 2008), one arm only, and how smoking lead to addiction, (Perry et al., 2009)

and (Motamedi et al., 2016), one arm only. The information provided in the ineffective interventions was only about illness caused by smoking, except in four ineffective arms, one discussed social consequences of smoking (Resnicow et al., 2010), two arms explained the national smoking law (Tahlil et al., 2015) and one arm explained smoking in the main religion in the targeted context (Tahlil et al., 2015). The information on the consequences of secondary smoking was provided only in effective interventions. Furthermore, all interventions that provided combined information on how smoking affects the environment, emotion and social life in addition to the health of smokers and people around them were effective in preventing smoking initiation by adolescents, (Perry et al., 2009, Motamedi et al., 2016). **Normative education** was used in four arms which provided information on the national smoking rates among adolescents aiming to correct pupils' overestimation of smoking rates by adolescents, one arm in Chou et al. (2006) the three arms in Tahlil et al. (2015). None of the arms that used normative education was effective in preventing adolescents from smoking initiation

The **skills** domain was also clear in all the included interventions as they all aimed to prevent pupils from smoking through enhancing their social competences or social influence skills or both. Half (eight) of the intervention arms aimed to enhance pupils' social influence skills by improving their awareness of different social influences around them that support smoking and train pupils on how to resists social pressure to smoke and refuse smoking offers by friends, relatives or tobacco-companies. Also, half (eight) arms aimed to enhance pupils' social competence skills by training them on at least one of the followings skills: problem-solving, decision-making, stress-coping techniques, self-control, self-esteem or self-awareness. Most (six) of the arms that provided training on social competence skills also included training on social influence skills, only one of them is effective (Motamedi et al., 2016). All the effective interventions provided training to enhance pupils' social influence skills and one effective intervention provided training on both social influence and social competence skills (Motamedi et al., 2016).

The domain of **memory, attention and decision-process** was identified in over half (10/16) of the arms. The memory and attention aspects of this domain were illustrated in ten arms through using attractive methods (such as video, role play, discussion and group activities) for educating pupils on smoking consequences to drew pupils' attention to contents and enhance their ability to retain the provided information after the interventions. The decision process domain was administrated in three arms, all were effective, which explained the advantages and disadvantages of smoking and allowed pupils to think of them before deciding to smoke or not (Lotrean et al., 2013, Mohammed et al., 2016, Perry et al., 2009). Memory and attention aspects of this domain were clear in all effective interventions, except one (Reddy et al., 2002). Additionally, memory and attention aspects of this domain were combined with the decision-process aspect only in effective interventions (Lotrean et al., 2013, Mohammed et al., 2016, Perry et al., 2009).

The domain of **managing environmental-context and resources** was identified in six arms, half of them were effective, through increasing barriers and reduce facilitators of smoking in the environment surrounding pupils to prevent smoking initiation. All arms that used this domain aimed to improve accessibility to information on smoking consequences inside school environment, through school-posters, booklets or newsletters. Pupils' exposure to these sources of information inside schools was high in all effective interventions that used this domain (Perry et al., 2009, Reddy et al., 2002). Whereas this exposure in the ineffective interventions that used this domain was either low, recognised by less than 40% of pupils (Chen et al., 2014), or was not evaluated (Seal, 2006, Wen et al., 2010). In the effective arms that used this domain, changes in pupils' environments went beyond school to include home

(Reddy et al., 2002) and community environments outside schools (Perry et al., 2009). Whereas in the ineffective arms, these environmental changes were limited to school environments (Chen et al., 2014, Seal, 2006) or only involved distributing anti-smoking pamphlets to parents and asking them to sign a contract not-to-smoke (Wen et al., 2010). Additionally, five arms indicated establishing anti-smoking policies to restrict smoking, by pupils, teachers, parents and visitors, inside school buildings. In the effective arms, anti-smoking policy went beyond school environments to the wider environment outside school through either stimulating community members to enhance the national smoking policy (Perry et al., 2009) or inviting pupils to sign a petition, presented to the country Prime Minister, requesting a ban on tobacco advertising (Reddy et al., 2002). Whereas the ineffective arms involved developing antismoking policies that were limited to school environments, the enforcement of these policies was unexplained (Wen et al., 2007, Chen et al., 2014).

The **social influence domain** was demonstrated in over half of the included arms (9/16). These arms aimed to reduce pupils' social opportunity to smoke by modifying interpersonal influences, role models and social-norms that encourage or discourage adolescents' smoking. All the effective interventions, except one (Motamedi et al., 2016), involved activities that aimed to affect at least one of the social influences of adolescents' smoking. Using peer-pressure to enhance positive attitudes toward non-smoking behaviour was clear only in the effective interventions that used the social influence domain, (Lotrean et al., 2013, Reddy et al., 2002, Perry et al., 2009, Mohammed et al., 2016). Furthermore, identifying non-smoker pupils as role-models was only demonstrated in effective interventions (Mohammed et al., 2016, Lotrean et al., 2013) which sometimes also identified non-smoker parents and teachers as role-models (Perry et al., 2009). In these effective interventions, the names of these role-models were announced in school newsletter. Thereafter, role-models: 1) provided voluntarily formal promises inside schools not-to-smoke (Lotrean et al., 2013), 2) supported other pupils not-to-smoke or quit smoking, 3) informally shared with other pupils their views on smoking and experiences of being non-smokers (Perry et al., 2009), 4) explained how to attract others without smoking (Mohammed et al., 2016). Interventions that aimed to raise parents' awareness of smoking and used peer-pressure or modelling to enhance positive attitudes toward non-smoking behaviour were effective (Perry et al., 2009, Lotrean et al., 2013). Whereas interventions that aimed to change home norms towards smoking through raising parents' awareness without using peer-pressure or role-modelling were ineffective, even when parents were asked to sign contracts not-to-smoke (Wen et al., 2010).

To influence social-norm, some interventions asked parents and teachers to sign contracts not-to-smoke (Wen et al., 2010) or requested pupils to make public commitments in front of their classmates not-to-smoke and discuss consequences of smoking with their peers (Chou et al., 2006, Chen et al., 2014) but none of these interventions was effective. Also, other ineffective arms (Tahlil et al., 2015) tried to influence social-norm only through explaining to pupils, in educational sessions, cultural issues that discourage smoking by adolescents. Relying only on teaching pupils how to refuse smoking offers without making changes in their social environment to change social-norm or reduce the social pressure to smoke was clear in another two ineffective arms (Resnicow et al., 2010, Seal, 2006).

The domain of **beliefs about consequences** was demonstrated in all arms through enabling participants recognizing smoking consequences, at least on their health, and believing that smoking is harmful. Seven arms also discussed smoking consequences on social relationships (Chou et al., 2006, Mohammed et al., 2016) and (Resnicow et al., 2008) in one arm, and the environment, (Perry et al., 2009) and (Tahlil et al., 2015) in the three arms. Five arms discussed the emotional consequences of smoking, (Resnicow et al., 2008) one arm and (Wen et al.,

2010), and explained how smoking could lead to addiction, (Perry et al., 2009, Mohammed et al., 2016) and (Motamedi et al., 2016), one arm. Two-thirds (eight) of interventions significantly improved pupils' beliefs that smoking is harmful but only six arms enabled participants to translate their positive beliefs into action by avoiding smoking initiation (Perry et al., 2009, Motamedi et al., 2016, Mohammed et al., 2016, Lotrean et al., 2013, Reddy et al., 2002). After two ineffective interventions (Wen et al., 2010, Chen et al., 2014), there was no significant difference between intervention and control groups in the changes of pupils' beliefs about smoking; these two ineffective interventions reported a high attrition bias in the intervention group. Changes in pupils' beliefs about smoking were not measured after two ineffective interventions (Chou et al., 2006, Marsiglia et al., 2015). All Interventions that emphasised correcting pupils' beliefs about the social, environmental and emotional consequences of smoking together with the health consequences were effective in preventing smoking initiation by adolescents (Perry et al., 2009, Motamedi et al., 2016).

Only four interventions demonstrated the theoretical **domain of beliefs about capability**, only one of them was ineffective. These interventions aimed to improve pupils' beliefs on their ability to avoid initiating smoking together with enhancing their beliefs that smoking is harmful. The effective interventions encouraged pupils' self-confidence in their ability to avoid being smokers and also to help their peers and relatives to avoid or quit smoking, and empowered them to do so through training, roleplay and allowed them to practice the learned skills in the presence of professionals (Mohammed et al., 2016, Lotrean et al., 2013), in addition to establishing support group at schools that provided help in relation to smoking prevention after the intervention completion (Perry et al., 2009). The ineffective intervention trained participants to refuse smoking offers, explain to others for avoiding smoking, avoid being with smokers and leave smokers when they smoke (REAL: Refuse, Explain, Avoid, and Leave). Real-life scenarios on videos were used in the training and participants were given opportunities to rehearse the use of these skills. However, as the authors acknowledged, these activities were condensed over a short period of time because of resources and time limitations which may have caused a failure in achieving the desired outcome of preventing smoking initiation by participants (Marsiglia et al., 2015).

All arms aimed to enable participants making an informed and conscious decision to avoid smoking initiation and therefore, demonstrated the **intention theoretical domain.** The intention to smoke was significantly reduced in over two-thirds (11/16) of arms. However, only five arms enabled pupils to make a conscious decision to avoid smoking, maintaining their intention not-to-smoke and translate their positive intention into action and be non-smokers at the end of the follow-up periods (Perry et al., 2009, Mohammed et al., 2016, Lotrean et al., 2013, Reddy et al., 2002). In most interventions, changes in intention to smoke were measured through self-administered questionnaires before and after the interventions. However, in three interventions, the intention not-to-smoke was estimated only through signing pledge or commitment not-to smoke by the intervention group not the controls which restricted estimating the difference in the intention to smoke between the intervention and control groups (Wen et al., 2010, Chen et al., 2014, Chou et al., 2006). Changes in pupils' intention to smoke were not reported in three ineffective (Marsiglia et al., 2015, Seal, 2006, Resnicow et al., 2010) and one effective intervention (Motamedi et al., 2016).

The domain of **identity and social role** was identified in seven intervention-arms, four of them were effective. The three ineffective arms that used identity and social role domain requested all participants to make public commitments in front of their classmates not-to-smoke and discuss consequences of smoking with their peers (Chou et al., 2006, Chen et al., 2014, Wen et al., 2010) and in one ineffective trial parents and teachers were asked to sign non-smoking contract (Wen et al., 2010). However, none of the included articles explained if this commitment was voluntary or obligatory. All effective interventions, except one (Reddy et al., 2002), used the identity and social role domain through allowing non-smoker pupils to make a self-conscious voluntary intention to be recognized as non-smokers, be no-smoking role models and take active roles in convincing their peers, relatives or friends to avoid or quit smoking. Even in the only effective intervention that was not coded in this domain, non-smokers pupils took active voluntary social roles by signing a petition to ban smoking inside schools and they felt responsible to do so (Reddy et al., 2002). The voluntary aspect of taking these responsibilities by pupils was unexplained in the ineffective interventions that considered this theoretical domain.

The **emotion management domain** was demonstrated in six arms, only one of them was effective (Motamedi et al., 2016). The six arms provided training sessions on stress-management and coping strategies with anxiety and depression. However, only in the effective intervention (Motamedi et al., 2016) the provided information on emotion-management was also supported by allowing participants to practice burn-out techniques such as leisure, hobbies or physical activities and these facilities were made accessible to them in their community with a discussion of how to deal with barriers of accessing these services. Using this practical approach motivated participants to practice the acquired information and skills on emotion-management and significantly reduced pupils' smoking initiation rates, even after three years of completing the intervention.

The following four theoretical domains were infrequently used in the included interventions: behavioural regulation, reinforcement, optimism and personal-goals setting domains. The domain of personal-goals setting was used only in two interventions (Mohammed et al., 2016, Motamedi et al., 2016), both of them were effective. These two interventions encouraged participants to set proximal and distal goals they want to achieve in their young age and smoking prevention education was engaged to make them aware of how smoking could hinder them from achieving their distal goals of having a healthy and bright future and how they could still enjoy their time without smoking. The **behavioural regulation domain** was demonstrated only in one intervention through enhancing pupils to monitor their emotional reaction and usage of free time; training them on anger and anxiety management skills; encouraging them to use their free time positively through practising leisure to beat boredom; helped them overcoming leisure constraints. This intervention (Motamedi et al., 2016) was effective in preventing adolescents from smoking initiation. The same interventions were also the only intervention that clearly demonstrated the **optimism theoretical domain** through stimulating participants' confidence that they will have a healthy future and win sports competition due to good health and avoid smoking (Motamedi et al., 2016). None of the ineffective interventions used any of the personal-gaols, behavioural regulation or optimism theoretical domains.

Social not financial rewards for those who remained never-smokers were used only in three arms, two of them were effective, in order to increase the probability of pupils' responses to intervention activities and maintaining non-smoking status. This approach demonstrated the **reinforcement theoretical domain.** Announcing the names of pupils who remained never-smokers at different stages of the intervention in school posters and newsletter was used in the effective interventions (Mohammed et al., 2016, Perry et al., 2009, Lotrean et al., 2013) as a social reward to reduce the probability of smoking initiation by them and other pupils who might want to imitate them to get similar reward. One of these effective interventions (Perry et al., 2009) also rewarded non-smoker teachers and parents in the same way to reduce the probability of imitating teachers and parents, who are considered as role-models, in smoking. No intervention used financial incentives. Whereas rewards in the ineffective intervention (Wen et al., 2007) were limited to providing memberships of the school's smoking-control-committee for the winners of the school competition of the best anti-smoking essays and presentations. The smoking status of those winners was unexplained. Other ineffective interventions asked pupils to make public commitment not-to-smoke from the perspective of been committed rather than been rewarded (Chou et al., 2006, Chen et al., 2014, Wen et al., 2010). No intervention used punishments for pupils who smoke.

None of the included interventions used all the 17 theoretical domains listed in Table 12. The number of the used domains ranged from five to ten theoretical domains in each arm. The intervention arms that used the least number of theoretical domains were ineffective. The averages number of theoretical domains that are considered in the effective interventions is eight with a minimum of six and a maximum of ten. Whereas an average of seven theoretical domains were used in the ineffective arms, with a minimum of five and a maximum of ten domains. Two arms used ten theoretical domains, one was effective (Perry et al., 2009) and the other one was ineffective (Wen et al., 2010). This indicates that increasing the number of theoretical domains in interventions does not guarantee effectiveness. Accordingly, there is no clear conclusion that the number of domains influences the effectiveness of SBSPIs.

All the included SBSPIs in Arabic and LMICs used the knowledge, skills, intention and belief on consequences theoretical domains in addition to at least another domain. The commonly used theoretical domains, especially in effective arms, are: social influence domain; memory, attention and decision process domain; identity and Social role domain; followed by: environmental context and resources domain; beliefs about capabilities domain; and emotion management domain. The followings are the less frequently used theoretical domains: reinforcement, behavioural regulation, optimism and personal-goals. The theoretical domains that were only used in the effective interventions are: behavioural regulation, optimism and personal-goals.

Table 12 Summary of the theoretical domains of the included studies

The study ID (1st author, year, country)	The effectiveness of the intervention in smoking prevention		Knowledge		Skills			Memory, attention & decision process	Behavioural regulation	Environmental context & resources	Social influences	Beliefs about Consequences	Beliefs on capabilities	Optimism	Intentions	Identity / Social role	Personal-goals	Reinforcement s	Emotion management
			Knowledge on consequences	Normative education	Social competence	Social influence	Combined												
1. Perry, 2009, India	Effective		X			X		X		X	X	X	X		X	X		X	
2. Motamedi, 2016 South-Africa	Effective		X				X	X	X			X		X	X	X	X		X
3. Lotrean, 2013, Romania	Effective.		X			X		X			X	X	X		X	X		X	
4. Mohammed, 2016, Saudi Arabia	Effective		X			X		X			X	X	X		X	X	X		
5. Reddy, 2002, India	School intervention	Effective	X			X				X	X	X			X				
	School intervention plus family intervention	Effective	X			X				X	X	X			X				
6. Tahlil, 2015, Indonesia	Islamic based intervention	Ineffective	X	X	X							X			X				
	Health-based intervention	Ineffective	X	X			X				X	X			X				X
	Combined health & Islamic based intervention	Ineffective	X	X			X					X			X				X
7. Resnicow, 2010 South-Africa,	Harm management	Ineffective	X		X			X				X			X				
	life skills intervention	Ineffective	X				X	X				X			X				X
8. Chou, 2006, China	Ineffective		X	X		X		X			X	X			X	X			
9. Seal, 2006, Thailand	Ineffective		X				X	X		X		X			X				X
10. Wen, 2010, China	Ineffective		X				X	X		X	X	X			X	X		X	X
11. Marsiglia, 2015, Mexico	Ineffective		X			X		X				X	X		X				
12. Chen, 2014, China	Ineffective		X			X				X	X	X			X	X			

Sources: adapted from (Atkins et al., 2017, Griffin and Botvin, 2010)

4.4.8 Intervention functions

The functions of the included interventions in relation to the effectiveness in preventing smoking initiation by adolescents are summarised in Table 13. The ***education and training functions*** were used in all the included trials, as all interventions provided information on smoking consequences through sessions that also aimed to train participants on either social competence or social influence skills, including refusal skills to smoking offers, or both, as discussed in section 4.4.7. The educational and training activities in the effective interventions went beyond explaining the smoking-related illness to include discussion of environmental and emotional consequences of smoking and hazards of secondary smoking, using educational methods that enable pupils to remember this information such as video, role play, group activities and discussion. Additionally, the educational sessions in effective arms encouraged pupils to think and discuss the advantages and disadvantages of smoking before deciding whether to smoke or not.

Persuasion function was demonstrated in all effective interventions as all these interventions involved explaining the advantages and disadvantages of smoking and reasons not-to-smoke using real-life scenarios in videos or roleplays followed by group discussion or debate on these issues. In contrast, the ineffective arms showed limited utilization of the persuasion function which was limited to presenting pictures of smoking-related illnesses (Chen et al., 2014) or using animal experiments to explain biological hazards of smoking (Wen et al., 2010) or discussing reasons for declining smoking offers only from the perspective of pupils (Marsiglia et al., 2015).

The included SBSPIs showed limited utilization of the ***Incentivisation function*** in general, as it was used only in four interventions. However, this function was utilized more frequently in the effective intervention than ineffective arms, as incentives were used only in one ineffective arm compared with half of the effective intervention arms. The incentives, when used, were limited to social rewards as financial incentives were not used in any included intervention. The effective intervention rewarded pupils who maintained their never-smoking status by announcing their names in school-posters and selecting them to be non-smoking role models (Mohammed et al., 2016, Perry et al., 2009, Lotrean et al., 2013). In one effective intervention (Perry et al., 2009) non-smoker parents and teachers were rewarded in a similar way for maintaining their non-smoking status. Whereas the ineffective intervention (Wen et al., 2007) gave a reward for three winners of the best anti-smoking essays and presentations in each class by making them candidates for a school-wide competition but this competition was not based on pupils' smoking status.

None of the included SBSPIs used the ***coercion function*** as no trial reported creating an expectation of punishment or cost for those, pupils or adults, who initiated smoking or even smoke inside schools.

The included SBSPIs showed limited utilization of the ***restrictive function***, used only in five arms, in preventing smoking initiation by adolescents in Arabic and LMICs. However, this function was used more in the effective intervention arms, used by half of the effective arms and in two ineffective arms. The restriction function, when used, focused on establishing anti-smoking policies that prevent teachers, parents and visitors from smoking inside or around schools buildings. In all effective arms, the established policy went beyond schools to enhance community policies against smoking either through providing opportunities to community members to learn about and enhance national anti-smoking policies, in one arm (Perry et al., 2009), or inviting pupils to sign a petition requesting banning tobacco advertising to be

presented to the country Prime-Minister, in two arms (Reddy et al., 2002). The two ineffective arms that used the restriction function (Wen et al., 2007, Chen et al., 2014), a smoking-control-committee reviewed and established school policy that bans smoking anywhere inside school buildings. The committee in one arm (Wen et al., 2007) also ensured that school policy demonstrates school commitment to support anti-smoking initiatives and activities through providing the required financial and human resources and time. However, it was unclear in the two arms if this policy was enforced or not. In contrast, the effective arms enforced this policy inside schools and went beyond schools environment to include the wider community by either informing the community about the national smoking prevention policy or participating in establishing a national policy that restricts smoking inside school buildings.

This review showed limited use of the ***modelling function*** in SBSPIs in Arabic and/or LMICs. The modelling function was demonstrated only in less than a fifth (3/16) of the included arms which used non-smoker pupils, after training them, to discuss smoking harms with their peers, all these interventions were effective. The modelling function was poorly demonstrated in all ineffective interventions arms. However, two ineffective arms used few pupils to deliver some educational activities at schools (Chen et al., 2014, Wen et al., 2010). The smoking status of the peer-educators was unexplained in the ineffective interventions as they were elected by pupils in one intervention (Chen et al., 2014) and criteria for selecting them were unexplained in another intervention (Wen et al., 2010). The role of peer-educators in ineffective interventions was limited to discussing smoking hazards with smoker pupils only and assisting teachers in delivering educational-sessions on smoking hazards (Chen et al., 2014), or running formal peer-education sessions in classroom setting (Wen et al., 2010). Whereas the role of peer-educators in effective interventions went beyond chairing, stimulating and summarising small group discussion, presented outcomes of group work and running formal peer-education sessions in classroom setting to also include informal discussion of smoking harms outsides classrooms with smoker and non-smoker pupils (Perry et al., 2009), demonstrating, in roleplays or videos, real-life situations about positive attitudes concerning non-smoking and how to resist social pressure to smoke (Lotrean et al., 2013, Mohammed et al., 2016) in addition to sharing personal experiences on how to attract others without smoking (Mohammed et al., 2016). All effective interventions with the modelling function indicated using non-smoker peer-educators. Non-smoking role models of teachers and parents plus pupils were used in one effective intervention (Perry et al., 2009).

The function of ***environmental reconstructing*** was clear only in five interventions that involved activities aimed to create anti-smoking social-norm at school, two of these interventions were effective and three were ineffective. The effective interventions that showed the social and environmental reconstruction function created anti-smoking norms through smoke-free initiatives implemented by smoking-prevention-committees that consist of non-smoker pupils who provided formal promises not-to-smoke and support other pupils not-to-smoke or quit smoking (Mohammed et al., 2016, Perry et al., 2009). The created smoking-free norm went beyond school to include home and surrounding neighbourhood environment, in one effective intervention (Perry et al., 2009). Whereas, the social and environmental reconstruction function in the ineffective interventions, when existing, was limited to: informing pupils on the national adolescents' smoking rates (Chou et al., 2006); celebrating the world no-smoking-day (Wen et al., 2010); publishing school-posters that explains smoking harms (Chen et al., 2014). Only two ineffective interventions established Smoking-Control-Committee at school (Chen et al., 2014, Wen et al., 2010) but the role of this committee in any of these interventions was unexplained. One ineffective intervention indicated that additional emphasis was placed on

avoiding household exposure to smoking without clarifying how this was done (Chou et al., 2006).

Activities to enhance pupils' capability (beyond education and training) and opportunity to remain never-smokers, the ***enablement intervention function***, were provided only in two interventions, only one of them was effective (Perry et al., 2009). The effective intervention (Perry et al., 2009) provided school-based smoking prevention, counseling and quitting services for parents and pupils, smokers and non-smokers. Whereas in the ineffective intervention (Resnicow et al., 2008) the enablement function did not target parents and was limited to providing school-based quitting services for smoker pupils.

At least two intervention functions, education and training, were included in each intervention arm. None of the included SBSPIs used all the BCW intervention functions. However one effective intervention (Perry et al., 2009) used nine of these ten functions, coercion was the only excluded function in this intervention. The education, training and persuasion functions were used in all the effective interventions. Some effective interventions used education, training and persuasion functions alone (Motamedi et al., 2016) or in addition to: restriction function only (Reddy et al., 2002), or modelling only (Lotrean et al., 2013), or modelling and environmental reconstruction functions (Mohammed et al., 2016), or all other functions except the coercion function (Perry et al., 2009). A minimum of three functions was used in the effective-interventions. However, some ineffective interventions used more than five functions which indicates that using many functions does not guarantee intervention's effectiveness.

Table 13 Summary of the Presence of BCW Intervention Functions in included studies

The study ID (1st author, year, country)	The effectiveness of the intervention in smoking prevention		Education	Persuasion	Incentives	Coercion	Training	Restriction	Environmental restructuring	Modelling	Enablement
1. Perry, 2009, India	Effective		X	X	X		X	X	X	X	X
2. Motamedi, 2016 South-Africa	Effective		X	X			X				
3. Lotrean, 2013, Romania	Effective		X	X	X		X			X	
4. Mohammed, 2016, Saudi Arabia	Effective		X	X	X		X		X	X	
5. Reddy, 2002, India	School intervention	Effective	X	X			X	X			
	School intervention plus family intervention	Effective	X	X			X	X			
6. Tahlil, 2015, Indonesia	Islamic based intervention	Ineffective	X				X				
	Health-based intervention	Ineffective	X				X				
	Combined health & Islamic based intervention	Ineffective	X				X				
7. Resnicow, 2010, South-Africa	Harm management	Ineffective	X				X				X
	life skills intervention	Ineffective	X				X				
8. Chou,2006, China	Ineffective		X				X		X		
9. Seal, 2006, Thailand	Ineffective		X				X				
10. Wen, 2010, China	Ineffective		X	X	X		X	X	X		
11. Marsiglia, 2015, Mexico	Ineffective		X	X			X				
12. Chen, 2014, China	Ineffective		X	X			X	X	X		

Presence of a BCW Intervention Function in an intervention arm is indicated with an X

Source: adapted from: (Michie et al., 2014a)

4.4.9 Delivery methods

Table 14 summarises the methods used in delivering the included SBSPIs. All interventions arms used ***face-to-face educational sessions*** to deliver the contents. Furthermore, ***printed educational materials*** (brochures, leaflets, posters, newsletters, postcards, handbook or booklets) are used in eight interventions (Resnicow et al., 2010, Seal, 2006, Mohammed et al., 2016, Chen et al., 2014, Lotrean et al., 2013, Reddy et al., 2002, Perry et al., 2009, Wen et al., 2010). These printed educational materials were distributed to pupils (in these eight interventions); hanged on schools wall, in five interventions (Mohammed et al., 2016, Chen et al., 2014, Lotrean et al., 2013, Reddy et al., 2002, Perry et al., 2009); given to parents/family members, in two interventions (Reddy et al., 2002, Wen et al., 2010), and other community-members outside schools, in one intervention (Perry et al., 2009). Furthermore, one intervention used mass-media to inform the public about smoking prevention activities implemented at schools (Wen et al., 2010). All effective interventions, except one (Motamedi et al., 2016), used anti-smoking school-posters and distributed educational-materials to pupils inside schools (Mohammed et al., 2016, Lotrean et al., 2013)and their parents, relatives and other community members outside schools (Perry et al., 2009). Whereas, educational-materials were not distributed inside or outside schools in half (5/10) of the ineffective arms (Tahlil et al., 2015, Chou et al., 2006, Marsiglia et al., 2015). All the distributed educational-materials included information on consequences of smoking but in five interventions they also presented other key messages on smoking prevention or reminders of what was discussed in

educational-sessions such as advantages of non-smoking (Mohammed et al., 2016), how to refuse smoking offers, (Reddy et al., 2002), resist social and peer-pressure to smoke and manage stress and emotion, communicate assertively, (Resnicow et al., 2010), and solve personal problems (Seal, 2006) in addition to creating smoke-free environment at home, school and neighbourhood (Perry et al., 2009). School posters/brochures were used in five interventions, all of them were effective (Mohammed et al., 2016, Lotrean et al., 2013, Reddy et al., 2002, Perry et al., 2009) except one (Chen et al., 2014). In effective interventions, the antismoking school posters/brochure were designed by pupils mainly through school competition on the best-designed brochure about advantages of non-smoking and disadvantage of smoking (Mohammed et al., 2016, Perry et al., 2009) whereas it is unclear how school-posters were designed and by whom in ineffective interventions when used (Chen et al., 2014).

Active learning, group activities and discussion were emphasised in all effective interventions (Reddy et al., 2002, Mohammed et al., 2016, Perry et al., 2009, Motamedi et al., 2016, Lotrean et al., 2013)and some ineffective interventions (Tahlil et al., 2015, Resnicow et al., 2010, Marsiglia et al., 2015, Seal, 2006). One effective intervention (Reddy et al., 2002) also used debates inside and between schools to emphasise the importance of banning smoking sponsorship. Video was used to deliver contents in some interventions, mainly to demonstrate how to perform skills in different situations (Seal, 2006, Lotrean et al., 2013, Marsiglia et al., 2015), interviewing adolescents who share their positive and negative experiences with smoking (Mohammed et al., 2016) or patients who suffered from smoking-related illness (Wen et al., 2010). In order to make educational-sessions more attractive and stimulate discussion of key massages, role plays by pupils was used in two effective (Lotrean et al., 2013, Mohammed et al., 2016) and four ineffective interventions (Tahlil et al., 2015, Resnicow et al., 2010, Seal, 2006, Wen et al., 2010). In effective-intervention, real-life scenarios played by local adolescents used to explain reasons to smoke or not, demonstrate how to resist smoking offers and share personal experiences of smoking or never-smoking (Lotrean et al., 2013, Mohammed et al., 2016). Whereas contents of roleplay were unclearly specified in ineffective interventions, except in one (Wen et al., 2010) which indicated using roleplay scenarios to demonstrate and practise ways for handling peer-pressure to smoke. Furthermore, only in effective interventions roleplays were recorded on videos and kept at schools to be watched by pupils in other times even after completing interventions (Lotrean et al., 2013, Mohammed et al., 2016) but the frequency, location and time of watching these videos by pupils after interventions completion and if this was associated with discussion or not were unexplained in any article. Local games were involved in the contents of two, ineffective, intervention (Seal, 2006, Chou et al., 2006) but it was unclear how they were linked to smoking prevention. May be these games were used in explaining smoking consequences of fitness, which may include these games, or they were played in the break time between educational-sessions.

Michie et al. (2014a) suggested that direct communication is useful in delivering interventions with education, persuasion, coercion and modelling functions. All the effective SBSPIs utilized the education, persuasion and modelling functions, therefore direct communication was a suitable approach for delivering these interventions. Moreover, all the effective interventions emphasised active learning and group discussion during the training sessions, as an effective method for communicating the interventions' contents to pupils. Recording role-plays which were based on real-life scenarios presented by adolescents to demonstrate skills and explain reasons for avoiding smoking was clearly used in effective-interventions.

Using intervention manual/guideline is considered as an important tool for delivering all types of BCW intervention functions, except the modelling function, according to Michie et al.

(2014a). In this review, interventions deliverers were supported by ***guidelines or manuals*** in six arms only, four of them were effective. All effective interventions supported educators, teachers and pupils when involved, with guideline or manuals that summarise key messages that should be transmitted to participants and all activities that should be implemented in schools with instructions on how to achieve these activities and trained educators how to use these manuals/ guidelines (Lotrean et al., 2013, Perry et al., 2009, Reddy et al., 2002). In contrast, the contents of deliverers manuals were unclear in the ineffective arms (Resnicow et al., 2010). Another ineffective intervention distributed (Wen et al., 2010) anti-smoking pamphlets, not a manual or guideline, to teachers to raise their awareness on smoking harms not to guide them on how to deliver intervention activities.

Most effective arms used several delivery methods while half of the ineffective arms used only one delivery method, as Table 14 shows.

Table 14 Summary of the delivery methods used in the included studies

The study ID (1st author, year, country)	**The effectiveness of the intervention in smoking prevention**		**Face-to-face sessions**	**Printed materials**	**Guideline**
1. Perry, 2009, India	Effective		X	X	X
2. Motamedi, 2016 South Africa	Effective		X		
3. Lotrean, 2013, Romania	Effective		X	X	X
4. Mohammed, 2016, Saudi Arabia	Effective		X	X	
5. Reddy, 2002, India	School intervention	Effective	X	X	X
	School intervention plus family intervention	Effective	X	X	X
6. Tahlil, 2015, Indonesia	Islamic-based intervention	Ineffective	X		
	Health-based intervention	Ineffective	X		
	Combined health & Islamic based intervention	Ineffective	X		
7. Resnicow, 2010, South Africa	Harm management	Ineffective	X	X	X
	life skills intervention	Ineffective	X		X
8. Chou,2006, China	Ineffective		X		
9. Seal, 2006, Thailand	Ineffective		X	X	
10. Wen, 2010, China	Ineffective		X	X	
11. Marsiglia, 2015, Mexico	Ineffective		X		
12. Chen, 2014, China	Ineffective		X	X	

4.5 Discussion

This section discusses the main findings of this review on the approach and strategies for cultural-appropriateness, intervention functions, smoking prevention curriculum and theoretical-domains that were commonly used in the included effective SBSPIs in Arabic and/or LMICs. It also discusses the implications of these findings for practice and research; areas need to be fulfilled by further research in addition to the strengths and limitations of this review.

4.5.1 Cultural-appropriateness of the intervention

The importance of cultural-appropriateness to ensure the transferability of the effectiveness of interventions and integration into the new system or context and the need for guidance to achieve that has been emphasised in the literature (Evans et al., 2019). A culture is a mixture of learned values, practices, way of life, social regulations and norms that are shared in a group and transmitted across generations (Hughes et al., 1993). Family and social roles, communication patterns among members and Individual characteristics, such as: values, spirituality, beliefs, individualism, personal control and collectivism, are factors that shape cultures and are influenced by cultures (Kreuter et al., 2003). Cultural-appropriateness of interventions aims to make the intervention sensitive to the culture of the targeted population (Kreuter et al., 2003). Smoking behaviour is markedly influenced by the culture (Wellman et al., 2016) as many predictors of youths' smoking vary across countries that have different cultures (Steptoe et al., 2002), as discussed in chapter 3. Therefore, poor consideration of cultural influencers of adolescents' smoking in the targeted population and improper adaptation of prevention intervention to address these influencers threatens the intervention's effectiveness, even if similar intervention was effective in another context (Castro et al., 2010, Castro et al., 2004, Colby et al., 2013). This review identified limited information published on cultural-adaption of the included SBSPIs in Arabic and/or LMICs, as more attention was given to other aspects of these interventions. This limited information on cultural-appropriateness hinders full-explanations of why 50% of the interventions arms that were based on effective interventions in developed high-income countries were ineffective in LMICs. Poor understanding of cultural-appropriateness of intervention challenges replicating effective intervention in other contexts (Elliott and Mihalic, 2004). This section discusses the available evidence on the cultural-adaption of SBSPIs in Arabic and/or LMICs in relation to their effectiveness in preventing smoking initiation by adolescents.

Generally, most of the high-quality evidence on SBSPI is based on few high-income countries. For example, the last Cochrane systematic review of School-based programmes for preventing smoking included only eight RCTs implemented in LMICs and none was implemented in Arabic countries (Thomas et al., 2013). This review identified only 12 RCTs aimed at preventing adolescents from smoking initiation through their schools in Arabic and/or LMICs and met the eligibility criteria, discussed in section 4.3.1. About 67% of the included arms were based on SBSPI originally developed in high-income countries. Accordingly, intervention developers in LMICs, face challenges in balancing the dynamic tension between keeping the fidelity of effective interventions that were imported from another context and cultural-appropriateness of these interventions to the targeted context. This tension could result in either surface cultural-appropriateness or major changes of the effective ingredients of the imported interventions and both may decrease interventions' effectiveness (Castro et al., 2010, Castro et al., 2004, Colby et al., 2013).

The deep cultural-appropriateness was considered in 80% of the included effective arms, see Table 10. In contrast, all ineffective interventions, except one, involved either unclear or

surface adaptation of contents and activities to the targeted adolescents' culture, although these interventions were based on either literature review of SBSPIs evidence (Tahlil et al., 2015, Wen et al., 2010, Chen et al., 2014) or SBSPIs that showed effectiveness in developed high-income countries (Resnicow et al., 2008, Chou et al., 2006, Seal, 2006, Marsiglia et al., 2015). Targeting adolescents from the same ethnicity but live in different countries using similar SBSPIs without deep cultural-appropriateness does not lead to the same desired outcome, as in the intervention by Marsiglia et al. (2015). Surface cultural-appropriateness increases acceptance and receptivity of interventions whereas deep cultural-appropriateness increases the cultural competence of these interventions in addressing the targeted behaviour of this population (Resnicow et al., 1998). Surface cultural-appropriateness of interventions prompts consumers' participation and engagement with the intervention (Castro et al., 2010) while going beyond surface cultural-appropriateness, by addressing local predictors such as values, beliefs and social-norms, enhances effectiveness (Perry, 1999).

To ensure maintaining effectiveness of imported effective SBSPIs it is important to consider the followings: 1) cultural-tailoring; 2) evidential, linguistic, peripheral and sociocultural strategies for cultural-appropriateness; 3) constituent-involvement of local stakeholders, through both top-down and bottom-up approaches, to adapt interventions' contents and delivery methods to fit the targeted LMICs context, as in SBSPIs by (Wegner et al., 2008) and Perry et al. (2009), (Wegner et al., 2008, Perry et al., 2008). Local factors at three levels need to be considered in deep cultural- appropriateness: 1) characteristics of the targeted group such as: their language, gender, ethnicity, beliefs, values, social-norms, socio-economic status and place of residence; 2) characteristics of intervention deliverers such as: their age, gender, qualification or training, experience, cultural orientation and competences; 3) characteristics of the targeted community such as enthusiasm, interest, awareness and concerns (Glanz et al., 2008, Castro et al., 2010, Castro et al., 2004, Colby et al., 2013). Poor (improper or superficial) considerations of these factors in adapting imported-interventions that were effective in high-income countries was acknowledged, by some interventions' designers in LMICs, a reason behind the ineffectiveness of their interventions (Marsiglia et al., 2015, Chen et al., 2014, Chou et al., 2006). Poor cultural-appropriateness of any of these factors hinders the implementation, effectiveness and sustainability of interventions (Colby et al., 2013), as was concluded in another review of 44 prevention interventions (Castro et al., 2004).

In this review, 75% of the included arms used both bottom-up (by involving local stakeholders) and top-down (through involving experts in designing SBSPI) approaches for adapting the interventions. However, the bottom-up approach was only limited to the design stage. Moreover, local stakeholders' participation in most cases was limited to checking clarity and suitability of already designed interventions to the local context rather than real involvement in designing interventions. Pupils' involvement in designing interventions was only considered in two effective interventions (Perry et al., 2008, Motamedi et al., 2016), both considered pupils' opinions on best school activities for smoking prevention. Community participation in designing, implementing and evaluating interventions was only considered in effective arms (Wegner et al., 2008, Perry et al., 2008). Proper cultural-adaptation should be based on evidence and experience of experts (top-down approach) in addition to local people knowledge and experience of what is feasible and acceptable, at high and local levels, in the targeted context (bottom-up approach)(Minkler and Wallerstein, 2003, Perry, 1999). Involving key local stakeholders, from inside and outside schools and adolescents, in designing, implementing and evaluating interventions enhances community participation and ownership, thus sustainability, of interventions (Minkler and Wallerstein, 2003). For proper community participation in adapting the intervention, local stakeholders should be convinced on the

importance of using scientific evidence in addressing the targeted behaviour and at the same time invited to tailor contents and delivery methods to meet the targeted population's need and culture (Noar et al., 2007, Minkler and Wallerstein, 2003, Kreuter et al., 2003).

It is recommended to do the following steps to ensure that the adapted intervention is as effective as the original intervention: 1) identify core components of the intervention that influence effectiveness; 2) determine issues that could be adapted in the intervention; 3) explore community concerns; 4) identify the available and needed resources and training; 5) consult the original intervention developer;6) involve local stakeholders at different levels; 7) develop a plan for ensuring cultural appropriateness; 8) monitor and evaluate the involved activities and process alongside with intervention monitoring and evaluation (Backer, 2001, Noar et al., 2007, Castro et al., 2010, Castro et al., 2004, Colby et al., 2013). Following these steps in developing and implementing a comprehensive approach for cultural-appropriateness of an effective American SBSPI enhanced intervention's effectiveness in South-Africa (Motamedi et al., 2016). This intervention involved open discussions between the original intervention designers and local experts, teachers and pupils. The discussions resulted in identifying: elements of the intervention that are key to the effectiveness, therefore should not be changed; elements in the original intervention that are inappropriate to the South-African context; the cultural influencers of adolescents' smoking in South-Africa. The discussion succeeded in identifying varieties of smoking prevention activities that suit the South-African culture in line with theories that guided the original intervention (Wegner et al., 2008).

The dynamic tension between cultural-appropriateness and keeping the fidelity of the original effective interventions could be balanced by a planned participatory and systematic approach for cultural-appropriateness which should be guided by evidence-based strategies to avoid decreased effectiveness due to inappropriate or haphazard adaptation (Castro et al., 2010, Castro et al., 2004). The balance between fidelity and cultural-appropriateness was demonstrated in adapting an effective Dutch SBSPI before being used effectively in preventing adolescents' smoking in Romania through improving their social influence skills (Lotrean et al., 2013, Dijkstra et al., 1999). The cultural-appropriateness of this imported intervention went beyond contents' translation to involve amending the original contents, which were focused on resisting peer-pressure to smoke, by adding contents related to parents' and siblings' influences of smoking, after assessing social influences of adolescents' smoking in Romania and exploring pupils' and teachers' opinions on the intervention. Although peer-education was uncommonly used in Romania, this intervention used peer-education, similar to the original intervention in the Netherlands (Dijkstra et al., 1999), after exploring its acceptability by Romanian pupils and teachers (Lotrean et al., 2010). Another effective SBSPI (Mohammed et al., 2016) used survey findings on predictors of adolescents' smoking in Saudi Arabia (Mohammed et al., 2018) to adapt the effective European Smoking Prevention Framework Approach (de Vries et al., 2003, de Vries et al., 2006) before being used successfully in preventing Saudi adolescents from smoking initiation. The intervention also used locally developed videos involved Saudi adolescents wearing local clothes to discuss, in the local language, socially-accepted methods for resisting social pressure to smoke and emphasising values, beliefs and social-norm in the Saudi context. In both examples, the intervention was effective in the imported and exported contexts

Cultural-tailoring is commonly ignored in cultural-adaptation although it enhances the effectiveness of behaviour change interventions (Kreuter et al., 2003). In this review, cultural-tailoring strategy was only used in effective arms. Cultural-tailoring of behaviour change interventions aims to include contents that address shared cultural issues regarding the

targeted behaviour with a consideration of cultural-differences between individuals in these issues in order to succeed in changing the behaviour of large proportions of the targeted population (Gould et al., 2017, Kreuter et al., 2003, Kreuter et al., 1999). While the translation of contents is the most obvious form of intervention adaptation, cultural-tailoring is the most challenging form of adaptation (Castro et al., 2010, Castro et al., 2004, Colby et al., 2013). The effectiveness of SBSPIs in LMICs is enhanced by paying attention to cultural-tailoring of contents to ensure addressing individual variance among target groups in term of their beliefs and interests in the included contents and delivery methods, as demonstrated in SBSPIs by Wegner et al. (2008), Caldwell et al. (2010) and Perry et al. (2009). In contrast, paying less attention to individual variance within the target population minimizes interventions' effectiveness even if extensive activities were done to adapt the intervention to the local context through the other five strategies for ensuring cultural- appropriateness, as was the case of Tahlil et al. (2015), Resnicow et al. (2010). The designers of the last two SBSPIs acknowledged that more consideration of the heterogeneity in predictors of smoking (such as ethnicity, knowledge and beliefs) among the targeted adolescents were needed for achieving better outcomes.

Considering differences in school capacity and resources is also part of the cultural-tailoring of school-based interventions (Kreuter et al., 2003, Bauld et al., 2009, Wagner and Waldron, 2001). For example, discussion in small groups is more effective and manageable than in large groups but it is not always possible to use small group discussions in SBSPIs, especially in LMICs where classrooms have more pupils and less equipment than in high-income countries (Shackleton et al., 2016b, Bauld et al., 2009).

Poor consideration of differences in classrooms' capacity and resources of targeted schools, reduces the effectiveness of the imported effective-interventions, as in the SBSPI by Marsiglia et al. (2015).

4.5.2 Implementation process

Limited information is available on the process of implementing the included studies, and if these interventions were implemented as planned or something was changed during the implementation process and why, as other aspects of the interventions were given priorities in the published articles on these interventions. Lack of information on the implementation process of complex-intervention creates challenges in replicating effective-interventions in other contexts (Elliott and Mihalic, 2004). Based on the Medical Research Council (MRC) definition (Craig et al., 2008), SBSPI is considered as a complex-intervention because adolescents' smoking is influenced by several factors at different levels, see chapter 3, and many of these factors could be addressed through schools. Conducting a process-evaluation is essential in designing and evaluating complex interventions (Craig et al., 2008) because it explores issues on the interventions' socio-cultural and political acceptability, accessibility, feasibility, challenges, setting and quality of implementation (Oakley et al., 2006). This information is essential for explaining the outcome of interventions and informing policymakers and intervention designers on how to replicate effective-interventions in their context and achieve similar positive outcomes (Moore et al., 2015). Relying only on the final-outcome of behaviour-change interventions does not necessarily lead to positive outcomes when the same interventions were implemented in another context as effect-size does not explain how effectiveness could be reproduced (Elliott and Mihalic, 2004, Gould et al., 2017). In this review, only five of the included interventions conducted a process-evaluation. Detailed information on complex-interventions contents, activities and delivery methods, what worked and did not work, why and how are important for replicating effective-interventions in

different contexts (Eldredge et al., 2016). With the limited information on the implementation of the included studies, it is difficult to explain why and how SBSPIs could be effective in preventing adolescents' smoking in Arabic and/or LMICs. For example, two arms of SBSPIs were ineffective in reducing smoking initiation rates among South African adolescents although extensive work was done to culturally adapt contents of two interventions that showed long-term effectiveness in the USA (Botvin and Griffin, 2001) and Western Australia (Hamilton et al., 2007), to suit the South African context. The process-evaluation of this intervention explained that the adapted South African intervention delivered only half of the educational sessions that were implemented in the original American and Australian interventions, the socio-economic differences were unexplained. Also, there was a high dropout rate, and no booster-sessions implemented over the two years following the intervention (Resnicow et al., 2008). This information on the implementation explains that the intervention's ineffectiveness is attributed to the insufficient dose of contents rather than inappropriate content. Without the process-evaluation, this difference in effectiveness between the original and the adapted interventions cannot be explained.

The available information, although limited, on the implementation of some included interventions helped in explaining some issues regarding the ineffectiveness of SBSPIs in Arabic and/or LMICs. The review concluded that poor participation of pupils in most interventions' activities do not lead to the desired positive outcome of interventions. For example: in an ineffective intervention (Chen et al., 2014) less than one-third of pupils participated in half of the activities, pupils' participation was only 15% in some activities, smoking education materials was recognized only by 38% of the targeted pupils and in the best scenario participation rate was 68%. Low participation rates were also reported in another ineffective Chinese intervention (Wen et al., 2007) as only less than one-third of the targeted pupils participated in six of the top seven popular intervention activities. Although the last intervention was based on an extensive review of Chinese and worldwide literature, low participation rates explain why smoking rates increased among targeted pupils after a year of follow up (Wen et al., 2010). The reviews concluded that ineffectiveness of SBSPIs is also attributed to shortening the period of implementing activities of imported-interventions, by 50%, compared with the original interventions timeframe as well as implementing SBSPIs before the exam or near the end of school-terms (Chou et al., 2006, Marsiglia et al., 2015); even when fidelity of contents was maintained and original interventions were effective (Marsiglia et al., 2014). Condensing activities over a short-period do not allow time for pupils to think and discuss information and practice the delivered skills (Marsiglia et al., 2015, Thomas et al., 2013, Skara and Sussman, 2003, Wiehe et al., 2005, Flay, 2009).

4.5.3 The theoretical constructs

Underpinning behaviour change interventions with theory followed by evaluating the intervention allow testing the appropriateness of this theory in addressing the targeted behaviour which in turn could enable further utilization and adaptation of the theory and the intervention in future (Rothman, 2004). Despite that, articles on behaviour changes interventions do not often refer to theories in designing, adopting, implementing or evaluating interventions, as many reviews identified (Davies et al., 2010, Painter et al., 2008). In this review, only seven of the included SBSPIs in Arabic and/or LMICs indicated theory employment at any stage of the intervention but all the effective interventions, except one (Reddy et al., 2002), referred to at least one theory that informed designing the intervention. Proper reporting of theory-underpinning should include explanations of how the theory and its constructs were used in selecting intervention activities and adapting the contents and delivery methods to suit the targeted context or population in addition to discussion of the

findings in relation to the applied theory (Michie and Prestwich, 2010). In this review, none of the included studies that indicated theory-employment detailed how the named theory was used in all interventions' stages. When information was provided it was limited on how the named theories were used to design, implement, adapt and evaluate SBSPIs. Poor reporting of theory-underpinning is not limited to SBSPIs only as it was also identified other systematic reviews of behaviour change interventions such as weight management and physical activities (Prestwich et al., 2014, Mama et al., 2015, Quirk et al., 2014, Booth et al., 2014), cancer prevention (Avery et al., 2013), perinatal care (Ayers and Olander, 2013) and HIV and sex risk behaviours (Meader et al., 2013). Studies that did not mention theories either did not use any theory or did not report theories' application. In both cases, this minimizes utilizing the findings to design a new SBSPI in Arabic and/or LMICs.

In this review, using TDF to identify the theoretical constructs on the included SBSPIs in Arabic and/or LMICs helped in overcoming the dilemma of lack and poor reporting of theories-underpinning in the included studies. The involved theoretical domains were mapped against the COM-B model by Michie et al. (2014a) to identify what theoretical domains were used by effective SBSPIs to enhance pupils' capability, opportunity and motivation to avoid smoking initiation in Arabic and/or LMICs. The findings of this step are discussed below.

4.5.4 Enhancing pupils' capability, motivation and opportunities to avoid smoking initiation

The findings on the theoretical domains and intervention functions were mapped against the COM-B model by Michie et al. (2014a) to identify what was used by the effective SBSPIs to enhance pupils' capability, opportunity and motivation to avoid smoking initiation in Arabic and/or LMICs. The mapping process was facilitated by the framework, in Figure 7 page 22, and the matrix, in Figure 6 page 17, that links the COM-B model with each of the TDF theoretical domains and the intervention functions respectively. These links were based on group discussions and consensus of a group of behaviour change specialists (Michie et al., 2014a), as explained in section 2.3.1. The findings of mapping the intervention functions and theoretical domains were integrated and summarised in this section.

Pupils' **psychological capability** to maintain non-smoking behaviour was enhanced in the included effective SBSPIs by considering the followings: 1) raising pupils' awareness of the social, environmental and mental consequences of smoking in addition to the health consequences of smoking. 2) Clarifying how smoking could lead to addiction. 3) Educating pupils about the negative emotions that motivate pupils to smoke. 4) Ensuring pupils' high exposure and accessibility to information on smoking consequences through posters, booklets or newsletters in schools. 5) Improving pupils' skills and ability to avoid smoking and resist smoking offers in their society through explaining how to perform these skills, providing opportunities for pupils to practice these skills, obtain feedback on their performance and discuss ways to improve their skills. 6) Informing pupils on the social and environmental situations and events that predict smoking and advising pupils how to recognize and analyse direct and indirect pressure to smoke from peers, family, advertisements and adults. 7) Training pupils how to monitor their emotional reaction, manage and cope with anger, stress, anxiety and depression. 8) Building pupils' confidence in their ability to have a healthy future and win sports-competition if they maintain non-smoking behaviour

In the included effective SBSPIs, pupils' **physical opportunities** to initiate smoking were reduced through the followings: 1) Establishing and enforcing antismoking school-policies that restrict smoking, by pupils, teachers, parents and visitors inside school premises. 2) Stimulating community members, when possible, to enhance and enforce the national anti-smoking policy.

To reduce pupils' **social opportunities** to initiate smoking the included effective SBSPIs considered the following: 1) Increasing pupils' exposure to non-smoking role models at schools. 2) Drawing pupils' attention to important people in their society who never smoked. 3) Using non-smokers in roleplays, pictures and videos to present issues and demonstrate skills that enhance non-smoking behaviour. 4) Repeatedly presenting smokers and tobacco products in disliked images, through roleplays, pictures or posters at schools, as this would discourage pupils to initiate smoking. 5) Encouraging never-smoked pupils to present themselves as role models in never-smoking who could be imitated by other pupils. 6) Encouraging and empowering non-smoker pupils to take an active role in convincing their peers, relatives and friends to avoid or quit smoking, and if possible, taking a voluntary social role in smoking prevention outside schools. 7) Using peer-pressure to enhance positive attitudes toward non-smoking behaviour. 8) Training well-recognized volunteers of never-smoked pupils and enable them to provide consultation to their peers on how to avoid smoking and ways for attracting others without self-harm or smoking and encourage them to share their experiences of avoiding smoking with their peers. 9) Encouraging pupils to obtain consultations and social support from their parents, friends or teachers in order to avoid smoking initiation. 10) Allowing pupils to practice peer-education skills over a reasonable period in the presence of professionals.

The included effective SBSPIs considered influencing pupils' beliefs about what is good and bad about smoking and enhancing their conscious intention **(reflective motivation)** not-to-smoke through the following: 1) Explaining the pros and cons of smoking and non-smoking. 2) Encouraging pupils to think about the advantages and disadvantages of smoking before deciding to smoke or not after explaining smoking consequences using memorable educational methods such as video, role play and group discussion. 3) Encouraging pupils to compare the negative emotions that motivate pupils to smoke with the emotional consequences of smoking. 4) Encouraging pupils to set proximal and distal personal-goals (e.g. having a healthy and bright future) then explaining to them how smoking could hinder them from achieving these goals. 5) Enabling pupils to make a conscious decision to avoid smoking and make it as a personal goal. 6) Encouraging pupils' self-confidence in their ability to remain non-smokers. 7) Asking pupils to make a verbal or written commitment to avoid smoking. 8) Encouraging pupils who never smoked pupils to make a conscious voluntary intention to be recognized as role-models and continue non-smoking. 9) Encouraging pupils to consider parents' disapproval of adolescents' smoking and punishments.

Moreover, the included effective SBSPIs considered influencing adolescents' reflex responses and emotional reactions to their desires, needs, urges and wishes (***automatic motivation***) to initiate smoking through the followings: 1) Rewarding never-smoked pupils, and teachers and parents when possible, at least socially through announcing their names in school posters and newsletter as encouraged other pupils to imitate them and remain non-smokers. 2) Encouraging pupils to monitor their emotional reaction and their usage of free time. 3) Discussing different ways of enjoying free time without smoking and providing access to affordable community services to motivate and facilitate pupils' practice of leisure, hobbies and physical activities in order to release their negative emotions and beat boredom.

4.5.5 Long versus short term effect of interventions

In about half (six) of the intervention arms, pupils were followed only for six months after completing the interventions, due to limited resources, which might be a short period for recognizing changes in adolescents' smoking status. The rest of the interventions indicated that pupils' smoking status was reassessed after at least a year, in seven arms, or eight or nine months, in two arms. However, only one-third (four) of the included interventions provided booster-sessions after completing the interventions. Some interventions stated that pupils tend to forget what they have learnt in the intervention after long periods after interventions completion, especially if booster-sessions were not added during the follow-up period. This could explain why some SBSPIs were effective in the short-term (Tahlil et al., 2013b, Marsiglia et al., 2014) but not in the long-term (Tahlil et al., 2015, Marsiglia et al., 2015).

Only three of the included interventions showed long-term effectiveness, i.e. showed a significant reduction in smoking initiation rate in the intervention cohort compared with the controls after at least a year of completing the intervention (Perry et al., 2009, Reddy et al., 2002, Motamedi et al., 2016). All the SBSPIs that showed long-term effectiveness in preventing pupils from smoking initiation in Arabic and/or LMICs included the followings: 1) training pupils on skills required for resisting social pressure to smoke; 2)allowing pupils to practise these skills during the training period; 3) using persuasive and attractive educational-methods (such as pictures, real-life scenarios, in videos or role plays, group discussion or debate) to discuss smoking consequences and reasons not-to-smoke and enable pupils to memorize this information after the interventions; 4) nominating non-smoker pupils as role models; 5) asking pupils to provide voluntary public commitment not-to-smoke; 6) training and encouraging non-smoker pupils to educate their peers informally on smoking consequences of smoking and how to avoid smoking offers and resist social pressure to smoking. Only in two of these interventions (Perry et al., 2009, Motamedi et al., 2016), booster-sessions were delivered after intervention completion.

4.5.6 Focusing only on smoking behaviour

In this review, all the interventions that included components on preventing other substance-use in addition to smoking prevention were ineffective except one (Motamedi et al., 2016). This study aimed to teach pupils a better way of using their free time instead of smoking and substance use in general. The last Cochrane systematic reviews, that included 134 SBSPIs in different countries, concluded that multi-focal interventions, that aimed to prevent smoking together with alcohol and drugs, are less effective, in the long-term, than interventions that focused on smoking prevention alone, even when the same prevention approach and curriculum were used (Thomas et al., 2013).

4.5.7 Barriers to implementing SBSPI in Arabic and/or LMICs

This review identified limited information on the affordability, practicality, acceptability, safety and equitability of contents and approaches used in the included SBSPIs. Based on the available information the followings are barriers of implementing SBSPIs in Arabic and/or LMICs:

- Pupils' reluctance to discuss smoking issues with their teachers;
- Pupils' lack of interest in educational-sessions delivered by teachers when formal educational methods were used;
- Difficulties in providing booster-sessions;
- Difficulties in providing ongoing training for peer-educators;

- Inability to provide support outside schools to minimize pupils' exposure to social pressure to smoke;
- Difficulties in involving parents and community members in smoking-related school-based activities due to their busy schedule at school-time;
- Challenges in enforcing anti-smoking school-policy, especially in case of smoking by teachers and visitors inside school premises;
- The limited financial resources hinder implementing comprehensive interventions over a reasonable period of time in a considerable quality;
- Time-limitation and busy teachers' workload restrict the number of extra-curriculum educational sessions, especially those to be delivered by teachers;
- School limited capacity and resources restrict delivering interactive educational-sessions.

4.5.8 Implications for designing SBSPIs in Egypt

The findings of this review are useful to inform the design of SBSPI for Egypt, which shares the limited resources and some cultural aspects with other Arabic and LMICs. However, before designing this intervention it is essential to collect local information in Egypt on the followings: 1) school resources, capacity and policies; 2) teachers' qualification, their smoking status and their awareness of smoking consequences, available training opportunities for teachers, teachers' activities and responsibilities inside and outside the school curriculum. 3) The centralization versus flexibility of the educational system versus school independence. 4) Local factors that could hinder or facilitate making changes in school activities, curriculum and policy regarding smoking prevention. The above information is needed because these issues are expected to vary among Arabic and LMICs. 5) Additionally, it is important to explore what is acceptable and feasible to be implemented in the Egyptian context using the available school resources and current capacity. Study-3 of this PhD project aims to gain a better understanding of the applicability of this review's findings in the context of Egypt and explore the feasibility, acceptability and barriers of implementing the identified intervention functions and theoretical-domains in Egyptian schools.

4.5.9 Implication for research

This review highlighted the following gaps in the available evidence regarding factors that influence the effectiveness of SBSPIs in Arabic and LMICs, which should be filled by further studies:

More high-quality and long-term RCTs are required for a better understanding of what strategies, intervention functions and theoretical constructs enhance effectiveness on SBSPI in the context of Arabic and/or LMICs. More attention should be paid to measures that reduce selection and detection bias.

Researchers and designers of SBSPI should use standardized methods for defining, measuring, assessing and reporting changes in adolescents' smoking status before and after the interventions. This would allow quantitative synthesis of the findings on the effectiveness of SBSPIs in Arabic and/or LMICs and facilitate comparisons across these interventions. The definitions and methods of the GYTS are recommended to be used in this regard because they are designed to allow global and regional comparison of adolescents' smoking.

For accurate assessment of interventions' effectiveness, it is recommended to measure biochemical markers, at least among a random sample of participants when resources are limited, to cross-validate the result of self-reporting of smoking (Mermelstein et al., 2002). This is to avoid over-reporting or under-reporting of participants' smoking status. As explained in

section **Error! Reference source not found.**, misreporting of adolescents' smoking is influenced by their gender and culture (Valladolid-Lopez et al., 2015, Dietz et al., 2015, Patrick et al., 1994) and their attitude toward smoking (Ng et al., 2006, Mermelstein et al., 2002, Al-sheyab et al., 2016, Arora et al., 2011, Dolcini et al., 1996).

More research is required on how cultural-appropriateness influences the effectiveness of SBSPIs in Arabic and/or LMICs. A meta-analysis of more homogenous RCTs could be conducted to explore the effectiveness of each cultural-appropriateness dimension, strategy and approach.

The review identified that SBSPIs in Arabic and/or LMICs are inadequately theoretically-underpinned; no intervention tested or refined any theory or used theory in tailoring interventions or selecting participants. More evidence is required on the theoretical-underpinning of SBSPIs in Arabic and/or LMICs and how theories may influence the effectiveness of these interventions. This is to allow proper design and replication of effective SBSPIs in similar contexts, as recommended by the MRC guidance on complex-interventions (Craig et al., 2008).

Financial-incentives for non-smokers or punishments of smokers were not used in any of the included SBSPIs. However, it is worth exploring the feasibility, acceptability and effectiveness of using punishments and financial-incentives in SBSPIs to prevent adolescents from smoking initiation in the context of Arabic and/or LMICs. It is also important to analyse the dose-response relationships or cost-effectiveness of using incentives in SBSPIs in different contexts along with exploring what alternative incentives could be used in SBSPIs in LMICs where resources are limited.

The effectiveness of discussing the positive consequences of non-smoking behaviour on the length and quality of peoples' life, social relationships, income and environment alongside the negative consequences of smoking in preventing adolescents from smoking initiation needs more investigation in Arabic and/or LMICs.

Normative-education was used only in four arms, all were ineffective, to correct pupils' overestimation of smoking rates among peers. More RCTs are needed to identify the need for, as well as evaluating the impact of, using normative-education in SBSPIs to prevent smoking initiation by adolescents in Arabic and LMICs. The need for using normative-education in SBSPIs in the Egyptian context will be explored in study-3.

More information should be gathered on barriers, required resources and cost of developing and implementing SBSPIs in Arabic and/or LMICs. Furthermore, evidence on the cost-effectiveness of these interventions is required for fundraising with regard to researching and implementing SBSPIs in Arabic and/or LMICs and thus accelerating the global control of the smoking epidemic.

None of the included intervention used the internet, smartphones and social media although adolescents, utilization of these methods is increasing globally (Park and Calamaro, 2013, Savci and Aysan, 2017). Accordingly, it might be worth exploring the applicability, feasibility, acceptability and effectiveness of these methods in SBSPIs in Arabic and/or LMICs. Some of these issues are explored in study-3 in the Egyptian context.

Furthermore, standardization of key aspects of SBSPIs such as key intervention functions and delivery methods could enable reliable research on intensity and duration of SBSPIs (number, frequency and length of sessions). However, this requires a systematic-review and meta-analysis of the global evidence on SBSPIs in order to identify the effective intervention

functions and theoretical constructs that could be used to prevent adolescents' smoking through schools.

Qualitative studies were not included in this review because of its focus on the effectiveness of SBSPIs in Arabic and/or LMICs. However, another systematic review that includes qualitative studies could help in exploring feasibility, acceptability, barriers and facilitators of SBSPIs in the context of Arabic and/or LMICs. Study-3 of this PhD explores, qualitatively, some of these aspects in the Egyptian context.

To enhance the utilization of findings, the following should be considered in the publication about SBSPIs in Arabic and/or LMICs:

- Better reporting of attrition rates, running attrition analysis and adjustment of findings are required for better explanations of intervention outcomes (Hoffmann et al., 2014) and would help in explaining the effectiveness of SBSPIs in Arabic and/or LMICs.
- For a better understanding of how modelling and peer-led activities influence the effectiveness of SBSPIs in Arabic and/or LMICs more details on the following should be published: type of peer-led activities, frequency, density and attendance of each activity plus the contents and extent of training peers.
- Particular attention should be paid to providing detailed information about the procedures involved for ensuring cultural-appropriateness of the interventions with clear explanations of what has been done or changed if the intervention was imported from another context, how, why and by whom these changes were made. Detailed information should be also provided about the contents, activities and delivery methods, quality of implementing the included interventions, what worked and did not work, why and how. The provision of these details would facilitate replicating the effective interventions and learning from mistakes in ineffective interventions. Publishing more details on interventions' contents and delivery methods or at least storing these details in a publicly accessible database would allow proper data extraction on the behaviour change techniques used in SBSPIs.

4.5.10 Strengths

This systematic review is focused for the first time on SBSPIs that were implemented in Arabic and/or LMICs. It is also the first review that explores smoking prevention interventions using the BCW intervention functions, COM-model and TDF. Other reviews used the BCW in exploring interventions related to smoking cessation and other behaviours not smoking prevention. The strengths of this review are: 1) the comprehensive search of SBSPI in multiple databases and reference lists with no restrictions on publication's date. Only two studies were excluded because of language. So it is unlikely that key trials were missed. 2) The comprehensive exploration of the included studies to identify the intervention functions, theoretical constructs and smoking prevention curriculum that were used in schools to prevent adolescents in Arabic and/or LMICs from smoking initiation. 3) The exploration of approaches, methods, dimension and strategies for cultural appropriateness of SBSPIs in Arabic and/or LMICs, especially those imported from high-income countries. 4) Considering RCTs that targeted never-smoked cohorts at baseline which provided clear indications for intervention effectiveness in preventing smoking initiation by pupils. 5) Contacting authors to obtain more details about the included interventions, double-checking 20% of the included and excluded abstracts and 25% of the included full-text for eligibility and the low disagreement rate among the two reviewers are other strengths of this review.

4.5.11 Limitations

Although this review included the most robust evidence available on SBSPIs in Arabic and LMICs, caution in interpreting the findings of this review is needed because some studies suffered from methodological weaknesses. These weaknesses include: 1) poor reporting of fidelity, cultural- appropriateness and quality of the implementation. 2) High attrition and risk of bias. 3) Incomplete evaluation of effectiveness (no process evaluation). 4) Poor outcome-measures through using different definitions of indicators that measured smoking behaviours. 5) Lack of checking validity and reliability of outcome measures. 6) Problems in statistical analysis such as lack or poor adjustment for confounders and poor accounting for the effects of clustering. 7) Lack or poor cultural- appropriateness and theoretical-underpinning of interventions during the designing, implementation and evaluation process. Below are limitations should be considered when interpreting the findings of this review.

Due to the limited resources available in LMICs to conduct high-quality and long-term interventional RCTs, few school-based RCTs were implemented in LMICs to prevent adolescents' smoking and only 12 studies met the eligibility criteria of this review. This small number of relevant articles could be due to poor skills and experience on publication among researchers and intervention designers in Arabic and/or LMICs and poor connectivity of local journals to the international databases. Other studies related to SBSPIs in LMICs have been identified but many of them are either not RCTs or the follow-up period was shorter than six-months. Other systematic reviews identified a similar gap in the availability of high-quality RCTs about SBSPIs in LMICs (Nishio et al., 2018, Thomas et al., 2013, Caan et al., 2015, Brown et al., 2014, Hale et al., 2014, MacArthur et al., 2016, Langford et al., 2015). Less than five of the RCTs that were eligible for inclusion in other systematic reviews on SBSPIs were implemented in LMICs (Thomas et al., 2015, Wiehe et al., 2005, Shackleton et al., 2016b, Uthman et al., 2009, Thomas, 2002, Thomas and Perera, 2006, de Kleijn et al., 2015, Langford et al., 2014). The common limitations in RCTs on SBSPIs in LMICs that caused exclusion from pervious systematic reviews are the performance bias, pupils' attrition, poor-reporting of findings and short follow-up periods. limited financial and human resources in LMICs are recognized as important barriers of implementing long-term high-quality RCTs related to SBSPIs (Brown et al., 2014, Kreuter et al., 2016, Tahlil et al., 2015), especially when peer-education was used (Thomas et al., 2013).

Self-reporting of smoking status was the only method used for assessing outcomes of all the included interventions. Self-reporting is considered as a valid and stable indicator for assessing smoking status in many contexts (Wills and Cleary, 1997, Bauman and Koch, 1983). However, as explained in section 3.5.2, the alignment between saliva cotinine levels and self reporting of smoking among adolescents, which reflect the sensitivity and specificity of self-reporting, varies across culture, sex and age (Dolcini et al., 1996). In some contexts, young people and females might under-report their smoking status because their smoking is culturally unacceptable (Valladolid-Lopez et al., 2015, Dietz et al., 2015, Patrick et al., 1994). In other context, adolescents might over-report their smoking behaviour because they consider smokers are mature, cool and impressive people (Ng et al., 2006, Mermelstein et al., 2002, Al-sheyab et al., 2016, Arora et al., 2011, Dolcini et al., 1996). Accordingly, using self-reporting alone to assess outcomes of SBSPIs might misestimate interventions' effectiveness because there is a possibility that participants over-reported or under-reported their smoking status (Mermelstein et al., 2002). Limited financial-resources often hinder using biochemical measures in assessing interventions' outcomes in LMICs, as many designers of SBSPIs indicated

(Flay, 2009, Georgie et al., 2016, Peirson et al., 2016, Thomas et al., 2013, Reddy et al., 2002, Wen et al., 2010).

The assessment of the risk of bias suggested that all the included SBSPIs might have a risk of selection or detection bias due to poor reporting of information on blinding participants and deliverers. There is a considerable chance that the findings of the included studies have been influenced by these biases since changes in smoking status before and after interventions were measured through self-reporting only.

Poor reporting of attrition rates in about a half (five) of the included trials and the high risk of attrition bias that was reported in another third (four) of the included studies were other limitations of this review. The high attrition rate in one of the arms indicates poor comparability (in term of outcome) between these groups after the intervention even if they were comparable before the intervention started; it also reduces findings' representativeness of the participants at the beginning of the intervention (Moher et al., 2010). Running attrition analysis and adjustment of findings clarifies and minimizes, respectively, bias due to attrition (Higgins and Green, 2008). Attrition analysis was reported in less than half (7/16) of the include arms, see section 4.4.4. Better reporting of attrition rates, running attrition analysis and adjustment of findings are required for better explanations of interventions outcomes (Hoffmann et al., 2014) and would have helped in better explanations of the effectiveness of the included SBSPIs.

Some SBSPIs were only focused on males, especially those implemented in the Arabic context (Mohammed et al., 2016). Less attention was given to explaining the gender difference in the effectiveness of SBSPIs as findings were not always disaggregated by gender. Disaggregating findings on interventions' effectiveness by gender facilitates understanding what needs to be considered in SBSPIs to prevent both male and female adolescents from smoking initiation and if the same or different interventions are needed for both gender. Study-3 explores gender-differences that need to be considered in SBSPI in the Egyptian context.

Most of the included interventions mentioned that the control group received the regular school curriculum without explaining the contents of the regular curriculum in relation to smoking prevention. Therefore, it was difficult to identify if there was enough contrast between what the intervention and control cohorts received in the included SBSPIs.

Limited information is available on the duration of implementing activities, specified only in 50% of the included arms, plus barriers, facilitators, affordability, practicality, acceptability, safety and equitability of the contents and approaches that were used in the included interventions.

The heterogeneity of the included interventions, in term of contents, context, and defining, measuring and reporting changes in adolescents' smoking behaviour restricted considering the identified studies as a cohesive group which, together with the small number of the included articles, did not allow quantitative synthesis of the findings of this review.

Limited information is available on the cultural-appropriateness of the included interventions and how well the proposed interventions were implemented in real-life and if adherence to the designed intervention (fidelity) was maintained or not. Less than half (five) of the included interventions explained fidelity but explanations of why some activities were not implemented as planned were limited in these studies. For different reasons, changes could be introduced to an intervention or parts of it which affect fidelity. Assessing fidelity, by explaining the extent of delivering interventions as planned, and assessing quality of interventions implementation,

through process evaluation, helps in explaining findings, minimizes errors in interpreting interventions' effectiveness and informs cultural-adaptation and future modification of interventions to be implemented in similar or different context (Hoffmann et al., 2014). Maintaining fidelity helps in assessing interventions contents are effective in achieving the desired outcome or not while poor fidelity indicates infeasibility or (cultural or political) unacceptability of the proposed interventions and could suggest further modification and cultural-adaptation of the proposed interventions, especially complex-intervention such as SBSPI, to enhance its effectiveness in the targeted population (Moore et al., 2015). Poor reporting of cultural appropriateness /adaptation, fidelity and quality of the implemented interventions is an important limitation in this review as it hinders understanding why some intervention functions and theoretical constructs are effective in preventing adolescents' smoking through schools in some context and ineffective in another context. Further details on fidelity and quality of the included interventions could have enhanced understanding of this issue within the context of Arabic and/or LMICs.

Due to time and resources constrains additional systematic search for eligible articles has not been conducted since the last update in November 2019. However, auto-alerts from PsycINFO, Medline, Pub-med and Global health (Ovid) suggest that no additional studies have been published on SBSPIs in Arabic and LMICs.

4.6 Conclusion

Table 15 summarises the main conclusion of this review about the key approach and strategies that were used only in the effective SBSPIs in Arabic and/or LMICs to enhance the capability, opportunities and motivations of pupils to avoid smoking.

Table 15 key COM-B Component that were used only in the effective SBSPIs in Arabic and/or LMICs

COM-B Component	Key components that were used only in the effective SBSPIs in Arabic and/or LMICs
Psychological capability	- Raising pupils' awareness of the social, environmental and mental consequences of smoking in addition to the health consequences of smoking. - Clarifying how smoking could lead to addiction. - Educating pupils about the negative emotions that motivate pupils to smoke. - Ensuring pupils' high exposure and accessibility to information on smoking consequences inside schools. - Improving pupils' skills and ability to avoid smoking and resist smoking offers through training courses that explain how to perform these skills, allow pupils to practice these skills, obtain feedback on their performance and discuss ways to improve their skills. - Informing pupils on the social and environmental situations and events that predict smoking and advising pupils how to recognize and analyse direct and indirect pressure to smoke from peers, family, advertisements and adults. - Supporting and training pupils to monitor their emotional reactions, manage and cope with anger, stress, anxiety and depression. - Building pupils' confidence in their ability to have a healthy future and win sports-competitions by maintaining non-smoking behaviour.
	- Establishing and enforcing antismoking school-policies that restrict smoking, by pupils, teachers, parents and visitors inside school premises.

Physical opportunity	- Encouraging community members, when possible, to enhance and enforce the national anti-smoking policy.
Social opportunity	- Increasing pupils' exposure to non-smoking role models at schools. - Drawing pupils' attention to important people in their society who never smoked. - Using non-smokers in anti-smoking educations and training (e.g.in roleplays, pictures and videos) - Repeatedly presenting smokers and tobacco products in disliked images, (through roleplays, pictures or posters). - Encouraging pupils who never smoked to identify themselves as role models and encourage them to share their experiences of avoiding smoking with their peers to be imitated. - Encouraging and empowering pupils who never smoked to take an active role in convincing their peers, relatives and friends to avoid smoking, inside, and if possible outside, schools. - Using peer-pressure to enhance positive attitudes toward non-smoking behaviour. - Training socially active volunteers of pupils who never smoked pupils and enable them to provide peers consultation on how to avoid smoking and ways for attracting others without self-harm - Encouraging pupils to obtain consultations and social support from their parents, friends or teachers to avoid smoking initiation. - Allowing pupils to practice peer-education skills over a reasonable period in the presence of professionals.
Reflective motivation	- Explaining the pros and cons of smoking and non-smoking. - Encouraging pupils to think about the advantages and disadvantages of smoking before deciding to smoke or not after explaining smoking consequences using memorable educational methods such as video, role-play and discussion. - Encouraging pupils to compare the negative emotions that motivate pupils to smoke with the emotional impact of smoking. - Encouraging pupils to set proximal and distal personal-goals then discussing how smoking could hinder them from achieving these goals. - Enabling pupils to make a conscious decision to avoid smoking and make it a personal goal. - Encouraging pupils' self-confidence in their ability to avoid smoking. - Asking pupils to make a verbal or written commitment to avoid smoking. - Encouraging pupils who never smoked to make a conscious voluntary decision to be recognized as role models and to continue in avoiding smoking. - Encouraging pupils to consider parents' disapproval of smoking and punishments.
Automatic motivation	- Rewarding pupils, and where possible teachers and parents, who never smoked, at least socially through announcing their names in school posters and newsletter to encourage other pupils to imitate them and remain non-smokers. - Encouraging pupils to monitor their reactions to emotions and usage of free time. - Discussing options for enjoying free time without smoking, providing access to affordable community services to motivate and facilitate pupils' practice of leisure, hobbies and physical activities in order to release their negative emotions and beat boredom

4.7 Chapter summary

This chapter discussed the aim, objectives, methods and findings of study-2 of this PhD project which is a systematic review of SBSPIs that were implemented in Arabic and/or LMICs. The review was concluded by identifying issues that should be considered in order to enhance the effectiveness of SBSPIs in enhancing pupils' capability, motivation and opportunities to avoid smoking initiation in Arabic and/LMICs. Study-3 of this PhD explores the current and anticipated SBSPIs in Egypt through a qualitative exploratory study in preparatory schools at Upper-Egypt. The next chapter justifies the need for this study, introduces its aim and objectives and discusses the used methods.

Chapter 5 - An Exploratory Qualitative Study in Upper-Egypt (Study-3 Part A)

5.1 Introduction

The previous chapter discussed study-2 which systematically reviewed School-Based Smoking Prevention Interventions (SBSPIs) in Arabic and/or Low and Middle income countries (LMICs) and identified issues influenced the effectiveness of these interventions. Study-2 concluded that cultural appropriateness of contents, approaches and delivery methods is a key influencer of the effectiveness of SBSPIs in Arabic and/or LMICs. There is limited evidence on the current SBSPIs in Egypt, as explained in section 1.5. Understanding the current interventions in place and what other acceptable and affordable activities could be implemented within the available resources is a key step in designing culturally-sensitive interventions (Kreuter et al., 2003, Hecht and Krieger, 2006). Whereas poor understanding of these issues threatens the intervention effectiveness, acceptability and sustainability, even if a similar intervention was effective in another context (Castro et al., 2010, Castro et al., 2004, Colby et al., 2013). Accordingly, study-3 was conducted to explore the current and anticipated roles of schools in preventing adolescents from smoking initiation in Egypt with an overall goal of providing cultural grounding for SBSPIs in Egypt. An exploratory, qualitative approach was used to address the aim, objectives and specific questions of study-3. The study was conducted in Assiut city in Upper-Egypt because Upper-Egypt has the highest prevalence of adolescents' smoking in Egypt (WHO and CDC, 2009b), see section 1.4. Three preparatory schools were included in this study – a boys', girls' and mixed-gender preparatory school. This chapter outlines the aim, research questions and objectives of this study and explains the research methods used to achieve these objectives whereas the results will be discussed in the three following chapters.

5.2 Aim and objectives

This study aims to understand adolescents and school-staff perception of the current and anticipated role, and capacity, of preparatory schools in preventing adolescents in Upper-Egypt from smoking initiation to contribute, through making recommendations, towards designing a culturally-sensitive school-based intervention to prevent smoking initiation by adolescents in Egypt. The main research question, corresponding to the study aim is:

> *How preparatory schools could play a better role to prevent adolescents in Egypt from smoking initiation?*

The study aim is achieved through addressing the following specific objectives and answering the corresponding specific-research questions, which are presented in Table 16. The research objectives and questions were developed according to the COM-B model of the BCW, explained in section 2.3.1.

Table 16 The research objectives and corresponding specific questions

Research Objectives	Research Questions
1. To identify and assess the current role of preparatory schools in Upper-Egypt in preventing adolescents from smoking initiation;	- What information is included in the formal school curriculum about smoking? - What are the existing school policies on smoking prevention? - What educational activities (curricular and extracurricular) are implemented in preparatory schools in Upper-Egypt to prevent adolescents from smoking initiation?
2. To explore the perspective of school staff and pupils about key elements, activities and delivery methods that can be implemented in preparatory schools in Upper-Egypt to enhance adolescents' capability, opportunities and motivation to avoid smoking initiation;	- In what way can preparatory schools role in preventing adolescents in Upper-Egypt from smoking initiation be improved? - How preparatory schools in Upper-Egypt can enhance pupils' capability and motivation to avoid smoking? - What could be implemented in preparatory schools in Upper-Egypt to reduce physical and social opportunities for pupils to initiate smoking? - Who could be the feasible, acceptable and sustainable key implementers of school-based smoking prevention interventions, from the perspective of pupils and school-staff in Upper-Egypt?
3. To identify the potential barriers and facilitators of implementing school-based smoking prevention interventions in the preparatory schools of Upper-Egypt, from the perspective of school staff and pupils.	- What factors do staff and pupils attending preparatory schools in Upper-Egypt believe to hinder the implementation of smoking prevention interventions in their school? - What factors do staff and pupils attending preparatory schools in Upper-Egypt believe to facilitate the implementation of smoking prevention interventions in their school'?

5.3 Research methods

A pragmatic qualitative approach of inquiry was used to address the aim, objectives and specific questions of this study. The study was conducted in three – a girls', boys' and mixed-gender - preparatory schools in Assiut city, Upper-Egypt. Assiut was selected as a study location as it met the key criteria which are discussed in section 5.3.3. Data collection included semi-structured interviews with school-staff, written essay and focus group discussions (FGDs) with pupils and a review of school-documents. This section discusses the research methodology, data collection and recruitments methods and data analysis, in addition to ethical considerations.

5.3.1 Research methodology

This section explains the potential approaches and methodologies for addressing the research questions in Table 16, and justification for selecting or excluding each of these approaches.

There are two main approaches to research: quantitative and qualitative. there are conceptual differences between the two approaches in aspiration, philosophy, inquiry approach, conceptual approach, researcher position and sampling strategy (Patton, 2015a). The mixed-methods approach comprises elements of both quantitative and qualitative approaches (Morgan, 2014).

Qualitative approach was adopted in this study as it is best suited to research individuals' attitude toward problems that are related to wider social, cultural and economic contexts; understand people's experiences in controlling these problems; elucidating the local context and peoples' perception of how things work, and should be managed, in their context; and Identify unanticipated consequences and barriers of a particular intervention (Patton, 2015a). Using qualitative approach to answer questions on `how things work or could work differently and why` provides a deep-understanding of the acceptable and feasible solutions for a complex problem (such as adolescents' smoking) and reasons behind various issues associated with this problem (Bowling, 2014). Although collecting qualitative data consumes time and doesn't aim to generalize findings (Green and Thorogood, 2014), it is essential to inform the development of health interventions (Bowling, 2014), particularly behaviour-change interventions where the local context should be well-understood and considered at early stages of designing these interventions to enhance the effectiveness (Green et al., 2015).

The quantitative research approach assumes there is an independent reality, therefore, measures previously identified issues that may be unrelated to the local-context through hypothesis-testing design (Kumar, 2011, Golafshani, 2003, Bahari, 2010). While quantitative researchers aim to identify associations and possible causal determination and generalize their findings; qualitative researchers aim to illuminate, understand and explore similar situations in relation to the targeted-context (Patton, 2015a, Creswell, 2013). Study-1 identified the available evidence of factors that influence adolescents' smoking in Egypt. However, it is unclear how these predictors could be addressed through schools in the Egyptian context to prevent adolescents' smoking. Study-2 identified issues that influence the effectiveness of SBSPIs in Arabic and/or LMICs but there is a need to explore these issues in the Egyptian context to enhance the feasibility and acceptability of the recommendations for designing SBSPI in the Egyptian context. Qualitative approaches are suitable for explaining the above issues which this thesis aims to achieve. Conducting a survey in a representative sample of schools would not allow in-depth exploration of schools role in smoking prevention, especially because the current role of Egyptian schools has not been investigated in the available literature. A quantitative approach could be used after developing SBSPI to test its effectiveness because it quantifies changes caused by interventions and mostly aims to generalise findings (Bowling, 2014).

Based on the above considerations, qualitative research methods were used in this study to address the research questions.

Different approaches to qualitative inquiries are explained in the literature, but some of these approaches are overlapping (Lincoln et al., 2011, Creswell, 2013).

A pragmatic qualitative approach of inquiry is suitable for understanding "what are the practical consequences and useful applications of what we can learn about the [researched]

issue" (Patton, 2015b. p.99). A pragmatic approach focuses the inquiry on obtaining useful and practical answers that could solve or provide direction in addressing the investigated problem, therefore it is suitable in designing interventions. The pragmatic approach informs the qualitative inquire through asking practical questions; searching for actionable answers; making pragmatic decisions during the inquiry which allow adapting the study design to real-world constraints of time and resources limitation rather than adherence to a fixed design or theoretical inquiry tradition (Creswell, 2013, Patton, 2015b). Although the pragmatic approach allows adapting the study design to actual challenges of conducting health research, such as resources, time, data-accessibility and political constraints, it encourages acknowledging these limitations and discussing their implications for findings (Bamberger et al., 2019, Patton, 2015b). A pragmatic inquirer is encouraged to be creative and practical in adapting the inquiry to fit the complexity of a particular fieldwork situation using diverse data collection methods (Denzin and Lincoln, 2011). According to the above, a pragmatic qualitative approach of inquiry was considered appropriate for understanding how the influencers of adolescents' smoking could be addressed in real-life school setting toward smoking prevention. This approach would reveal opportunities for exploring practical schools strategies and approaches for enhancing pupils' capability, motivation and opportunities to avoid smoking initiation. Although the pragmatic approach of inquiry could involve quantitative and qualitative data collection method (Morgan, 2014), only qualitative data collection methods were used in this study as quantitative methods considered inappropriate for addressing the research questions as discussed above.

A case study approach was initially considered for this study as it allows "in-depth and multi-faceted explorations of complex issues in their real-life settings" (Crowe et al., 2011, p.1) and understanding how particular changes could be made in a social setting as it reveals opportunities and complexities of the targeted tissue in a given setting (Yin, 2014, Gerring, 2017). The case-study approach requires in-depth explorations of one or few cases. If more than one case used, findings across cases should be compared and contrasted to achieve the goal of the case-study approach (Simons, 2009, Tight, 2017, Swanborn, 2010). However, not many differences between the involved schools were identified. Accordingly, studying schools as separate bounded cases and then comparing and contrasting findings across them was no longer seem a sensible approach. Therefore, this approach was not used in this study.

Other qualitative approaches have been suggested but considered inappropriate for this study either because they require time longer than the study's timeframe (ethnography) or because of their focus on one side of the context such as culture (ethnography) or individual's emotion and feeling (phenomenology and narrative) (Creswell, 2013, Patton, 2015b).

Based on the above considerations, the study objectives and research questions were addressed using a pragmatic qualitative approach of inquiry.

5.3.2 Study Site

The research was conducted in Upper-Egypt, specifically in Assiut city. Upper-Egypt was selected for the study location because it is a good representation of the entire country due to the following: 1) 36.7% of Egyptian young people (aged 15-35) reside there (Population Council, 2015); 2) Upper-Egypt has the highest smoking rate among Egyptian adolescents', aged 13-15 (WHO and CDC, 2009b). 3) More than half of ever daily-smoker adults in Upper-Egypt initiate the daily smoking habit before the age of 17 with minor differences between rural (63.1%, 95%CI= 4.7- 80.3) and urban areas (66.9%, 95% CI=51.9-75.8) (MOHP et al., 2009). 4) Upper-Egypt has the highest poverty rate in Egypt (29.4% in urban Upper-Egypt and 51.1% in rural Upper-Egypt) (CAPMS, 2014). Assiut governorate, located in Upper-Egypt, has

the highest poverty rate in Egypt over years (WFP, 2013), a rate of 66% compared with the national poverty rate of 27.8% in 2017 (WB, 2018, UNFPA et al., 2018) . Assiut city, the main city in Assiut governorate, was selected as a location for this study conserving the following criteria:

- The young people demography is similar to Egypt demography, 30% of the population below the age of 15 years, males are 51.2% of them (Population Council, 2015). This similarity would enhance transferability of the study findings, as recommended by Denscombe (2014).
- The religious demography of the city includes both Muslims and the second largest proportion of Christians in Egypt, 20.7% of the population (Pontificio, 2007). This would allow exploring the influence of religious values on smoking prevention.
- The availability of evidence on adolescents' smoking. In Assiut city, a study (of a random sample of 840 students in two out of five public and two out of five technical secondary schools randomly selected) showed that: 51.2% and 30% of male smokers in secondary school have been smoking for more than three years and smoke more than 16 cigarettes per day respectively (Ibrahim and Ahmed, 2006).
- The similarity in preparatory school types, curriculum and average capacity between Assiut and other Egyptian governorates (CAPMS, 2017).

Furthermore, Assiut is a safe and politically stable city, and includes a research-active university agreed to facilitate the data collection process; this ensured the researcher's safety.

5.3.3 Schools selection criteria

A small sample of particular cases is usually explored in detail in qualitative studies to illuminate the general (Denscombe, 2014). Therefore, three preparatory schools were included in this study – a Girls', boys' and mixed-gender preparatory-school. This section justifies the school selection criteria.

Preparatory schools were selected because the GSHS shows that most (89.4% CI= 79.3 -94.9) adolescents, aged 13-15, who ever-smoked cigarettes tried a cigarette before age of 14 years (MOHP et al., 2011). Egyptian pupils start the preparatory school-education at the age of 12 and finish it before completing 15 years old (UNICEF, 2014). Most effective SBSPIs target pupils shortly before the mean age of smoking initiation in order to remain proximal to the age of the first experimentation of smoking (Gee et al., 2016). The national mean age of initiating *daily* smoking in Egypt is 16.8 years old (MOHP et al., 2009). However, the mean age of trying smoking (including irregular) is not explicitly reported in the identified national studies. Evidence from other contexts indicates that adolescents experiment smoking for a few years before becoming regular-smokers (Wellman et al., 2016). So pupils in the first and second grades (aged 12-13) of preparatory-schools are appropriate targets for SBSPIs. According to the above, preparatory-schools are considered as information-rich cases for exploring the current and anticipated role of these schools in preventing adolescents' smoking and thus were selected in this research.

Both males and females were included in this study because being a male is a predictor of adolescents' smoking (Islam and Johnson, 2005, Harbour, 2011) and female adolescents' smoking rate is increasing (El-Awa et al., 2013) in Egypt, as study-1 concluded. Accordingly, both boys and girls should be targeted by SBSPI; thus both were included in this study to identify any gender differences that should be considered in SBSPI in Egypt. In Egypt, girls and boys may be separated in preparatory-schools, especially in conservative families (CAPMS, 2017, Ghoneim et al., 2014). Consequently, three schools were selected a boys', girls' and

mixed-gender school. This is to allow in-depth and multi-faceted explorations of the perception of pupils and school-staff toward implementing SBSPI and researching experiences on how and why things work or could work differently within a school setting that includes pupils of the same or different gender. It was not feasible to include more than three schools within the study's timeframe and resources.

Three out of the 71, one out of each of the 39 mixed-gender, 17 girls and 15 boys, public preparatory-schools in Assiut city that are listed on the Ministry of Education Website (MOE, 2016) were selected in a purposeful manner. Purposeful sampling was selected because it has twofold goals: " to make sure one has adequately understood the variation in the phenomena of interest in the setting, and to test developing ideas about that setting by selecting phenomena that are crucial to the validity of those ideas", as Maxwell stated (1992, p. 293). According to Patton, "the logic and power of purposeful sampling lie in selecting information-rich cases for in-depth study [... which] yields insights and in-depth understanding" of the problem of interest (2015, p. 264).

To enhance the transferability of qualitative research findings, it is recommended to select exemplary cases and consider criteria for selecting samples, including purposive samples (Green and Thorogood, 2014). In order to restrict the differences between the selected schools and the rest of preparatory-schools in Upper-Egypt, a school had to meet the following eligibility criteria to be included: (1) a public-school because 92% of the Egyptian pupils are enrolled in public-schools (CAPMS, 2017) which provide free education (Ghoneim et al., 2014). (2) Includes preparatory grades only similar to the majority of Egyptian schools (MOE, 2017). (3) An average size school compared with the other schools in Upper-Egypt (not too small or too large)[1]. The following schools were excluded: (1) private-schools, language-schools, faith-based schools and National Institutions schools because they target minorities (CAPMS, 2017). (2) Schools that combine primary or secondary grades with preparatory grades because this is unusual in Egyptian schools (CAPMS, 2017, MOE, 2016). Also, schools with expanded age groups may have different predictors of smoking and therefore need different considerations in interventions.

The names of all preparatory-schools in Assiut and their contact details were obtained from the Ministry of Education Website (MOE, 2016). Then schools were contacted by phone to identify those that fulfill the above criteria and explore schools willingness to take part in the study. All schools that met the eligibility criteria and were responsive and willing to take part were selected for inclusion and listed by sex (boys, girls and mixed-gender schools). Thereafter, a convenient sample of schools was selected, one from each category, after gathering further information on these schools from the Community Medicine Department at Assiut University, which hosted the researcher during data collection. Thereafter, head-teachers of the identified schools were contacted, by phone first then in person, in order to discuss the study, purpose and method, and obtain formal permission to conduct the study in the school. All the three schools were responsive and willing to work with the researcher in this study and therefore, were selected.

[1] Decisions were based on the host's advice as there is no clear specification of school size.

5.3.4 Methods of recruitment within schools

Once schools were selected and access was granted, the methods explained below were used to recruit staff and pupils in each school. In total 40 staff and 76 pupils, divided into 16 groups eight for each sex, participated in this study. The staff and pupil participants were selected purposively because purposeful sampling allows selecting information-rich cases for in-depth study and understanding of the problem of interest (Patton, 2015). The boys' school was visited first then the mixed-gender school followed by the girls' school. In each school, staff were recruited before pupils. However, the researcher interchangeably interviewed school-staff and pupils and move between the three schools during the fieldwork to check the applicability of the identified findings to the three schools.

5.3.4.1 Staff participants

It is important to ensure that the informants are willing and able to provide the required information, in order to gain privileged information from interviewing them (DiCicco-Bloom and Crabtree, 2006). Staff who had a role related, directly or indirectly, to preventing smoking in schools were interviewed in each school. Roles included: head-teachers and their deputies; organizers of informal school activities; schools psychologists and social workers who are responsible for resolving problems related to pupils' behaviour, including smoking; and teachers of first and second preparatory grades, especially those who teach sciences and religions subjects and those nominated by pupils as popular teachers; those who organize and deliver health education activities. Teachers of sciences and, Islam and Christianity, religions were interviewed because biological smoking hazards are science-related topics and the religious prohibition of smoking is related to religious lessons. As recommended by Harrell and Bradley (2009) and DiCicco-Bloom and Crabtree (2006), these informants were selected purposively because their role is key in smoking prevention at schools which is important to inform this study. After mapping the list and job descriptions of school-staff, an initial list of respondents was developed then the snowball technique was used during data collection to identify further respondents by asking, staff and pupils, interviewees to recommend additional key-informants. See section 6.2.1 for the number and characteristics of staff participants.

5.3.4.2 Pupil participants

Adolescents' voice is routinely ignored or misunderstood by adults, especially in LMICs, although considering adolescents' views is crucial for changing their behaviour

(Jessor, 2017a). Involving adolescents in designing substance-use prevention interventions is associated with the effectiveness of these interventions (Wagner and Waldron, 2001, Wanger et al., 2001). School pupils are vulnerable individuals, however gathering pupils' perspective is more accurate and a better method of enhancing behaviour change than using parents opinions or teachers perspective alone, especially at adolescence age when individuals start to develop their personal opinion (Jessor, 2017a, Wagner and Waldron, 2001, Wanger et al., 2001, Jessor, 2017b). As this study is working toward designing SBSPI in Egypt, it was crucial to interview adolescents to explore their views on school role in preventing smoking initiation by adolescents. Pupils from the first and second preparatory grades were researched using FGDs. These grades were selected because: 1) they include pupils aged 11 to 13 years (UNICEF, 2014). 2) A national surveys showed that most (89.4% CI= 79.3 -94.9) adolescents, aged 13-15, who ever-smoked cigarettes tried a cigarette before the age of 14 years (MOHP et al., 2011). 3) Most effective SBSPIs target pupils shortly before the mean age of smoking initiation in order to remain proximal to the age of first experimentation of smoking (Gee et al., 2016, Onrust et al., 2016). See section 5.3.6.3 for the methods used in researching pupil participants.

In order to allow in-depth exploration of the research questions in few FGDs with a good quality and less disturbance of other school learning activities (Gallagher, 2009a) (Morgan et al., 2002), two groups of pupils from each of the first and second preparatory grade, a total of four groups, were selected in each single-gender school. In the mixed-gender school, eight groups of pupils were selected as two separate groups of each sex were chosen from each of the first and second preparatory grades. Mixed-gender groups were not considered in this study because of the following: 1) boys and girls sit in separate classes and do not usually meet inside schools even in the mixed-gender school as confirmed by the head-teachers and observed during the fieldwork. 2) It is culturally unacceptable for male and female pupils in Egypt to sit together in groups inside schools (Bhutta, 2002, Silverman et al., 2007). 3) Egyptian adolescents' smoking is influenced by sex (MOHP, 2015, WHO and CDC, 2014b), see section 3.4.1.2. Therefore, discussing smoking-related issues in mixed-gender groups make adolescents feel uncomfortable and may exaggerate, especially boys, or hide, especially girls, their real opinion (Alderson and Morrow, 2004, Cash R. et al., 2009)

It is recommended to minimize participants' number in FGDs, a maximum of five in case of young participants (Horner, 2000, Gibson, 2007), to give opportunities for all participants to contribute sufficiently during the discussion (Krueger and Casey, 2014). Large groups limit participants' opportunities to discuss their views sufficiently and can be difficult to manage by the researcher while small group leads to limited discussions (Gill et al., 2008). Consequently, a minimum of four and a maximum of five participants in each FGD was considered appropriate in this study. See section 6.2.2 for participants characteristics

Class-teachers and social workers[2] were consulted in recruiting a purposive sample of pupils to ensure involving a range of boys and girls from each of the selection criteria (Krueger and Casey, 2014, Morgan et al., 2002). Considering criteria in selecting a purposive sample of participants enrich qualitative study findings and reduce selection bias (Patton, 2015a, Golafshani, 2003). The following criteria were considered in selecting boys and girls participants because they may influence adolescents' perspective on smoking prevention at schools: high, average and low school performance level; class-leaders, popular and socially active pupils as well as average, shy and quiet pupils; pupils with recognized smoking behaviour; pupils from known smoking and non-smoking families. Pupils were not asked directly about their or their parents smoking status. Alternately teachers' knowledge of pupils' and parents' smoking status was used to inform the selection process. Using teachers' knowledge to inform the recruitment of FGD participants may have introduced selection bias (Gibson, 2007). In order to minimize this selection bias, the recruitment process was not limited to one teacher and it involved teachers from both gender and different specialities who play different roles at school, as recommended by (Krefting, 1991) and (Golafshani, 2003). Teachers were encouraged to obtain pupils' suggestions on who could participate in FGDs during the recruitment process, as this is recommended to reduce selection bias (Gallagher, 2009a). Accordingly many of the FGDs participants were also suggested by their classmates.

Homogeneity of FGD participants minimizes the impact of peer-pressure on group discussion (Gibson, 2007, Krueger and Casey, 2014). Therefore, the homogeneity of participants in each group was considered in consultation with class-teachers and social workers who know pupils well. For example, the leaders, commanding and rebellious pupils in each grade were in separate groups to minimize their dominance of discussion over other pupils. The researcher explained the recruitment criteria and their importance in informing pupils' discussion to class-

[2] They are usually consulted first in any pupils' problems, so they know most pupils in their school

teachers and social workers who then used these criteria to select and list participants in each group, but without labeling pupils or informing the researcher which participant fits which criterion.

The nominated pupils in each group were invited to preparatory sessions which aimed at: 1) introducing the study; 2) distributing the information sheets and consents forms; 3) testing groups' dynamic. Section 5.3.8 explains the ethics considered in recruiting pupils.

5.3.5 Sample size and saturation

In qualitative studies, the number of participants is mainly determined by reaching data saturation rather than a specified sample size. The saturation happens when enough information is collected, no additional new information has been attained and further coding [information] is no longer feasible (Fusch and Ness, 2015). However, the concept of saturation has been criticized in the literature because it is difficult to prove reaching saturation and many qualitative research reports indicate achieving saturation without clear descriptions of how it was achieved (Bowen, 2008). Also, Guest et al. (2006) argue that saturation is a `matter of degree` as always there will be new ideas to emerge in qualitative research. Accordingly, it was suggested to stop data collection when the new ideas do not add anything to the overall story or framework, to avoid collecting excess of data that become hard to manage (Ritchie et al., 2003). Malterud et al. (2016) P.1 suggested the information power to guide sample size identification in qualitative studies; this depends on "the broadness of study aim, sample specificity, use of established theory, quality of dialogue, and analysis strategy". Ritchie et al. (2003) p.84 identified seven factors that influence determining sample size in qualitative studies:

> "the heterogeneity of the population; the number of selection criteria; the extent to which 'nesting' of criteria is needed; groups of special interest that require intensive study; multiple samples within one study; types of data collection methods use; and the budget and resources available".

Fewer participants are needed to achieve saturation when multiple data collection methods were used and key informants were selected using criteria (Guest et al., 2006, Mason, 2010).

The followings were considered to determine the number of participants and FGDs in this study: 1) recruiting participants based on criteria that bring different perspectives to the collected data, see section 5.3.45.3.4; 2) reviewing the sample size used in other studies on similar topics; 3) reviewing the literature on the number of FGDs conducted in studies about behaviour change interventions in specific settings. This review concluded that a minimum of three FGDs in each study site is needed for obtaining multiple perspectives on behaviour change interventions (Glanz et al., 2008, Atkins et al., 2017); especially with resource limitations (Mason, 2010, Krueger and Casey, 2014). Section 6.2 explains the exact number of participants and data sources included in this study.

5.3.6 Data collection methods

A pragmatic approach usually uses multiple data collection methods to get diverse perspectives on the investigated problem acknowledging that each method has strengths and weaknesses (Patton, 2015b). Using multiple sources of information in qualitative research enhance rigour and allows different insights to the study on the investigated phenomenon (Mays and Pope, 1995, Krefting, 1991, Padgett, 2012, Flick et al., 2004). While laying on one source of data might be insufficient to understand complex issues (Flick, 2018, Greene, 2007, Barbour, 2001) such as adolescents' smoking prevention. A pragmatic researcher is encouraged to be creative which includes identifying alternative and emergent data collection methods even during the fieldwork (Lincoln et al., 2011). Accordingly, multiple data collection

methods were used in this study in order to develop an in-depth understanding of smoking prevention in schools of upper-Egypt. The data collection methods used and the data sources they produced are summarised in Table 17.

Table 17: Summary of data sources

Methods	Source of information	Data used in the analysis
Semi-Structured Interviews	School-staff	40 transcripts
Focused group discussion using cards and discussion of Pictures	Pupils	16 transcripts and 76 individual cards 40 pictures used in developing three schools posters
Story making	Pupils	20 individual written stories
Reflective field notes	The researcher	Reflective notes after each interview (40) and FGD (16)
Documents Review	- School's curriculum of 1st and 2nd preparatory grades - School policy documents - School activities documents - Smoking prevention manuals	172 documents

Each method was selected due to its appropriateness in achieving the research objectives, the aim and justification of using each of these methods are discussed in details below. The data collection methods used to address each of the research objectives are illustrated in Table 18.

Table 18 Data collection methods and the corresponding research objectives

Research Objectives	Data collection methods
1. To identify and assess the current role of preparatory schools in Upper-Egypt in preventing adolescents from smoking initiation;	- Documents Review. - Semi-Structured Interviews with staff - Focused group discussion with pupils - Reflective field notes
2. To explore the perspective of school staff and pupils about key elements, activities and delivery methods that can be implemented in preparatory schools in Upper-Egypt to enhance adolescents' capability, opportunities and motivation to avoid smoking initiation;	- Semi-Structured Interviews with staff - Focused group discussion with pupils using cards, discussion of pictures and individual story writing.
3. To identify the potential barriers and facilitators of implementing SBSPIs.	- Semi-Structured Interviews with staff - Focused group discussion with pupils - Reflective field notes

5.3.6.1 Documents review

Reviewing documents besides other data collection methods increase the validity and comprehensiveness of qualitative studies (Patton, 2015a). Documents review has particular strengths that are not captured by other qualitative research methods, which provided a rationale for reviewing documents in this study. Firstly, document review is a cost-effective method to search for permanent sources of data that can be checked by others at different times (Bowen, 2009). Secondly: the data is, usually, impartial and unaffected by the research process as it is produced before the research for other purposes. Thirdly: documents, in most cases, are collectively produced, can provide exchanged and used information that might not be available in other forms (Miller and Alvarado, 2005). However, documents contents can be influenced by the author's knowledge, interest and opinion, therefore, it is important to check the credibility of documents by evaluating the authority of sources and the methods used in generating the data to avoid being misled by the author's interpretation (Denscombe, 2014). These issues were considered in analysing the context of the included documents, see below.

School policy and education documents are valuable sources of data that reflect what is culturally acceptable in the local context in addressing issues, based on decisions of multiple relevant people about the contents, presentation style and relevance to pupils' age (Bowen, 2009). Furthermore, institutes' documents give an insight into the system in terms of procedures, practice and culture (Miller and Alvarado, 2005). Accordingly, preparatory school curriculum, policy and activities' (published and unpublished) documents were reviewed in this study to identify the existing anti-smoking messages, policies and activities that are used and could be enhanced more in smoking prevention intervention at schools. Documents on school activities included annual reports of the previous academic year, as the school year was not finished at data-collection time, plus plans of the current academic year, if available. School policies over the past 5 years were reviewed. Also, manuals used in smoking prevention at schools were reviewed. See Table 22 page 158 for the types, number and dates of the documents reviewed in each school.

Granting access is a challenge in documents-review (Bowen, 2009) besides the availability of documents on school activities, especially informal activities. Accordingly and as recommended by Miller and Alvarado (2005), the number of reviewed documents depended on availability and accessibility to school documents. Documents were identified and reviewed continuously throughout the whole research period. For example, before the field visit, the school curriculum was reviewed online as it is accessible from the Ministry of education website. The identified information was used to develop the questions guide. Permission to access school documents was obtained from head-teachers during the first visits. Additionally, after each interview, informants were asked to recommend key documents of relevance to smoking prevention at schools.

All included documents were reviewed using Miller and Alvarado's (2005) framework which is commonly used in documents-analysis. This included: *contents analysis*, which focuses on understanding the document itself as an independent source of evidence, and *context analysis*, which focuses on the reflectivity of the document to the wider context. School documents' contents were analysed in terms of presence, or absence, of clear and explicit anti-smoking policies, educational messages or information plus any documented formal or informal activities related to smoking prevention in schools. The documents review form is attached in Appendix G. For triangulation, the contents of several school documents were compared for similarities and differences (Flick, 2004). In the context analysis, the documents were explored in terms of reasons for developing the documents, who are the audients, how

the contents were developed, based on what information and sources, by whom, and why certain aspects were excluded (Bowen, 2009). In order to analyse the documents as *a social actor,* as suggested by Miller and Alvarado's (2005), school documents were read in relation to the findings from FDG and semi-structured interviews to relate school documents to school practice in smoking prevention, assess the awareness of school-staff and pupils on the existing anti-smoking policies, educational materials and messages and evaluate the validity of their responses. Furthermore, the analysis included: documents' availability and accessibility within and across the three schools, to whom, type of unavailable documents, reasons for unavailability or inaccessibility of anti-smoking school policy, educational information or training guidelines. Smoking-related contents of the included documents were analysed using the framework approach analysis, explained in section 5.3.7.2, similar to the other collected data.

5.3.6.2 Semi-structured interviews with staff

Semi-structured interviews were used in this study to collect data *from school-staff* because interviews "yield in-depth response about people's experiences, perceptions, opinions, feelings and knowledge"(Patton, 2015, p.14), especially when a complex issue (such as adolescents' smoking) is explored (Denscombe, 2014). Semi-structured interviews use open-ended questions related to the research topics that were asked on the basis of a loose structure to allow pursuing ideas and responses that emerge during the interview (Doody and Noonan, 2013). A semi-structured topic guide was used in this study to guide the discussion in each interview, this topic guide is attached in Appendix F and discussed in section 5.3.6.4. The interviewer was flexible, even in ordering questions, to pursue issues that emerge during the interviews, asked open-ended questions to allow interviewees to discuss the raised issues widely, and probe to explore interviewees' responses further, as recommended in the literature (DiCicco‐Bloom and Crabtree, 2006, Patton, 2015a, Doody and Noonan, 2013).

As recommended by Doody and Noonan (2013), respondents were informed in advance that the interview is estimated to last for 90 minutes in order to plan and identify a suitable time for interviewing them which enhances their participation in providing details on the asked questions. With the participants' consent, all interviews were recorded, transcribed and included within the analysis.

5.3.6.3 Data collection from pupils

Data was collected from pupil participants mainly through FGDs that were supported by discussion of pictures, writing notes on cards and story-making. Combining these methods offers pupils an interesting alternative to their usual schoolwork which makes them actively engaged with the research questions rather than passively responding in interviews (Gallagher, 2009a). Table 19 shows the links between each method with the research objectives and corresponding questions and each method is explained and justified below.

Table 19 Data collection methods from pupils and the corresponding research questions and objectives.

Methods	Questions
Objective 1: The current school's role in preventing adolescents' smoking	
FGDs were used to generate data	<u>Curriculum</u> • What contents about smoking are included in the school curriculum? <u>School policy</u> • What happens if a pupil/teacher/visitor smokes at schools?

	Teachers role • What teachers/staff do to prevent pupils from smoking? What do they tell pupils about smoking? How they react with smoking by pupils and adults? Peers role • How do your peers speak about smoking? How they behave with pupils' smoking? Role of outsiders including parents • What parents/people outside school do to prevent smoking by pupils and adults inside schools?
Objective 2:The anticipated **school roles in preventing adolescents' smoking**	
▪ FGDs were used to generate data. ▪ Cards and photos were used to elicit responses	- What could be changed/added to your school policies, curriculum and activities to ▪ reduce pupils' opportunities to smoke ▪ enable pupils to resist smoking offers ▪ motivate pupils not to smoke - How pupils could be convinced about smoking harms? Why? *Look at the provided pictures on smoking harms, then discuss:* - How convincing these pictures, explain why and why not? What could be added to or removed from these pictures to make them more convincing on smoking harms? *Work in groups to develop a convincing school-poster to educate pupils on smoking harms* ➢ *Type your answers in cards:* - Who at your schools could help pupils to avoid smoking? Then *order these people/cards by importance/.* ➢ *Discuss in groups:* - Why those people are chosen in this order? How each of them could help? - Who in school cannot help pupils to avoid smoking, and why?
▪ FGDs were used to generate data ▪ A story was used to elicit responses ▪ Individual story writing was used to generate data.	Imagine that there is a boy or a girl attending preparatory school in Assiut who was about to smoke. How their school could help them not-to smoke. ➢ *Discuss in groups:* • What their teachers, friends/peers/ other staff could do to prevent them from smoking? how, when and where? ➢ *Individual story writing:* Use your imagination to write a story about this boy or girl or both who were helped by their school, teachers and classmates to avoid smoking initiation, explaining: • What each of their teachers, friends, peers and other staff did to prevent them from smoking initiation? How? • How likely this story could happen at your school? Why&why not?
Objective 3: Facilitators and barriers of SBSPIs	
▪ FGD to generate data. ▪ Cards to elicit responses	• What your school already have to facilitating preventing pupils from smoking ? and what does your school need to do better? • What could stop your school from helping pupils not-to smoke?

5.3.6.3.1 Focus group discussion (FGD)

FGD was the main method used in collecting data from pupils. Individual interviews with school pupils were considered inappropriate because: 1) children feel unconfident to communicate individually with unfamiliar adults (Punch, 2002); 2) Individual interviews might remind pupils of bad experiences of meeting teachers individually to discuss poor performance or bad behaviours. 3) Individual interviews require spending long times and some adolescents have a short concentration span in one to one discussion (Gallagher, 2009a). In contrast, group discussion: 1) reduces adolescents' anxiety by bringing them together (Wilkinson, 2000); 2) generates a wealth of information from reasonable numbers of adolescents quicker than interviewing individuals separately (Kumar, 2002).

FGD is commonly used in researching middle-school pupils and considered an acceptable and practical method for in-depth exploration of pupils behaviour and school-related issues (Horner, 2000, Morgan et al., 2002). Although pre-existing relationships between classmates facilitate their discussion, it might challenge maintaining groups dynamic as dominant, loud and boys participants could command the conversation over shy, quiet and girls participants (Smithson, 2000, Krueger and Casey, 2014, Gallagher, 2009a). Dominance over discussions might cause false agreement within groups and could be minimized by considering the homogeneity of FGDs participants (Gill et al., 2008, Krueger and Casey, 2014). Homogeneity of participants was considered in recruiting pupils for FGDs, also, to minimize peer-pressures in expressing ideas during group discussion (Smithson, 2000, Gibson, 2007). Because teachers are usually aware of pre-existing problematic relationships between classmates and pupils' personal and communication characteristics (Gallagher, 2009a), teachers were consulted in pupils' recruitment to enhance FGDs homogeneity, see section 5.3.4.2.

For effective utilization of FGD in researching pupils, the following measures were taken: **1)** FGDs were collected in a quiet, private and convenient room that is away from others' observations and never been used for pupils' punishment, as emphasised by Horner (2000). This is to minimize pupils' fear to answer school-related questions inside their schools or in teachers' presence (Punch, 2002, Gallagher, 2009b). **2)** Before each FGD, pupils were asked to identify and agree on rules for effective discussion which were collectively written and kept in front of participants during FGDs, as suggested by Morgan et al. (2002). Red flags were given for pupils who break these rules, as a reminder while pupils who follow the agreed rules were rewarded with stickers. **3)** Dominance over discussion was monitored by the researcher, as Krueger and Casey (2014) suggested. For example, participants were given a red flag as a reminder when they dominate some answers or interrupt others. Shy and quiet pupils were encouraged to participate and given green flags when they participate. **4)** Commanding and stubborn pupils, identified either by teachers or during testing group dynamic, were joined in separate FGDs, as recommended by (Gibson, 2007) and Smithson (2000). **5)** Time was invested time building rapport with pupils, and their parents and teachers, to gain their trust before data collection started and improve the validity and quality of their responses, as the literature emphasises (Gallagher, 2009b, Mahon et al., 1996, Alderson and Morrow, 2004). The literature was reviewed to identify ways for building rapport with pupils and a list of activities were made to choose from it as appropriate during the data collection (Hershkowitz, 2011, Aldridge and Wood, 1998). These activities included: providing voluntary activities at school during assembly and lunchtime, meeting pupils at lunchtime and have an informal discussion about general issues, joining pupils in sports and arts activities before the FGDs, starting the meeting by discussing hobbies, preferred games, toys, stories, places to visit, food as well as dreams for future and explain the similarity between them and the researcher in these issues. At the beginning of the FGD, pupils were given a variety of colourful cards with different

shapes to choose among them to be used during the discussion. Pupils were asked to write their names on the cards and what he/she wants to be in the future, then to introduce themselves as they wanted. This approach was liked by pupils who were engaged and friends spoken, examples of how they introduced themselves included ["hello everyone, I am dr. X and I am here to tell you how to be healthy", "hi I am Mrs X and I am the headteacher and I want to advise you about your future", "I am your mother and I want you to be the best one in the world"]. **6)** Eye contacts were maintained with smiles and applying appropriate fun during FGDs as this empowers young participants and enhances their confidence (Gallagher, 2009b, Thomas and O'kane, 1998). **7)** Group activities were used to minimize the researcher's power and empower pupils by keeping the discussion among similar cohorts (Alderson and Morrow, 2004, Thomas and O'kane, 1998). Moreover, the following was considered during FGD, as per recommendation by Boyden and Ennew (1997), Thomas and O'kane (1998) and Gallagher (2009a):

- Pupils were assured that the researcher, regardless of mistakes in spelling and expressions, values their responses and there are no right or wrong answers to encourage them expressing their ideas comfortably.
- All activities were explained to pupils and questions were encouraged to ensure pupils' understanding of the tasks before group work started. Additionally, the researcher was with the groups all the time to answer any questions and facilitate the discussion.
- All participants were given coloured pens and papers to use for research activities, to avoid using their resources.
- Participants were not asked to disclose their smoking practices and questions were depersonalized
- Although teachers were gatekeepers to identify eligible pupils in this study and parents/guardians permission was required for pupils' participation, pupils were assured (verbally and through the information sheet) that this study is independent. Teachers and parents/guardians were not be allowed to observe FGDs, cards and the written stories or comment on pupils' responses. It was emphasised that although research findings will be fed back to the school, to make recommendations, all data will be anonymous.

FGD brings similar people, such as classmates, together to explore a limited number of topics in more depth (Krueger and Casey, 2014). In FGD, the researcher's role is to facilitate the discussion between participants by introducing few questions appropriately, using the questions guide (Wong, 2008). A topic guide, discussed further in section 5.3.6.4, was used to facilitate FGD, see Table 19 for the main topics explored in FGDs. In order to allow in-depth exploration of the research questions in good quality without overburdening pupils, the FGD questions were divided into three parts, each one was discussed separately and pupils were given a break after completing the discussion of each part (Gallagher, 2009a). To avoid overwhelming pupils with questions and maintain the quality of the collected data, it is recommended to keep the data collection period short (Gallagher, 2009a, Morgan et al., 2002). With a good moderator's skills, pupils' focus could be maintained for about ninety minutes (Gibson, 2007). Accordingly, each FGD was expected to last 90 minutes and school staff, pupils and their parents were informed on that in advance in order to plan and identify the suitable time for FGDs to enhance pupils' participation in providing details on the asked questions. suitable times for FGDs were discussed with relevant school staff first then with parents and pupils. No data was collected around the exams period to avoid stressing pupils, teachers and parents and disadvantaging participants from not attending pre-exam revisions. See section 5.3.8 for the ethics considered in FGDs.

Traditional research methods might be unsuitable for researching children, as they may feel unconfident, shy or nervous to express their opinion in the presence of unfamiliar adults, especially in societies, like Egypt, where adults usually decide for children (Punch, 2002). Therefore, researchers are encouraged to be flexible and creative in researching children, this includes creating fun and using a mix of verbal, drawn and written responses to the asked questions (Gallagher, 2009a, Kumar, 2002). Additionally, being flexible and creative in researching pupils minimize their intention to please researchers and seek attention (Punch, 2002) and encourage them to express their opinions and think outside their regular experience (Morgan et al., 2002, Gallagher, 2009b). Accordingly, the following creative methods were used during FGDs to maintain pupils' interest and enhance their thinking and discussion: cards, pictures, and stories. Each of these methods is discussed in detail below. Other innovative methods for stimulating pupils' discussion were explored but considered inappropriate for this study. For example, role-play was suggested as an interactive data-collection method but was considered inappropriate for this study because it involves few participants and undesired by shy and unconfident adolescents. (Wilkinson, 2000, Morgan et al., 2002). Moreover, role-play requires skills and time to develop scenarios, divide roles, practice and represent (Kumar, 2002). This may distract pupils from their schoolwork and may affect teachers' and parents' decisions to enroll pupils in this study or force participants to repeat irrelevant scenarios they have seen elsewhere as some researchers noticed (Cornwall and Pratt, 2003). The drawing was also suggested to encourage pupils to engage actively in research and gives them time to know the researcher and formularize their expressions, unlike interview situations where responses are provided quicker (Gallagher, 2009a). However, drawing was considered inappropriate for this study because a lack of artistic competence might inhibit older pupils from long engagements (Punch, 2002). Pupils over 11 years old may consider drawing as childish activity and refuse to do it (Wilkinson, 2000) and pupils aged 12-13 were recruited in this study. Although those who are unable or refuse drawing could be asked to imagine a picture, instead, and describe it, this approach is unsuitable for FGDs (Krueger and Casey, 2014, Boyden and Ennew, 1997). Also, analysing drawing is a challenge unless pupils are asked to explain their drawing which consumes time more than what is allowed for pupils to be away from their lessons in schools (Gallagher, 2009a).

The sub-sections below discuss the attractive methods used to stimulate pupils' discussion during FGDs.

5.3.6.3.2 Writing notes on cards

Using cards is a creative fun method to: 1) maintain children interest in providing rich responses rapidly (Punch, 2002, Loewenson et al., 2014); 2) prolong their concentration during FGDs (Gibson, 2007); 3) and engage them actively with research questions in an interesting way instead of the passive responses in interviews (Wilkinson, 2000, Gallagher, 2009a). Accordingly, pupils were asked, in this study, to write short notes on cards during FGDs besides their verbal responses to questions. Cards were used to stimulate or summarise pupils discussion during FGDs, for example, to identify and order who in school could participate in convening pupils not to smoke. See Table 19 for more examples.

5.3.6.3.3 Discussion of pictures

Pictures-elicitation is a well-recognized approach to stimulate participants' discussion in qualitative studies (Prosser, 2005), especially with children who may face difficulties in verbal communication with adults (Punch, 2002). Pictures-elicitation involves using a select number of pictures, produced by the participants or collected by the researcher, to stimulate interview dialogue (Keller et al., 2008). In this study, pictures-elicitation was used to stimulate pupils' discussion during FGDs. Providing cameras for pupils to take photos is an expensive and challenging approach, as it raises ethical and quality considerations such as obtaining permission to capture individuals' behaviour at school which might make them behave differently (Gallagher, 2009b, Loewenson et al., 2014). For these reasons, pupils were not asked to take pictures in this study. Instead, a selected number of freely-available online pictures that represent various smoking consequences, downloaded by the researcher based on participants criteria for selection, were used to enhance pupils' discussion of the acceptable and convincing contents of the educational materials on smoking consequences that could be used in school-posters. In order to avoid selecting age-inappropriate pictures, the pictures were downloaded from some websites that publish smoking-educational-materials target school pupils in the UK and Arabic countries. These websites included governmental and nongovernmental institutes such as schools, ministry of health, ministry of education and some NGOs active in smoking education at schools. Photographs of real individuals were either excluded or depersonalized, by masking personal features or using parts of the pictures, when possible. Photographs that show ill-patients were excluded to avoid traumatizing pupils (Gallagher, 2009b). See Figure 16, page 213, for examples of the used pictures.

Using ready pictures to represents the study themes requires careful consideration of the local context in terms of setting, facilities, furniture and peoples' clothes, feature and reactions (Prosser, 2005). However, recruiting an artist to draw pictures specific for the Egyptian context then piloting these pictures before using them to ensure their relevance and clarity, as recommended by Loewenson et al. (2014), was restricted by the limited time and resources available for this study. After reviewing the literature about using context-appropriate ready pictures (Wilkinson, 2000, Prosser, 2005, Kumar, 2002, Keller et al., 2008, Kreuter et al., 2003), the following measures were taken to ensure, as much as possible, appropriateness of the selected pictures to the Egyptian culture: 1) criteria for cultural appropriateness were considered in selecting pictures, these included: peoples' clothes and feature, furniture, facilities and languages used in written comments or explanations. 2) The researcher who was born and lived in Egypt for long-time used her knowledge of the Egyptian culture and ethics of researching children to exclude pictures that are clearly inappropriate. 3) Then, pictures appropriateness was discussed with researchers at Assiut University with experience in school-based research in Egypt. 4) Age and cultural appropriateness of all pictures were discussed with and school-staff before using them in FGDs. 5) Pictures that illustrate the study themes with no or few specifications of individuals' features, culture and languages were given priority for pupils' discussion in FGDs. For example, uncoloured picture of a smoker male with unclear face features who wear sports clothes but could not run properly was selected to discuss smoking consequences on fitness, as the smoker's age, skin colour, ethnicity and language were unspecified. 6) Cultural apparentness of the discussed pictures and suggestions for improvement were explored with participants during FGDs. Amendments in the used pictures were made, as early as needed, based on continuous analysis and reflection to ensure the cultural-sensitivity of the used pictures. When it was difficult to make the required changes in pictures, this was indicated within the analysis.

The used pictures included a range of drawn pictures and images of specimens of human organs affected by smoking. Pupils were asked to select the most appropriate and convincing pictures for them on smoking consequences, explain reasons for selecting and excluding pictures and suggest adding or modifying pictures if needed. Thereafter, participants were asked to order the selected pictures and use them to design a poster that could be used to educate their peers on smoking harms. With pupils and parents consents, pupils discussion during all process of designing the poster was recorded and used in the analysis.

Using picture-elicitation in interventions-related research provides insights on social, contextual and cultural factors that need to be considered in interventions to be culturally sensitive and reliable (Prosser, 2005). Accordingly, it is believed that the above-explained approach of picture-elicitation provides insights on factors related to the context, culture, age and gender of pupils which enhances the applicability of the findings to pupils in preparatory schools in Egypt.

5.3.6.3.4 Story-making

Story-making, is a powerful method in collecting detailed information, over a short time, on adolescents' views about how to address common events in their life as it stimulates their memory and imagination skills (Loewenson et al., 2014, Wilkinson, 2000, Gallagher, 2009a). In this study, story-making was used to explore pupils' perception of how school, teachers and peers could contribute better to preventing adolescents' smoking. As recommended by Boyden and Ennew (1997) the beginning of a story, on a boy or/and a girl who lives in a smoking environment, was given to pupils to stimulate their thinking further. In each FGD, participants worked together on completing the story by explaining how different pupils at schools could contribute to preventing this boy or girl from smoking initiation, see Table 19. The group discussion during story-making processes was recorded, transcribed and analysed as part of the FGDs data.

Accordingly, after each FGD, participants were asked to individually write a story on a similar scenario. Pupils were allowed to use, modify or ignore ideas discussed in FGDs in writing their individual stories. Individual story writing was used because writing is a powerful way for literate adolescents to express themselves and participate actively in research, especially at schools, although it is inappropriate for those with poor writing skills (Boyden and Ennew, 1997, Kumar, 2002). Additionally, collecting data individually after group discussion allows: 1) further development of individuals' thinking; 2) more expression of individuals' perspectives that might not be expressed or developed during FGD; 3) in-depth understanding of the investigated phenomena (Boyden and Ennew, 1997, Gallagher, 2009a). The written stories were analysed separately then compared with group stories for differences and similarities (Miles et al., 2014).

Teachers were consulted on time-availability and appropriateness of story-writing for pupils' age and workload and story-writing instructions were modified accordingly.

It was difficult to book time for story-writing during school-time, therefore, pupils were asked to complete the individual stories at home. However, pupils were assured that attention will not be paid to spelling and grammar mistakes. To avoid overwhelming pupils with this task besides other schoolwork, pupils were encouraged to write concisely rather than extensively discuss ideas, as recommended by Gallagher (2009a) and Loewenson et al. (2014). Allowing participants to complete written data collection methods at their convenient time and place is usually associated with a low return of competed data (Patton, 2015a), especially among

pupils (Wilkinson, 2000). However, it results in a better quality of data and causes less stress for pupils (Piper and Simon, 2005, Morrow and Richards, 1996).

Other written research methods recommended for researching adolescents, such as writing an explanatory essay and detailed diaries (Loewenson et al., 2014), were considered as inappropriate for achieving the research objectives within the allocated resources and pupils' capacity to participate in this study.

5.3.6.4 Topic guides

Semi-structured topics guides were used to facilitate the discussion with participants as explained above. See Appendix F and Table 19 for the main issues explored in the semi-structured interviews and FGDs respectively. As recommended in the literature (DiCicco‐Bloom and Crabtree, 2006, Patton, 2015a, Doody and Noonan, 2013, Gibson, 2007, Denscombe, 2014), the following were considered in using topics guides: **1)** topics-guides were used flexibly to pursue issues that emerge during the discussion. **2)** Open-ended questions were asked to allow participants to discuss the raised issues widely. **3)** Probing was used to explore participants' responses further. **4)** Questions were reordered as required to allow participants to express their views on the explored topics with fewer restrictions. **5)** In FGDs, the topic guide was used to facilitate the discussion between pupils (Gibson, 2007, Krueger and Casey, 2014, Denscombe, 2014).

Questions were developed prior to the fieldwork based on themes that arose from the findings of study-1 and study-2 and gaps identified in the available evidence in relation to the research objectives and questions as well as the inner two layers of the BCW. However, questions were included to allow for the exploration of new themes that were not previously identified.

5.3.6.5 Reflective field-notes

Qualitative researchers are encouraged to take field-notes to remind them of things happened during fieldwork (Patton, 2015a). Accordingly, the researcher took field-notes and reflections on lessons learned after each FGD, interview and school visit which were then used to revise questions guides and improve data-collection further. Field-notes were taken, either handwritten or audio-recorded, to remind the researcher with things happened during the fieldwork that was not recorded in the interviews or FGD. The handwritten field-notes were reviewed daily for clarity, missing contents and private abbreviations used were completed and all handwritten field notes were audio recorded. As recommended by Miles et al. (2014) the recorded field-notes were transcribed, were not analysed separately but were used for triangulating the findings from the other sources.

The field-notes should comment on how participants' backgrounds or experiences could have influenced their responses and assumptions made by participants in their responses (Denscombe, 2014). Accordingly, the taken notes included comments and reflections on the following issues: fieldwork activities and challenges; responses of the key-informants; what went well, what needs to be changed or improved in each FGD, interview and school visit; which picture should be excluded or added next time; location and clarity of anti-smoking messages and educational materials inside schools; school environments such as school capacity, equipment and resources, some formal and informal school-day activities (such as assembly, roleplays and health-education activities); the environment around schools in term of pupils' exposure to smoking behaviour, by age and sex, accessibility of pupils to tobacco products and public responses to adolescents' smoking and purchases of tobacco products in local shops and internet-cafes around schools.

5.3.7 Data analysis

Data analysis is the most complex phase of qualitative studies as researchers need to make sense of massive amounts of data by reducing its volume, identifying significant patterns and constructing a framework for communicating the findings (Miles et al., 2014, Pope et al., 2000). This section details the approach for data analysis, drawing on existing evidence from the literature. Qualitative data analysis (QDA) processes involve noticing, collecting and thinking activities in an iterative and spiral manner (Miles et al., 2014). For example, the researcher's observations during data-collection could enrich data interpreting (Patton, 2015a). Additionally analysing data alongside data-collection allows for noticing patterns, recognizing missing or emerging ideas which may require further data-collection (Miles et al., 2014), refining questions accordingly and developing new avenues of inquiry (Pope et al., 2000). Accordingly, the analysis in this study started during the data-collection period and the reflective-log was kept by the researcher during data collection and analysis.

5.3.7.1 The approach to data analysis

Qualitative inquiries are oriented toward exploring and discovering logics (Patton, 2015a). Therefore, the aim of analysing qualitative data could involve: developing conceptual definitions; describing complex phenomenon; explaining why phenomenon happen; finding associations between patterns, such as knowledge, attitude, behaviour, experience, resources and circumstances, and seeking, explicit or implicit, explanation of associations; developing typologies through categorizing types of attitudes, behaviours, motivations and experiences; developing new ideas or theories (Miles et al., 2014, Green and Thorogood, 2014). To achieve one, or more, of these aims, researchers need to process the unstructured qualitative data to be coherent while retaining a hold on the original ideas which require explicit, systematic and reproducible methods. Therefore, a clear approach for data analysis should be identified (Miles et al., 2014).

There are two broad orientations to QDA: deductive and inductive style. While the inductive analysis uses the data to generate ideas, categories and explanations without relating the data to pre-existing concepts (generating hypothesis), the deductive analysis starts with prior concepts and uses the collected data to confirm or negate these concepts (testing hypothesis) (Pope et al., 2000). In relation to conceptual models, the deductive style uses general conceptual models to develop context-specific models while the inductive style generates a specific conceptual model as a step toward developing a generic model (Patton, 2015a). In practice, the two styles are interrelated as it is hard to be purely deductive or inductive in the analysis. For example, a study could start with a conceptual model for intervention (deductive process) whereas allowing the possibility of generating new ideas from the collected data that suites the researched context (inductive process) (Miles et al., 2014). The pragmatic approach to inquiry aims to identify actionable findings, therefore, use multiple analytical processes: deductive and inductive (by moving back and forth between the general and specific context) to clarify the researched issues (Patton, 2015a, Davidson, 2012). This study explores SBSPIs in Egypt drawing on findings of study-2 that reviewed SBSPIs in Arabic and LMICs. Therefore, a combination of inductive and deductive approaches considered useful for analysing the collected data in this study. The collected data were analysed inductively, first, to identify themes, categories and explanations related to SBSPI in Egypt. Thereafter, the identified themes were considered in relation to the COM-B model of the BCW and study-2 findings in order to generate a framework that explains what should be considered in SBSPIs to enhance pupils' capability, opportunities and motivations to avoid smoking in Upper-Egypt.

Several approaches used in QDA. These approaches could: focus on the use and meaning of the language (sociolinguistic approaches), such as discursive and conversation analysis; or aim at generating theories or developing a story or propositions through engaged selection of codes and interrelating categories during data interpretation, as in Grounded Theory; or describe in details participants' culture and way of life, like in ethnographic approach; or interpret the meaning of a told story focusing on the way it was structured as a reflection of the teller's experiences, like in narrative approach; or develop the essence of experiencing a phenomenon explaining the way it was experienced, as in phenomenological analysis (Creswell, 2013, Patton, 2015a); or describe and interpret participants' views, such as contents analysis (Mayring, 2004); or systematically identify and organise patterns of meaning (themes) across the data such as thematic analysis (Braun and Clarke, 2012) and framework analysis (Ritchie and Spencer, 2002). Although these approaches are not mutually exclusive it is worth distinguishing them as they involve different ways of making sense of qualitative data (Creswell, 2013, Patton, 2015a).

The framework approach was considered appropriate, and consequently used, for analysing data in this study because it allows applying pre-existing as well as emergent concepts (Smith and Firth, 2011), in contrast with the Grounded Theory which exclusively uses inductive analysis (Creswell, 2013). Additionally, good QDA involves identifying uncovered issues/themes relevant to the investigated phenomenon and explains similarities and differences between- and within- the selected cases and participants (Miles et al., 2014) and these process are facilitated by the framework approach (Gale et al., 2013). The next section provides more justification and explanation of the use of the framework analysis in this study.

5.3.7.2 Framework approach

The framework approach is a, increasingly, popular method used for in applied-research because it facilitates QDA within the demands and constraints of applied-research (Ritchie and Spencer, 2002). The framework approach is a comprehensive matrix-based analytical technique that allows comparison between, and within, different parts of the collected data in a transparent, systematic reviewable and retrievable way (Smith and Firth, 2011). The framework approach enables systematic and in-depth exploration of data together with maintaining an active and transparent track of the analysis process applied(Gale et al., 2013, Smith and Firth, 2011). Framework analysis can be used for both individual and group interviews (Rabiee, 2004). Some authors criticized the framework approach and considered it as a procedure for deductive analysis that is not encouraged in QDA (Pope et al., 2000). In contrast, evidence from applied research emphasises that this approach allows for inductive and deductive analysis (Gale et al., 2013, Ritchie and Spencer, 2002, Smith and Firth, 2011, Green and Thorogood, 2014). However, for this to be achieved through the framework approach, researchers should be flexible and adaptive in QDA in order to generate rich findings that explain the complexity of the investigated phenomena (Gale et al., 2013).

The following stages of framework analysis are described in the literature (Gale et al., 2013) and were applied in this study to analyse all the collected data, including documents contents and written stories:

1) Data transcription;
2) Familiarization with the data: through listening, reading, transcribing the collected data;
3) Coding: developing codes that emerge from the data and reflect the research objectives;

4) Developing a working analytical framework: through grouping the identified codes into categories and produce a detailed coding index;
5) Applying the analytical framework (Indexing): rearranging the data using the coding index;
6) Charting data into the framework matrix: tabular presentation of the indexed data to allow comparing themes and subthemes;
7) Mapping and interpretation: exploring patterns and associations between themes, sub-themes within and between different data sources and developing an explanation of the investigated phenomena.

These seven stages and their application in this study are discussed below. Although these stages described separately, the analysis processes were iterative, not linear.

The researcher used MAXQDA version 2019.1, a QDA software package, after receiving online training, to organise, code, index, chart and map the data collected in this study. MAXQDA software was selected because it, unlike other software such as N-Vivo, supports analysing transcripts written in Arabic fonts (Woolf and Silver, 2017). Also, MAXQDA is frequently used by Arabic researchers who recommend it on the research-gate website.

1) Data management and transcription[3]

In framework analysis, a verbatim (word for word) transcription, which requires good quality audio-recording of the interviews and FGDs, is needed without the convention of the dialogue (such as simultaneous talking or pauses during interviews), as the primary focus is on contents (Gale et al., 2013). All the interviews and FGDs were recorded, with consent, and transcribed in Arabic (word for word) by the researcher. The recorded reflective notes were transcribed on the margin of each transcript. The transcripts and written stories were anonymized and filed according to their school and saved in password-protected folders on the researcher's M drive and cloud account at the University of Leeds. The data transcription started during the fieldwork, using word files with two-line spacing and large margins to allow for making notes, to be immersed in the data early and to inform subsequent data collection.

2) Familiarization

This stage is important and commonly applied in all approaches for QDA (Braun and Clarke, 2012) even if the analyst has collected the data, as it aims to gain an overview of the range and diversity of the whole dataset before sorting and sifting these data (Green and Thorogood, 2014). Listening to the recorded data, transcribing data and reading data transcription, field-notes and collected documents enable the researcher to immerse well in the collected data. However, familiarization with the whole dataset at once might not be always possible in case of collecting data in stages or gathering large volume data. Therefore, familiarization should start alongside data collection (Ritchie and Spencer, 2002). Accordingly, after each interview and FGD, the researcher listened to the audio-recordings and the recorded reflective notes then transcribed them. Thereafter, all transcripts were read and re-checked against audio-recording, field notes were studied and the collected documents were reviewed before coding started.

[3] As this stage is a data management stage, it is not included in the framework analysis by some authors.

3) Coding

In framework analysis, coding aims to enable classifying all parts of the data to be compared systematically with other parts of the collected data (Gale et al., 2013). Codes are the building blocks of QDA, as they identify and provide a label for parts of the data that are relevant to the investigated issues. For coding, the researcher reads the transcripts line-by-line then applies a paraphrase or label (a code) that describes what is interpreted in the data as important for answering the research questions. Codes can be descriptive, part of the data contents and close to the participants' meanings, or interpretive, provide meanings and interpretations of the data content. Both descriptive and interpretative codes could be used if relevant to the research questions. Line-by-line coding alert the researchers to consider some invisible meanings/ideas that were not clearly expressed or do not fit with the rest of the dialogue (Saldaña, 2016). In the inductive analysis, anything relevant to the investigated issues is coded, open coding (Miles et al., 2014). The number of codes depends on the richness of data, precision in coding, and the investigated topic, as there is no maximum (Saldaña, 2016). In purely a deductive analysis, this stage might be escaped, as codes are pre-identified. However, it is advised to apply open coding on some transcripts before moving to avoid missing important aspects of the data (Gale et al., 2013).

QDA software facilitates line-by-line coding and enables keeping track of new codes automatically (Silver and Lewins, 2014). In this study, all the collected data, transcribed FGDs, interviews and field notes, the written stories and documents' contents, were imported to MAXQDA software that was used to code these data digitally. Initially, open coding was used to identify descriptive and interpretative codes that are relevant to the research questions. The data from the boys' school was coded first, followed by the mixed-gender and then girls' schools. Within the data of each school, the interviews were coded first then FGDs followed by written stories and then documents. The data related to each FGD including cards, photos and written stories were coded together with the FGD transcript. As recommended by Bowen (2009), when contents of the included documents are related to the key themes, they were coded and then compared with codes from the transcripts. During the coding stage, codes were persistently modified to incorporate new ideas.

It is recommended to involve at least two researchers, if possible, and each codes the first few transcripts independently (Saldaña, 2016). In the inductive analysis, it is important to search the data for unexpected issues, not only code in a verbatim and descriptive way, which could be enhanced by involving people from the explored context in this stage (Braun and Clarke, 2012). Accordingly, an expert Egyptian researcher was involved in coding to ensure that the researcher's perspective does not dominate the analysis. The Egyptian researcher worked as an external supervisor during study 3, her role was limited to ensuring the involvement of the local context in the early stage of data collection and analysis. Initially, both researchers independently coded a sample (two interviews and two FGDs) of transcripts independently, discussed and agreed on both prior and emergent codes before the rest of the data was coded by the main researcher alone.

4) Developing the analytical framework[4]

This stage involves reviewing coded data to identify similarity and overlap between codes and generate themes and sub-themes. A theme is a distinctive, standalone, broad topic/issue around which codes cluster (Braun and Clarke, 2006). Themes generated by grouping codes that share some features together, so they reflect meaningful and coherent patterns in the data. Themes should be related but do not overlap to avoid repetition (Braun and Clarke, 2012). In the inductive analysis, relationships between themes are explored to identify the overall story reflected by these themes about the data, the analytical thematic framework according to which the data can be analysed (Miles et al., 2014). In the combined inductive-deductive analysis, the final version of the analytical framework may or may not corresponds to the original conceptual framework (Srivastava and Thomson, 2009). This is because this stage involves making judgments about relevance and importance of all prior and emergent codes in relation to the research questions and the investigated context which may lead to amendments in the original conceptual framework to produce a workable analytical-framework (Ritchie and Spencer, 2002).

Both researchers discussed similarity and overlap between emergent codes, generated themes and sub-themes reflected by these codes and agreed on their names and definitions. Once all prior codes and themes were agreed, the two researchers discussed and allocated each prior code/theme to the relevant intervention function and COM-B components (the inner two layers of BCW). Regular open and honest discussions took place during this stage to ensure that codes and themes were allocated to the most relevant intervention function and component of the COM-B model. The inner two layers of BCW were used to present the findings on what intervention functions are used and could be used in SBSPIs to enhance pupils' capabilities, opportunities and motivations to avoid smoking initiation. This facilitated the discussion of the findings of this study and study-2 which used the same BCW layers to explore SBSPIs in Arabic and LMICs. The collected data were sifted and sorted, in the next stage, using the agreed analytical framework. As recommended by (Miles et al., 2014), a miscellaneous category, which included all codes that do not fit anywhere, was used to avoid ignoring data during the coding process. This category was revisited later to discard the included codes or generate new themes. The analytical framework was continuously refined, to adapt the newly emerged issues, until the coding process was completed.

5) Indexing

Indexing means annotating data according to the themes, sub-themes and codes of the analytical framework (Smith and Firth, 2011). QDA software helps in speeding-up the indexing process and retrieving the data easily, at later stages (Silver and Lewins, 2014). MAXQDA software was used to index all the collected data in this study based on the themes and sub-themes and codes identified in the analytical framework.

6) Charting

Qualitative methods produce voluminous data, for example an hour of an interview could be transcribed into 15-30 pages (Saldaña, 2016). Combining innovative research methods in group discussion, although effective in data collection, creates a large amount of data (Wilkinson, 2000). Therefore, managing and reducing (summarising) the volume of qualitative data is a vital part of the analysis (Miles et al., 2014). In framework analysis, this was done through charting which involves rearranging and categorizing data from each transcript according to its relevance to specific elements of the analytical framework. The charted data then presented in

[4] This stage overlaps with coding, so some authors combine them.

a matrix (Srivastava and Thomson, 2009). Some analysts rely on a `copy and paste` approach whereby `chunks` of the data are grouped together and analysed according to their index reference. However charting has a tracking approach where the same `chunks` are tracked back in the original transcripts and analysed in relation to the adjacent issues (Ritchie and Spencer, 2002). Good charting should keep a balance between the two approaches to allow for reducing data volume with retaining the original meanings of the respondents (Green and Thorogood, 2014). To facilitate the tracking approach, the chart should include references to the illustrative quotations (Gale et al., 2013). The MAXQDA software was used in this study because it allows charting data in matrices that indicate the transcript, page and line number of each chunk of the indexed data (Woolf and Silver, 2017). The two researchers independently, applied the analytical framework of this study to index a sample (two interviews and two FGDs) of transcripts, compared, contrasted and discussed the charted data to identify any required amendments before indexing and charting the rest of the data by the main researcher.

7) Mapping and interpretation

In this final stage, all the dataset, after being coded, indexed and charted, are pulled together by its key characteristic, mapped and interpreted as a whole to answer the research questions (Ritchie and Spencer, 2002). Based on the research objectives, qualitative data interpretation could involve: defining or interrogating concepts, generating typologies, mapping nature and range of the investigated phenomenon, providing explanations or exploring associations (Miles et al., 2014). Interpretation of qualitative data is not simply aggregating patterns and searching for the multiplicity of evidence as it includes identifying a structure of evidence and weighting the dynamics, and salience, of the identified issues (Bryman and Burgess, 2002).

The rich data collected in this study allowed for these in-depth interpretations but prolonged this stage of the analysis. The findings from interviews were mapped against findings from FGDs and documents-analysis in each school, these findings were summarised in one matrix for each school (w*ithin-school* comparison). Additionally, findings from interviews, FGDs and documents-analysis were mapped across the boys', girls' and mixed-gender schools (between-*schools* comparison). This mapping process was facilitated by generating three matrices. Each matrix maps, separately, the findings across the three schools that were generated from the documents-analysis, interviews with males and females staff or FGDs with boys and girls. Then the findings from the three matrices were then mapped and summarised in one final matrix. This mapping aimed to cross-validate the findings as well as identifying similarities and differences in the followings: perspectives of staff and pupils, both males and females, in each school; between boys', girls' and mixed-gender schools; between participants' responses and the written documents. As indicated by Krefting (1991) this approach enhances the findings' rigour. Digital notes (memos) were taken during all the analysis process on interesting ideas, impressions and early interpretation of data. This helped in mapping data at early stages. The researcher's observations and reflections during the field-works, data transcription and indexing were used to inform the analysis as this enhances the quality of QDA (Pope et al., 2000).

5.3.8 Ethical considerations

Research studies raise ethical issues, especially qualitative studies because of their in-depth and unstructured nature that arise some unanticipated issues (Ritchie et al., 2013, Piper and Simon, 2005). The following were considered to address ethical issues in this study.

5.3.8.1 Ethical approval

Before collecting data, ethical approval was obtained from the ethics committee at Assiut University in Egypt, , and the School of Medicine Ethics Committee at the University of Leeds in the United Kingdom, reference number MREC17-025. Research clearance was obtained from the Central Agency for Public Mobilization and Statistics (CAPMS) in Egypt. Permission to access schools was obtained from the directorate of education in Assiut then from the head-teachers of each school.

5.3.8.2 Informed consents

Obtaining informed consent from participants is a key ethical issue in research. Consent is valid if it is completely voluntary (free of coercion), participants are fully informed about the process they are consenting to, and participants are competent to provide consent (Piper and Simon, 2005). School head-teachers, as gatekeepers, informed all staff, pupils and their parents/guardians about this study then individual and independent informed consents were obtained from all participants, as follow.

The researcher introduced the study in school assembly and was available, inside schools and through a local mobile number provided on the information sheet, to inform all participants and parents/guardians about the study and answer their questions. The researcher phoned all relevant parents/guardians or meet them at schools. Eligible informants were made aware, verbally and in person and through the information sheets, of the research aim, methods, their contribution (what to do and for how long) and how their information will be handled. Voluntary participation was emphasised. Withdraw at any time before data analysis started, dates were specified, were allowed. The information sheets, that detailed all the above, and the informed consents were offered, in Arabic, to the eligible informants at least 24 hours before each interview/FGD to give them enough time to decide on their participation.

Informed consent was obtained, mainly in writing, from each participant, individually after answering their questions about the study. Participants were consulted on the convenient time and location for the interview/FGD. Before each interview/FGD, the researcher double-checked each participants' understanding of everything, voluntary contribution and consent to record. Two staff participants, although willing to participate in the study, refused signing the consent form (due to cultural reasons as they only sign formal documents in formal situation). Verbal consents were obtained from them, by saying "I agree to be interviewed and for my interview to be recorded and my anonymous data to be used in this research study". These verbal consents were audio-recorded and witnessed by another teacher who signed the consent forms as a witness. To allow accurate documentation of the consents, these participants' names were recorded and kept separately from their record interviews, which were anonymised later. This approach is a common and acceptable alternative to signatures in international research in LMICs (Cash R. et al., 2009, Hyder et al., 2004, WHO, 2015a) following the international guidelines that recognize the validity of verbal consent when written consent is either inappropriate or unacceptable, but only when it is properly documented (Marshall, 2007).

As adolescents usually rely on trusted adults in making decisions (Alderson and Morrow, 2004) the following was considered to avoid conflicts between pupils' and their parents/guardians around their participation in this study: **1)** the information sheet was verbally explained to eligible pupils first, then was sent with the consent forms to parents/guardians, in closed envelops through schools. Parents/guardians were asked to fill, sign (or thumbprint) and return the completed form to the school, with their child in a sealed envelope that was provided to them in advance for free, if they consented to the participation and audio-recording. **2)** As recommended by Lambert and Glacken (2011), simplified and pictures-supported information sheets and consent forms, see Appendix H and Appendix I respectively for the English versions, were given to pupils to take home, think, for at least 24 hours, and discuss their participation with their parents/guardians. **3)** The researcher met again pupils whose, at least one, parents consented, in writing or thumbprint, for their participation and audio-recording to obtain their written consent. Pupils consent form included a tick box asking if they discussed their contribution with parents/guardians, as recommended in researching children (Alderson and Morrow, 2004). **4)** The researcher revisited pupils' consents before each FGD, in the absence of teachers and parents to check that their participation is voluntary without pressure from teachers or parents/guardians. **5)** Pupils participated only if both they and at least one of their parents/guardians consented and neither parent/guardian nor pupils refused their participation and the audio-recordings. The above measures follow the recommendations on the ethics of researching pupils (Gallagher et al., 2010, Lambert and Glacken, 2011, Alderson and Morrow, 2004, Dockett et al., 2009, Mahon et al., 1996).

Illiterate parents who cannot sign used their stamp or thumbprint. However, the researcher contacted illiterate parents, in person or over the phone, to explain the information sheets, consent forms, and answer their inquiries before accepting their thump-printed or stamped consent. Pupils' hand-written names, witnessed by a teacher, were alternative to signatures if pupils did not have signatures yet. These alternatives to signature are ethically acceptable in Egypt (Abou-Zeid et al., 2006, Marzouk D et al., 2014), commonly used by researchers in developing countries and follow the international guidelines of obtaining consent in LMICs (Cash R. et al., 2009, Marshall, 2007, Hyder et al., 2004, Kass et al., 2003, WHO, 2015a).

Some researchers prefer to use the opt-out consent in school-based research, as they believe that opt-in consent may bias the sample, especially in western countries where parents from a higher socioeconomic background are more likely to respond and opt their children in. The tension between researchers regarding the use of the opt-in or opt-out consent was explained in the literature and it was concluded that this selection should be context-based (Heath et al., 2007). The local host and the ethics committee in Egypt emphasised the importance of using the opt-in consent in Egypt as opt-out consent may cause problems with parents, therefore, this approach was used in this study.

Permission to audio-record interviews/FGDs and use all the collected and recorded information in analysis and publications, after anonymization, was obtained from all participants, staff and pupils, plus parents/guardians. With permission, all FGDs and interviews (except two interviews) were audio-recorded. Two female teachers consented for interviews without audio-recording, so notes on these interviews were taken instead of recording. Because it is difficult to write notes on FGDs without missing important information (Krueger and Casey, 2014, Smithson, 2000), two pupils were excluded from FGDs, although they consented to participate, as their parents refused the recording.

Permission to obtain copies of relevant school documents was obtained from the head-teachers and relevant staff. School documents that cannot be moved outside schools, they

were photocopied/pictures inside the school premises or information about these documents was obtained by interviewing relevant staff.

5.3.8.3 Data management, anonymity and confidentiality

All data collection, collation, storage, transfer, analysis, archiving and destruction were in line with the University of Leeds Data Protection Code of Practice and the local national regulation of data protection in Egypt (Silverman et al., 2007, Sleem et al., 2010, Abou-Zeid et al., 2006) and the guidelines for implementing international researches (Kass et al., 2003, Hyder et al., 2004, Bhutta, 2002, Cash R. et al., 2009). As maintaining the anonymity and confidentiality of participants and their data is paramount during the research process (Piper and Simon, 2005), the following confidentiality and anonymity procedures were applied, clarified in the information sheets, including how anonymous data may be disseminated in the final report, and then iterated when obtaining consent.

Data collection took place in a private and quiet room, in consultation with participants and school managers, within schools to ensure confidentiality and anonymity.

As recommended by Horner (2000) and Alderson and Morrow (2004), before starting FGDs groups were asked to set and agree on ground-rules for ensuring the confidentiality of everything said during the discussion. This included not sharing anything mentioned outside FGDs. Also not to share, during FGDs, confidential information or anything they do not want others to know (e.g. their smoking status, the smoking status of their parents/ guardians or siblings). The agreed rules were written and all participants were asked and reminded to adhere to these rules at the beginning of each FGD.

No personal data was collected except participants' names and contact information for arranging interviews and obtaining parents'/guardians' consents but this information was kept strictly confidential. Data was not used for purposes other than what was agreed with participants.

Each collected data in each school was organized and filed separately and was stored according to the university of Leeds code of conduct. During data filing and transcription, all responses were anonymised by removing the direct (e.g. names, initials, address or contact details), and indirect (e.g. position, job titles) aspects of data from which a participant can be identified. Participants' and school identities were pseudonymised, kept, and will be kept even after publication, confidential. Generic labels (such as gender, role and school type) were used to reference quotes in reports. Moreover, minor details of quotes were changed, when necessary, to hide respondents' identity, as recommended by Ritchie et al. (2013) and Piper and Simon (2005).

All interviews and FGDs were audio-recorded using encrypted recorders. Participants' records were coded, to identify them, and kept separately from consent forms that included participants' names. The codes were in a separate document kept securely at all times. All audio-recordings were deleted, daily, from the recorder after being pseudonymised, encrypted and saved on the researcher's M drive (at the University of Leeds), separately from the encryption keys. Audio-recordings were deleted, once transcripts were typed-up, checked and saved on the University M drive. The University M drive was only accessible to the researcher and was accessed through University-approved methods for accessing the data when working off-campus such as Citrix. This was to ensure its security, backup, and University's requirements. The University's requirements for data security and assessment of information sensitivity were maintained.

Schools documents were anonymised and kept confidential, no personal documents were collected.

During the fieldwork, paper forms of the data and the signed consent forms were kept in a locked filing cabinet in a secure office at Assuit University. All paper forms were anonymised, scanned and saved on the M drive, then destroyed (using paper shredder) once saved on the M drive. Only the researcher had access to the key for the coded and saved data.

5.3.8.4 Protection from harm

Participants were not exposed to direct harm in this study. However, the following were considered to prevent some possible harms.

To protect participants from the risk of displeasing head-teachers, teachers and others, measures on confidentiality and anonymity were used, see above. Participants and class-teachers were informed, in advance, on the estimated time needed for interviews/FGDs/story writing and were consulted on the suitable time for data collection to protect participants from missing core lessons/activities or being overburdened during busy days. Time for FGDs and interviews did not exceed 90 minutes to avoid overburdening pupils and busy teachers, as recommended by Alderson and Morrow (2004). No data were collected during or in the run-up to the exam period as recommended by Gallagher (2009b). Where possible the research activities were linked with existing learning activities. For example, in agreement with teachers, the story writing replaced the writing homework. Neither of those who did not participate in the study was disadvantaged, nor of pupils who contributed lost core subjects, as FGDs did not take place during the time of core lessons

Participants were encouraged to ask questions, raise any concerns and inform the researcher when they are uncomfortable or want to break conversations at any time. During FGDs, pupils were given breaks to avoid distressing them. Lunchtime was not used for data collection, as Arabic people might feel uncomfortable to eat in front of strangers. None of the participants disclosed exposure to harm or being at risk of something.

Measures for protecting the researcher from harm were considered and detailed in a risk assessment form. Social-norm was considered during data collection, including wearing acceptable clothes, speaking a simple and understandable language, considering gender issues and respecting cultural and religious values. No research activities were implemented outside schools, during holiday, weekend or after the end of the school day.

5.3.8.5 Other ethical issues

The mental or physical state of all participants was appropriate for participation, no participant was ill, under the influence of any substances or aggressive. The researcher checked that all the included pictures were allowed to be used for the purpose of the study, depersonalized and anonymized before being used and sources were referenced (Pauwels, 2008, Prosser, 2005).

Participants were not paid for their contribution because financial reimbursement could encourage participants to please researchers and provided incorrect information (Piper and Simon, 2005), and could influence participants' decision to take part in research, especially in poor countries (Bhutta, 2002, Cash R. et al., 2009, Hyder et al., 2004, Marshall, 2007, WHO, 2015a). No travel expenses were provided as all data was collected inside schools where participants usually stay. Refreshments and drinks were provided to thank participants for their time, provide energy during the discussion and avoid dehydration and exhaustion in that

hot weather. However this was not announced, as Orb (2001) and Thomas and O'kane (1998) recommended, to avoid coercing potential participants who are affected by the high poverty rates in Egypt.

The above-explained approaches were discussed with the local host in Upper-Egypt prior to commencing data collection to ensure their compliance with in-country and organisational ethical guidelines.

5.3.9 Other methodological consideration

5.3.9.1 Translation

All Topic guides, information sheet and consent forms were first developed in English then translated, by the researcher, to the Arabic language. The Arabic topic guides, information sheet and consent forms were then back-translated to ensure the translation accuracy, as recommended by (Green and Thorogood, 2014). These documents are in the annexes because the words limit of this thesis did not allow attaching all of them in appendixes.

All data were collected, transcribed and mostly analysed, by the researcher, in Arabic. The limitted time and resources aviable for this study restricted translating all the collected data into English. The used MAXQDA software supports Arabic fonts which facilitated analysing data in Arabic. The findings were translated into English during the analysis to allow supervisors' involvement in data analysis. All the selected quotations were translated into English and then back-translated to Arbaic to ensure translation accuracy.

5.3.9.2 Piloting

All data collection tools, information sheets and consent forms were piloted, by the researcher in a fourth school, before using them to ensure their clarity and appropriateness to the Egyptian context and participants age, as recommended in the literature. Information from piloting was used for improvement purposes and excluded from the analysis (Denzin and Lincoln, 2011, Green and Thorogood, 2014, Patton, 2015a).

5.3.9.3 Validation Methods and Triangulation

This section explains the method used to enhance the validity of the findings of this study.

Triangulation refers to " the observation of the research issues from at least two different points" (Flick, 2004. p. 179) in order to maximize the validity of research findings (Golafshani, 2003). Triangulation strengthens qualitative study design toward an in-depth understanding of the investigated phenomenon (Flick et al., 2004, Patton, 2015a). Several methods of triangulation could be used: 1) *triangulation of data* through combining data collected from different sources from different people at different time; 2) *investigator triangulation* by using different data collectors to balance individual's subjectivity; 3) *methodological triangulation* within methods, for example reviewing several documents, and between methods, by using different data collection methods and compare their findings (Flick, 2004).

In this study, triangulation of data and methodological triangulation was used to validate the findings. Data was collected from documents, staff and pupils through, documents, FGD and interviews. Findings between and within these sources, within and between the three schools, were compared and contrasted for similarities and differences. This is to allow for an in-depth analysis of the findings (Krefting, 1991, Flick, 2004). Moreover, similarities and differences between male and female participants within and between interviews and FGDs findings across the three schools were compared for in-depth analysis of gender differences in the

perspective of staff and pupils toward SBSPIs in boys', girls, and mixed-gender schools. Additionally, document analysis findings were compared for similarities and differences with responses of pupils and staff on the current and anticipated role of schools in smoking prevention, as suggested by .

To validate the findings two researchers independently applied the analytical framework of this study to index a sample (two interviews and two FGDs) of transcripts, compared, contrasted and discussed the charted data to identify any required amendments before indexing and charting the rest of the data by the main researcher. The main researcher was born and raised in Egypt, therefore have an understanding of cultural related issues that might influence the research findings. The other researcher, who is an expert Egyptian academic, was involved as an external supervisor during the early stages of the data collection and analysis to bring more on the local insight and enhance the validity of the finding.

Additionally, deviant case analysis was used in this study as a validation method. Deviant case analysis is recommended to be used in qualitative research in order to provide opportunities for a wider theoretical resonance of findings, demonstrating trustworthiness of findings and their representation of the extend of the existing situation that is researched (Molnar, 1967, Wicks, 2012, Lijphart, 1975). The following was followed in this regard:

- The researcher interchangeably interviewed school-staff and pupils and move between the three schools during the fieldwork to check the applicability of the identified findings to the three schools.
- After conducting two interviews and one FGD in the boys' school, the topic guides were revised and used to conduct one interview and FGDs in the mixed-gender school; based on the initial analysis of these interviews and FGDs, the topics guides were further developed and used to collect some data in the girls' school and then revised accordingly.
- After modifying the topic guides based on the initial responses from the three schools, they were used in the rest of the interviews and FGDs across the three schools.
- Within each school, the FGD topic guide was revised based on the responses from the interviews and vice versa. In the mixed-gender school, two FGDs were conducted, one with boys then one with girls. The FGD topic guide used with girls was further developed based on the initial responses from the FGDs with boys and vice versa.
- Gender-related issues that emerged from the preliminary responses of male and female school-staff and pupils across the three schools were used to develop the topics guides further.
- Data coding and analysis started during the field visit to fill any gap in the collected information emerged during the analysis

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5.3.9.4 Researcher reflexivity

Throughout the process of this study, I have attempted to recognize my own position, beliefs and values and reflect on how they could influence the process of data collection, analysis and interpretation. This section discusses that and provides examples.

It is a challenge for researchers in qualitative research to step outside their own experience to obtain an observer-independent account of the phenomena under the study (Maxwell, 1992). It is therefore, recommended that researchers should reflect on their position during the research process (Golafshani, 2003); this includes reporting their own beliefs, values, assumptions and biases that may have shaped and influenced the research process (Cypress, 2017). Doing so enable the researcher to recognize or suspend their biases during study implementation and allows the readers to understand that (Maxwell, 1992).

At the beginning of this study, I attempted to recognize how my own values, identity and beliefs could influence the study design, data collection, analysis and interpretation, particularly my values and beliefs about smoking, health, religion and gender. For example, I recognized that my identity is grounded in a feminist, open-minded worldview. This made me aim to explore smoking issues among girls as well as boys although teachers and the local host initially emphasised that smoking is not an issue among girls in the conservative society of Upper Egypt. As a person, I am a Muslim Arabic female medical doctor who was raised by highly educated and open-minded parents, lived in several Arabic and European countries and have friends from various culture, religions and ethnicities. This trained me to deal with and respect all culture and religions as well as non-religious people and belief in the individual's right to freedom of religion, values, behaviour and beliefs. At the same time, I recognize the positive and negative influences of religion, values, beliefs and social norms on people's' behaviours, especially at young ages. While I recognize individuals' freedom and acknowledge the positive role religion and social norm have played in preventing adolescents from smoking initiation, at the same time, I have difficulty in understanding adolescents' ability, especially girls, to resist and fight the social, religious and cultural values and initiate unwanted behaviour, such as smoking, in conservative societies, even if this behaviour would affect their health and social status.

Moreover, my own opinion is also grounded by a public health perspective, in which I believe that everyone should be protected from harm, particularly the vulnerable. For example, while I recognize individuals' freedom to smoke or not, I believe that adolescents, especially in some societies, might not have enough information and skills to make informed and responsible decision on smoking. I also believe that harms of some behaviours, like smoking, affect smokers as well as their families and people around them and the whole society, therefore, these people have the right to be protected from harms. This encouraged me to consider exploring individuals' perspectives on smoking as well as social and other wider consequences either in my data collection or analysis and conclude that combining these issues is needed in SBSPIs toward effective prevention of smoking initiation, as discussed in chapter 7 and 8.

My critical reflection on my own values, identity and beliefs has allowed me to suspend them and minimize their influence on the research process as possible. This is through recognizing them, exploring and considering the evidence that supports or contradicts them in order to maintain the critical judgement that is required in academic research. Additionally, using triangulation in data sources and analysis as well as involving another Egyptian researcher in the early stage of data collection and analysis, as discussed in section 5.3.9.3, aimed to

minimize the influences of my personal position on the research process. In spite of all the above, my personal account and interpretation remains one of several possible interpretations of the research findings.

5.3.9.5 Host

The Community Medicine Department at the University of Assiut hosted the data collection process. This involved reviewing the ethics application form; obtaining permission for data collection from the local authorities and schools, on the behalf of the researcher; providing advice on the local context and issues related to data collection such as information on schools and piloting the topic guides.

5.4 Chapter summary

This chapter introduced study-3 of this PhD projects that aimed to explore the current and the anticipated role of preparatory schools in preventing adolescents' smoking in Upper-Egypt. This chapter outlined the study's aim and objectives and discussed the methods. The next two chapters will discuss the findings of study-3. Chapter 6 will discuss the findings on the current interventions implemented in preparatory schools to prevent adolescents' smoking in Upper-Egypt.

Chapter 6 – Findings on Current School-Based Interventions to Prevent Adolescents' Smoking in Upper-Egypt (Study-3 Part B)

6.1 Introduction

The previous chapter explained the methods used to address the aim, objectives and specific questions of the exploratory qualitative study in Egypt (study-3). This chapter explains the participants' characteristics and the interpretation of the collected data about the current interventions implemented in preparatory schools to prevent adolescents' smoking in Upper-Egypt.

6.2 The collected data and participants' characteristics

Data was collected during a six-month period from January to June 2018 in three public schools, a boys', girls, and mixed-gender, in Assuit city. Reviewing online documents took place before and after this period.

The three schools are the oldest among each gender-specific school in Assiut and average in the number of pupils and staff and facilities. While there is a lack of specific data on the socio-economic status of pupils and staff in each school based on staff openion and the resercher's observations and the host, and the three schools are all located in the Middle of Assiut city and serve families with all faiths from low and middle socioeconomic classes. The three schools teach the national curriculum and follow the Ministry of Education policies and regulations, similar to other Egyptian schools.

In total 40 Semi-Structured Interviews and 16 Focus group discussion (FGDs) were conducted and 172 documents were reviewed, see Table 17 for data sources and the amount of data used in the analysis from each source. Using different qualitative data collection methods and conducting this study in three schools, a girls', boys' and mixed-gender, allowed in-depth and multi-faceted explorations of how preparatory schools in Upper-Egypt contribute in preventing male and female adolescents from smoking initiation and how this role could be enhanced within the available resources.

The previously developed questions were revisited to ensure their applicability and clarity to respondents and the topic guides were further developed during the fieldwork based on themes that emerged during initial and ongoing analysis and reflections, as recommended by Harrell and Bradley (2009). For example, some issues were identified as important during the early visits to schools and therefore were included in the topic guide to allow further exploration of these issues in the rest of the interviews and FGDs. When it became evident by the respondents that some of the initially included questions/topics are not important, these questions/topics were excluded from the topic guide. However, the relevance of these issues in relation to gender, interest, personal experience, exposure to smoking and pressure to smoke, nature of staff work at school and relationship to pupils were checked with participants and host before making this decision to avoid omitting relevant issues. For example questions about the current role of parents in smoking prevention at schools were omitted from the topic guide because it was evident after few interviews that parents' connection to schools in the Egyptian context is limited to discussion of pupils' performance. Similarly, pupils' knowledge of barriers of SBSPIs was limited which made some questions irrelevant to them and therefore, omitted from the FGDs topics guide.

All staff and pupil participants were Egyptian who live in Assuit city. As planned, participants were a mix of 40 school-staff and 76 pupils (a ratio of 1:1.9) from low and middle

socioeconomic classes with different faiths, smoking status and exposure to smoking behaviour by relatives, friends and teachers inside and outside schools. This mix brought different perspectives to the collected data. The participants' characteristics are detailed below.No further substantial new information emerged from the collected data after collecting this amount of data. Consequently, it was assumed that a saturation point was reached and data collection was stopped to avoid collecting excess of data that become hard to manage (Ritchie et al., 2003), following the guidance on saturation, discussed in section 5.3.5.

6.2.1 Interviews with school-staff

Forty face-to-face semi-structured interviews were conducted with school-staff participants. It was planned to interview ten staff in each school however during the fieldwork, it was recognized that the mixed-gender school had more staff than the single-gender schools. Accordingly, two more interviews were conducted in the mixed-gender school (13) compared with the single-gender schools (11) in order to reach the saturation point. Some staff were responsible for delivering health educational sessions across schools, therefore, five of these staff were interviewed. The majority of interviews lasted for an hour, with a range of 45-90 minutes. The length of the interviews was dependant on the respondents' role and experience in relation to adolescents' smoking prevention, availability, interest and ability to answer questions and the depth of the provided answers.

There were more female (22) than male (14) staff participants, especially in the girls' and mixed-gender school, see Table 20, whereas more male (7) than females (4) staff participated in the boys' school. The gender of staff participants reflects the gender composition of staff in each school. The median age of the staff participants was 43 years old with a maximum of 57 years and a minimum of 27 years. All male participants from the girls' school were above 50 years as young males are unlikely to work in girls' schools as the culture discourages girls' contact with male adults. All staff participants hold at least a bachelor's degree, except three who hold undergraduate diploma. The median years of participants' work experience in preparatory-schools were 17 years (a mean of 18.6 years, ranged from four to 35 years) with an average of 17, 18 and 14.5 years of work-experiences in boys', girls' and mixed-gender preparatory schools respectively. The average work experience of participants was 12.9 years with a maximum of 26 years and a minimum of two years. This range of experiences informed the collected data on what works and could work in school settings to prevent adolescents' smoking.

The study did not investigate participants' smoking status in detail as this might influence their responses and decision to participate. However, staff with different recognized smoking status were recruited to identify responses' differences between smokers and non-smoker staff on smoking inside schools and how pupils could be protected from it. Based on self-reporting, 58% of staff participants never-smoked, 5% only experimented smoking once or twice in their life, 12.5% are current-smokers and 5% quit smoking. About 15% (6) of staff participants did not declare their smoking status, all of them were females, probably because of the cultural taboo of around females' smoking, as explained in section 3.4.1.2.

The roles of the staff participants include: teaching sciences and (Islam and Christianity) religions to pupils in the 1st and 2nd preparatory grade; engaging with pupils' behaviour such as social workers, psychologists and popular teachers (who were nominated by pupils regardless of what subjects they teach); managing school-policy like head-teachers and their deputies; organizing school health-education; organizing extra-curricular school-activities like theatre, media, assembly and publications; and leading Smoking Control Group at school. Some staff participants play more than one of these roles, therefore they were counted more than once in Table 20. For example, teachers of sciences usually lead health-education activities, teachers of religion also teach other topics, and social workers lead other extra-curricular school activities such as sports, social media or theatre[5].

[5] See the annex for the characteristics of each staff participant.

Table 20 School-staff participants characteristics

The school / Staff	Boys		Girls		Mixed-gender		Total		
	M[6]	F	M	F	M	F	M	F	T
Head-teachers	1	0	0	0	1	0	2	0	2
Head-teachers deputies	0	0	0	1	1	0	1	1	2
Social workers	1	1	0	2	1	1	2	4	6
Psychologists	1	0	0	1	1	2	2	3	5
Teach 1st & 2nd preparatory grades	3	3	4	7	2	6	10	15	**25**
Teachers of sciences	1	1	2	1	0	1	3	3	6
Teachers of religion (Islam)	0	1	0	1	0	1	1	2	3
Teachers of religion (Christianity)	0	1	0	1	0	1	0	3	3
Popular[7] teachers of other topics	2	0	2	4	2	3	6	7	13
Leaders of school-activities (total)	7	5	1	7	4	7	12	19	31
Sports	2	0	0	0	1	0	3	0	3
Media and publications	0	1		1	0	1	0	3	3
Health education inside schools	1	1	2	0	0	2	3	3	6
Social-media organizer	1	0	0	1	1	0	2	1	3
Theatre /roleplay	1	0	0	1	0	1	1	2	3
Vocational training	0	1	0	1	1	1	2	2	4
Smoking Control Group	1	0	0	1	1	0	2	1	3
Library-related activities/Librarian	1	0	0	2	0	1	0	3	3
Age group (years)									
<30	0	0	0	2	0	0	0	2	2
30-50	6	3	0	7	3	6	9	16	25
>50	1	1	2	0	2	3	5	4	9
Years of experience in preparatory schools									
< 5	0	0	0	1	0	1	0	2	2
5-10	1	1	0	2	1	3	2	6	8
11-20	3	2	0	2	1	2	4	6	10
> 20	3	1	2	4	3	3	8	8	16
Self-reported smoking status									
Never-smoked	2	3	2	6	2	6	6	15	21
Current smoker[8]	3	0	0	0	2	0	5	0	5
Quitted smoking	1	0	0	0	1	0	2	0	2
Only experimented smoking	1	0	0	0	0	1	1	1	2
Unreported	0	1	0	3	0	2	0	6	6
Total staff in each school	7	4	2	9	5	9	14	22	36
	11		**11**		**14**		**36**		
Organizers of health education activities across schools[9]	**4**						**1**	**3**	**4**
Total interviewed staff	**40**						**15**	**25**	**40**

[6] M = males, F= females and T= total

[7] Nominated by pupils during FGDs

[8] Based on the GYTS definition, this include regular and occasional smokers

[9] All aged 48-54 years with at least 20 years of experiences in teaching or leading activities at preparatory schools and never smoked, except one smokes heavily.

6.2.2 FGDs with Pupils

Sixteen FGDs were conducted, eight for each gender, four FGDs in each single-gender school and eight FGDs in the mixed-gender school. It was planned to include four to five pupils in each FGD but in two FGDs, one in each of the boys and girls school, six pupils were included as a result of pupils' eagerness to participate. In total 76 pupils participated with 1:1 male to female ratio.

The majority of FGDs lasted for one hour with a range of 60-90 minutes, as it was planned. The length of the FGDs varied by the respondents' exposure to smoking or social pressure to smoke, having smoker relatives or friends, awareness of smoking harms, interest and ability to answer questions and the depth of the provided answers. Participants were keen to follow the agreed FGDs rules, avoid dominance in order to obtain stickers and green flags and get a few red flags as possible.

Almost equal numbers of pupils participated from the 1st and 2nd preparatory grades, aged 11 and 12 years respectively, with an average age of 11.5 years. About 39% of pupil participants have an average school performance while pupils with low academic performance or those with above-average (very good or excellent) performance were equally represented in the sample, 30% of the participants each. Pupils' academic performance was based on their midterm exam results. Almost half (47%) of pupil participants were considered having average social relationships inside the school, 27% were considered socially active, leaders or popular among their peers while shy, quiet pupils or those with limited social relationships were 25% of the sample. Pupils' social relationships were initially determined based on their class-teachers observations then confirmed by self-assesment in FGDs. There is no gender-difference in the age, academic-performance, social relationships of pupil participants.

Participants were not asked about their, or their relatives', smoking status to avoid identifying and harming smokers pupils as schools are required to inform parents if they identify smoker pupils, also smoker females are stigmatized. However, it was essential to inform the study by responses from smokers and never-smoked pupils and those who have smoker and non-smoker relatives. Therefore, teachers' knowledge of the smoking status of pupils and their relatives was initially used to recruit pupils with different smoking status. Later, during FGDs, more than half of pupil participants reported their smoking status; probably this is because participants were assured about the confidentiality of the declared information, including smoking status. More girls (50%) than boys (29%) did not report their smoking status, fewer girls (18%) than boys (24%) reported experimenting smoking while more boys (37%) than girls (32%) stated they never-smoked, See Table 21. Some pupil participants also reported smoking status of their friends and close-relatives such as father, brothers or uncles. More girls than boys reported having smoker relatives, especially those in the girls'-school. Participants' characteristics[10] reflect that the sample included a mix of pupils in terms of their friends' smoking, parents' education and the practiced sport and hobbies.

[10] Detailed in the annex

Table 21 Pupil participants characteristics

The school / Pupils	Boys	Girls	Mixed-gender		Total		
	M	F	M	F	M	F	T
Preparatory grade (age)							
- 1st (11 years)	10	10	9	10	19	20	39
- 2nd (12 years)	9	9	10	9	19	18	37
Gender	19	19	19	19	38	38	76
School performance level							
- High (excellent and very good)	6	7	5	5	11	12	23
- Average	7	6	8	9	15	15	30
- Low	6	6	6	5	12	11	23
Social relationships[11]							
- Class leaders, popular /socially active	6	5	5	5	11	10	21
- Shy / quiet / has limited friendship	5	5	4	5	9	10	19
- Average social relationship	8	9	10	9	18	18	36
Family smoking							
- Yes	5	10	9	8	14	18	32
- No	13	9	10	11	23	20	43
- Unclear	1	0	0	0	1	0	1
Self-reported smoking status							
- Current-smoker	1	0	3	0	4	0	4
- Only experimented smoking	4	3	5	4	9	7	16
- Never-smoked	7	7	7	5	14	12	26
- Undeclared	7	9	4	10	11	19	30
Total interviewed pupils	19	19	19	19	38	38	**76**

During FGDs, one poster was developed in each school, then checked across the schools to produce one final poster, see section 5.3.6.3.3. Several pictures were used during the FGDs and poster design and all pictures and versions of posters, in all stages, were used within the analysis. Drawn pictures were used first until the participants' requested adding images of internal and external organs of smokers and non-smokers which were added to the discussion, accordingly. The collectively designed poster, Figure 16 page 213, was printed by the researcher and put in place approachable for pupils in each of the three schools. Feedback on clarity and appropriateness of the posters plus suggestions for improvement were collected from pupils and school-staff in following interviews and FGDs.

At the end of the fieldwork, only 20 pupils (out of the 76 participants) returned individual stories, an equal number of stories were collected in the single-sex schools (five in each school) compared with 10 stories in the mixed school, five from each sex. Ideas emerged from the collected individual stories were compared with those that arose from the recorded group stories for differences and similarity (Miles et al., 2014), but no substantial differences were identified between the two sources in relation to pupils perspective on SBSPIs.

[11] first identified by teachers then conformed by self-determination

6.2.3 School documents

In total 172 school documents were collected and subsequently reviewed in this study. Table 22 summarises the types, number and dates of the documents reviewed in each school. The number of available and accessible documents varied across schools. For example, girls' schools had more available and relevant documents than either boys or mixed-gender schools, partly because of its good archiving system but also because of its active smoking prevention school committee that produced more antismoking educational materials than the other two schools.

The collected data revealed that the Ministry of Social Solidarity has established addiction control and treatment fund which has branches in all the Egyptian governorates, including Assuit. This fund developed four manuals used in smoking-related education and training which are sometimes used in preparatory schools. Accordingly, these four documents were reviewed in this study. Contents of these manuals are explained under relevant themes.

Table 22 Documents reviewed in each school

Documents	Date	Number
All school curriculum	2017/2018	20 books, 5 for each term[12] in each grade
School policy	In the last 5 years (2013-2018)	3*
School regulatory documents	2017/2018	3*
Annual reports of health education activities	2016/2017	3*
The annual plan for school health education activities	2017/2018	3*
Annual report of extra-curricular school-activities	2016/2017	3*
Annual report on summer activities	2017/2018	3*
School webpage	March 2018	3*
School page on Facebook	December 2017 – December 2018	3*
School-posters	Everything available inside school premises	32 in mixed-gender school, 23 in boys' school, 43 in girls' school
Newsletters	2017/2018	9 in mixed-gender school, 7 in boys' school 14 in girls' school
Annual report of the media group	2016/2017	3*
Annual plans of media school-activities	2017/2018	3*
Annual report of the theatre activities	2016/2017	3*
Annual plan of theatre school-activities	2017/2018	3*
Annual report of the music group	2016/2017	3*
Annual report of the library activities	2016/2017	3*
List of topics covered in school assembly	2016/2017 & 2017/2018	3*
Documents of school smoking-prevention-committee	Everything available	5 in girls' school[13]

[12] The school year includes two terms in Egypt.

[13] None was available in the boys' or mixed-gender school

Manuals of smoking prevention	Everything available	4
Total		172 documents

Note: * means one in each school

6.3 Findings on the current SBSPIs in Upper-Egypt

This section explains the findings of what interventions are currently implemented in preparatory schools in Upper-Egypt to prevent adolescents from smoking initiation. The findings from all data sources in the three schools were integrated and differences between schools, gender, staff, pupils and documents were commented on only if exist.

Following an iterative process of coding, 16 themes emerged from the data. These themes were synthesised under six meta-themes that explain what intervention functions are currently used in preparatory schools to enhance pupils' capability, opportunity and motivation to avoid smoking (Table 23). Each theme is explained in a separate subsection below. The ways in which the codes related to each theme, intervention function and COM-B component are summarised in Appendix J.

Table 23 The coding frame on the current SBSPIs in preparatory schools, Upper-Egypt.

Emerging Themes	**Meta themes (Intervention functions)**		**The COM_B components**
- Brief and limited curricular information - Limited and opportunistic extracurricular educational sessions/lectures at schools - Few old unattractive anti-smoking school-posters - Limited use of plays/drama in anti-smoking school education	Insufficient knowledge are provided at schools on smoking harms		Psychological capability
- Egypt-specific simplified training manuals on skills for smoking prevention exist - Few pupils were trained on skills to avoid smoking	Providing skills to avoid smoking		
- School policy bans pupils' smoking in school - Random screening of pupils and places for smoking or cigarettes	Banning smoking or carrying of cigarettes by pupils inside schools		Physical opportunities
- limited restriction of smoking by adults, as role models for pupils, in schools	Through organizational facotrs	Creating anti-smoking social-norm at schools	Social opportunities
- Create anti-smoking social norm by establishing Smoking Control Group at schools			
- Sustaining social norm of non-smoking girls			
- Use peer influence to enhance non-smoking behaviour -	Through individual facotrs		
- Creating expectations of punishments when pupils smoke			Reflective motivation

- Requesting making written commitment / decision to avoid smoking	Persuasion and coercion toward decision making to avoid smoking	
- Punishments according to school policy - Social punishment by announcing names of smoker pupils - Informal punishments by teachers to discourage smoking by pupils	Feeling anticipated penalty when pupils smoke or carry cigarettes	Automatic motivation

6.3.1 Psychological capability: Insufficient knowledge provided on smoking harms

This meta-theme explains the smoking-related information delivered at preparatory schools from different sources. The main sources of smoking-related information in the visited schools were: school curriculum, extracurricular education sessions, school poster, and role-plays. The following subsections explain the information provided through each of these sources.

6.3.1.1 School curriculum includes brief information on some smoking harms in some subjects

The collected information indicates that the current school curriculum covers brief, limited and sometimes optional information on some smoking harms. All data sources indicate that the existing curriculum information is about smoking in general without specifying types of smoked tobacco. Harms of Shisha smoking was not specifically mentioned in the school curriculum. Reviewing the school curriculum of first and second preparatory grades revealed that some information about some smoking consequences are included in the following subjects: Sciences, English, Arabic, and religious studies. However, this information is incomplete, too short and requires additional explanations. For example, the sciences' subjects only include less than three lines about harms of smoking on pregnant women and the environments in two lessons; one about human's reproductive system and the other is about negative impacts of chemicals in the 2nd and 1st preparatory grades respectively. Most pupils and staff participants emphasized the lack of details and insufficiency of the curriculum information and explained that this reduces pupils' opportunities to become aware of smoking harms. For example, a boy with an average academic performance said:

> *"I know everything in our school books but I don't read other books…. Most pupils know only what is in school books, only few genius pupils read other books…if school books have more information on smoking we will know more about it because you have to know everything in your books, to pass the test…"(Boy, mixed-gender school)*

All teachers highlighted the difficulties of raising pupils' awareness of smoking harms through lessons, based on the current limited curricular information because of teachers' busy schedule and the dense curriculum which teachers should cover. A teacher who is keen to raise pupils' awareness stated:

> *"The sciences book includes a line in year one and two lines in year two about smoking harms at the end and among other information…. if I don't stop and explain these harms, pupils will not realize these harms but not all teachers do that...Teachers should finish the curriculum which will not finish if we explain everything"(Male teacher of sciences, girls' school)*

All experienced teachers of sciences indicated that a complete lesson about harms of smoking on health and addiction were remved from the 1st preparatory grade curriculum two years ago. Teachers indicated that they were neither consulted on this cancellation nor informed about the reasons for cancelling this lesson as the decision was made centrally in the ministry of education.

> *"A complete direct lesson on smoking harms on health was in sciences' lessons of grade one but it is completely removed in the new curriculum, I don't know why…. Teachers have never been consulted on curriculum... the ministry gives teachers what they should teach and we just cover it"(Female teacher of sciences, boys' school)*

Some boys and girls in the 1st preparatory grade, who left primary schools a year ago, indicated that smoking harms on health were taught in sciences' subject in primary schools. A girl with excellent academic performance stated:

> *"I read about smoking in a sciences' book of primary school, I think it was year four, …I remember smoking harms the respiratory system"(Girl, girls' school)*

However, most pupils respondents don't remember receiving this information in primary schools.

> *"My sister said they had a lesson on smoking…she is in year five primary school but I don't remember we had that lesson two years ago"(Boy, boys' school)*

The collected data revealed that the English-language book of grade one includes one lesson, of two pages, about smoking harms on health and fitness. All pupils mentioned that this lesson was taught in the English language in the three schools. Most staff participants believe that this English lesson does not necessarily improve pupils' awareness as most pupils don't fully understand the included information partially because: 1) most pupils don't know smoking harms in Arabic, their first language; 2) pupils struggle to understand English vocabulary, as English-language is only one subject; 3) teachers are not allowed to speak Arabic in English lessons to explain concepts.

> *"Pupils come with limited information on smoking harms in Arabic, they want to understand more about that but their English is weak and I can't speak Arabic or translate vocabularies to Arabic, I will be fired if I do that… so I just carry on or ask good pupils to explain to weak pupils in the break… I can't do anything to help them…these harms should be taught in Arabic first"(Female teacher of English, girls' school)*

Most pupils' respondents, including those with excellent academic records, stated that they study English to improve their language, not to understand concepts included in English subjects. Many pupils indicated that they just memorized the vocabularies included in this English lesson without full-understanding their exact meanings. A boy with excellent academic performance stated:

> *"English is hard, you have to remember many vocabularies to pass the exam… I did not understand everything the English teacher said last week about smoking but I knew from pictures in the book that smoking makes your lung black but I don't know how this happens!"(Boy, mixed-gender school)*

The collected data revealed that the Arabic-language book of grade two included two pages, for optional reading, explaining the social consequences of smoking and reasons for the social unacceptability of smoking. All pupils emphasised that these social consequences were not taught in classrooms. Teachers explained that school books in Egypt include essential information which should be covered in classrooms and extra information which is for further reading at home if pupils are interested. Teachers of Arabic subjects indicated that the social consequences of smoking were not discussed in lessons and they asked pupils to read this information at home. Most staff and pupils respondents highlighted that pupils don't read the optional information because it is not included in exams.

> *"The Arabic book includes two types of information: essential information which should be taught by teachers and included in exams and optional information which read by pupils at home if they want…two pages in year two book explain how smoking breaks social relationships, but they are for pupils' knowledge if they want... I asked pupils to read the two pages at home... I am sure the majority did not, they hardly study essential lessons and we don't have time to cover all topic in lessons… so consider this information as never exists"(Female teacher of Arabic and religion, mixed-gender school)*

The curriculum of Islamic and Christian religion differ, as was concluded from documents review, FGD and interviews. The first one does not include information on smoking directly or indirectly in the first or second preparatory grades. While the school's book on Christianity for first preparatory grade (The Egyptian Ministry of Education, 2019) includes a unit about behavioural values which explains the following: 1) criteria for selecting good friends which included non-smoking; 2) how bad friends encourage pupils to smoke; 3) then brief explanations of how smoking could lead to addiction and harm mental and physical health; 4) followed by a section titled `Your body is the temple of the soul and your health is its weight so preserve your health` which encourages pupils to avoid smoking, and other harmful behaviours, to preserve their health as part of their religious values. Staff explained that the book about Christianity is only taught to Christian pupils and the book on Islam is taught to Muslim pupils only. All boys and girls and teachers of religion emphasised that all the included information in the books about religions are explained in lessons and none is optional. This variance in the curriculum contents, which are compulsory, may explain the variations in pupils' awareness of smoking consequences within the same class.

6.3.1.2 Limited and opportunistic extracurricular educational sessions at schools on smoking

This theme explains the smoking-related information delivered face-to-face to pupils through extracurricular educational sessions or lectures which are defined as optional sessions delivered at schools where some pupils and staff were invited to attend based on selection by staff or pupil's personal preference.

The document review revealed that delivering knowledge on smoking harms is included in the annual plan of the health education and smoking control groups of the three schools. Most staff respondents in the three schools stated they are unaware of any formal extracurricular educational sessions or lectures delivered for pupils in their schools on smoking harms in the past five years. Few staff, including those who head smoking control groups, mentioned that only one extracurricular lecture on smoking harms was delivered in each of the mixed-gender and girls' schools, a year and two years ago respectively. The head of the Smoking Control Group in the mixed-gender school mentioned that the school was selected by his friend who

leads an NGO active in smoking control based only on their friendship neither because of having smoking problems among pupils nor as part of planned activities by or for this school, as the quotation below indicates:

> *"One of my friend Dr [name] has smoking control NGO in Assuit is interested in educating pupils on smoking…. He suggested to deliver extracurricular lectures in my school, I said ok then he did it once last year… we chose pupils who have records of smoking inside the school to attend his lecture… the lecture was never repeated as we don't need it… smoking is not a big problem in our school…. it just came by chance when we met at a wedding last year"(Male social worker, mixed-gender school).*

The quotation above indicates that even heads of smoking control groups at schools believe that delivering extracurricular knowledge on smoking harms at schools should be only done if pupils' smoking is prevalent. In contrast, the girls' school was randomly selected by the National Addiction Control and Treatment Fund for a five-day extracurricular training course on preventing pupils' smoking although girls' smoking is not an issue for this school. Girls and some staff in this course were informed about smoking harms and trained on skills needed to avoid smoking. Section 6.3.2 discusses these skills.

None of the participants mentioned that any extracurricular sessions or lectures were delivered at the boys' school in the past five years, although it was consistently among options for health education sessions and Smoking Control Group's activities.

The researcher explored the educational sessions delivered by the Addiction Control and Treatment Fund in preparatory schools, through its website and online-published resources and school staff who dealt with this fund. The result demonstrated that this fund delivers educational lectures on smoking and addiction that target youths in universities, clubs, social gatherings, secondary schools and sometimes preparatory schools. The online weekly-updated reports of the fund-supported educational sessions indicated that only a few lectures delivered in few preparatory schools across the Egyptian governorates in the past two years (2018-19)(The Addiction Control and Treatment Fund, 2019). Staff respondents who are familiar with this fund emphasised that preparatory schools are targeted by the fund's educational sessions only if pupils' smoking is an issue in these schools, otherwise older ages are usually targeted. The organizer of the fund's educational lectures for youths, including preparatory schools pupils, in Assuit governorate stated:

> *"We [the fund] target preparatory schools only if social workers' reports show large number of pupils were caught smoking inside schools... this year, we targeted two preparatory schools in Assuit, they are in rural area famous of smoking and Hashish [cannabis]"(Female leader of social workers at the Ministry of Social Solidarity, Assuit governorate)*

The above quotation indicates poor emphasis on primary prevention of smoking in preparatory schools.

Some pupil respondents, all in the boys' school, stated that they have not received any extracurricular sessions or lectures on smoking harms in their preparatory school.

> *"We never ever heard anyone in this school talking about smoking harms ... no one talked to us in Arabic about smoking"(Boy, boys' school)*

Only a few pupils in the girls' and the mixed-gender schools, boys and girls, mentioned that they either attended smoking-related educational lectures or training implemented in their schools or heard about that.

> *"I never attended lectures on smoking in this school and no one told me that he or she attended lectures about smoking here, I know almost all pupils in this school.. I don't think the school delivered one this year or previous year"(Boy, mixed-gender school).*

Those, pupils and staff, who attended or knew about smoking-related extracurricular sessions or lectures delivered at their schools emphasized that a limited number of pupils were invited to attend these events due to small room capacity. Most staff who organized these sessions in preparatory schools indicated that a maximum of 40 pupils (out of 300-400 average pupils per school) who ever smoked, current-smokers or have clear intention to smoke selected by schools social workers are usually invited to attend these sessions. While pupils with unclear smoking history or undeclared intention to smoke were never been invited to attend these educational sessions. This indicates that a limited number of pupils benefit from the current extracurricular school education on smoking harms before they initiate smoking. One girl said:

> *"I urged the teachers to let me attend just one lecture on smoking, I needed to know more about smoking to convince my dad to stop smoking but the miss said: no, the room is already full"(Girl, girls' school).*

The above quotation indicates that some pupils, including girls, were denied obtaining knowledge on smoking harms due to the limited schools capacity to deliver enough extracurricular sessions, although they need this information, and they may have communicated their need clearly, to benefit other people around them like family members. In contrary, some girls and boys stated that they refused or will refuse to attend extracurricular sessions on smoking, if were offered, or will not admit attending these sessions, if they were forced to attend, unless all pupils in the class were targeted; because being selected among others to attend smoking-related extracurricular sessions/lectures would give impression that they smoked. One girl who is a leader among peers and has two smoker relatives said:

> *"I and most girls in this school never attended lectures on smoking …I don't think I would like to attend one if only few girls will attend... Other girls will think we were selected because we smoke, unless the whole class go they will not believe we don't smoke, so why I have to put myself in this dilemma"(Girl, girls' school)*

Staff participants who were involved in the smoking-related educational sessions by the Addiction Control and Treatment Fund mentioned that each of these sessions is a two-hour lecture usually co-delivered by a medical doctor, who covers smoking consequences on health and a sociologist, who explains social consequences of smoking and association with addiction. Sometimes, a religious leader is also involved to explain the religious prohibition of smoking. For example, a staff who participated in delivering these sessions in preparatory schools during the last 10 years stated:

> *"In these educational sessions by the Fund medical doctor and sociologist from the university explained to pupils how addiction could start from a cigarettes what will happen then and how to seek help in case of addiction…sometimes religious leaders from Al-azhar [Islamic authority] and the church also explain that religion prohibits smoking "(Sm-ES1, male medical doctor, works in smoking prevention across preparatory schools, Assuit)*

Those who attended smoking-related extracurricular sessions or lectures at their schools emphasized the complexity of the provided information plus the uninteresting lecturing style used and the limited time given for pupils' questions. These issues were also emphasised by staff respondents who were involved in organizing smoking-related extracurricular sessions in the three schools. A leader of social workers who organizes educational sessions on smoking across schools stated:

> *"I think these lectures are useless because lecturers talk all the time, so pupils become uninterested to hear them, a short time was given for questions and discussion as lecturers are busy and leave the school after lecturing… These lectures always delivered by academics and medical doctors who are impatient and were not trained to deal with kids, they expect more respect! They usually don't come back again to schools" (Female, leader of social workers at the Ministry of Social Solidarity)*

The collected data, and as the above quotation indicates, shows that the current smoking-related extracurricular educational sessions in schools are delivered by external experts, mainly doctors, religious leaders or academics, who lack the right capacity and skills to provide an interesting educational event for pupils at school age. This limits the benefits of these delivered sessions in convincing pupils that smoking is harmful. However, one staff participant indicated that the National Addiction Control Fund trained some experts on how to present simplified information on smoking harms in attractive ways to pupils and were supported by manuals that include the training contents, as stated in the quotation below:

> *"The Addiction Control Fund trained some people to deliver educational sessions to youths in simple and convincing ways. They are doctors, religious leaders and sociologists who work with pupils' smoking or active in smoking prevention. We have been working with them and the Addiction Control Fund for years … The lectures' contents are available in the funds' manuals"(Male medical doctor, head of smoking prevention NGO in Assuit)*

Other respondents did not mention this training or any manuals used in smoking education. However, the documents review identified three manuals, available online, developed by the national fund for addiction control and used in smoking-related education at schools, including preparatory schools, across Egypt, which the above quotation mentioned. The information in these manuals are tailored to the Egyptian context on the following topics:

1) An education manual explains the followings: 1) social and health consequences of smoking and addiction; 2) position of religions (Islam and Christianity) about smoking and addiction; 3) methods of preventing and treating smoking and addiction; 4) and legal punishments applied in Egypt in case of drug abuse and addiction which explains that smokers are not legally punished but more likely to use other illegal substances.
2) A directory for preachers in raising awareness of the dangers of substance abuse, including smoking, and addiction. This directory includes followings in relation to smoking: 1) a chapter encouraging religious leaders to warn people, including pupils, against smoking. 2) Explanation of smoking-related issues to be raised in religious speeches such as the importance of protecting health, life, money, and mind in religions. 3) Summarised information on smoking consequences on physical and psychological health, social and family life and income. 4) Examples of written religious speeches used to raise awareness against smoking.

3) A medical manual explains types of addictive substances, including tobacco, methods of preventing and identifying addiction, including young addicts, and steps and procedures followed in addiction treatment and smoking cessation

Of the staff interviewed none were aware of the above manuals being distributed to schools. Nor were staff aware that the manuals were available online. Most staff respondents explained that school-staff never participated in delivering extracurricular educational sessions on smoking although they are capable to educate pupils because they lack detailed knowledge and resources that could be used to educate pupils on smoking harms.

> *"I think school-staff know better than doctors on how to speak to pupils and they exist in school for further discussion and answering pupils' questions in simpler ways but we don't have enough information, videos or pictures to do that"(Female social worker, mixed-gender school)*

All staff respondents in the three schools mentioned that the schools social workers and psychologists run individual extracurricular sessions with pupils to explain smoking consequences only if they were caught smoking or carrying cigarettes inside schools. The large pupils/staff ratio hinders expanding this extracurricular discussion to all pupils before they initiate smoking as the quotation below indicates:

> *"When we find pupils smoking inside the school or have cigarettes, social workers and I sit with them individually in four-five education and rehabilitation sessions and we tell them smoking leads to illness social and financial problems…we can apply punishment on you but you need to help yourself and don't smoke anymore.. but it is impossible to explain these smoking harms to all pupils …we have other things to discuss as well… they are 600 and we are just four. We tell everyone that smoking is not allowed inside schools, they should know smoking is not good for them from the society and familes"(Male psychologist, boys' school)*

Some staff and boys in the mixed-gender and boys' schools also mentioned that some teachers voluntarily deliver short extracurricular sessions explaining smoking harms to the whole class before or after their lessons when they knew some pupils smoked inside or outside schools.

> *"if pupils smoke, some teachers tell pupils about smoking hazards in five to ten minutes before or after their lessons… teachers are too busy and cant do more than that"(Male teacher of vocational training, mixed-gender-school)*

Other boys in both schools mentioned that such extracurricular sessions were initiated by pupils' questions to teachers who did not mind spending a short time explaining some smoking harms during class time.

> *"When we knew the head-teacher expelled boys from school…we asked the teacher for the next lesson about smoking …… He told us that smoking makes you lung black and you might die after few years… it was only 10 minutes then he had to start his lesson"(Boy, mixed-gender school)*

Most girls, in both schools, and some staff respondents in the girls' schools indicated that teachers don't speak to girls in classrooms about smoking outside the national curriculum as girls' smoking is not prevalent and no girls were caught carrying cigarettes or smoking inside schools to stimulate that discussion.

None of pupil participants indicated receiving any information on harms of Shisha smoking through formal, informal, group or individual sessions inside schools. Staff and pupil participants who attended any extracurricular educational sessions in their schools explained

that the information was about smoking in general without specifying harms of different smoked tobacco. When asked, all of them highlighted that the harms of shisha smoking were not specially explained in any session. A medical doctor active in smoking prevention at schools, including preparatory schools, during the last 6 years stated:

> *"no one speaks about Shisha specifically…the focus is on cigarettes because kids in this age if they smoke, they smoke cigarettes. it is easy for them to hide…Shisha smoking can't be hidden... I don't think they think about Shisha smoking… During the past 6 years, I worked in this field I never heard anyone speak to preparatory schools pupils about shisha, they explain smoking in general"(Female medical doctor and academic active in smoking prevention across preparatory schools in Assiut)*

6.3.1.3 Few old unattractive anti-smoking school-posters

This theme explains the utilization of school-posters to deliver knowledge about smoking harms in the preparatory schools at Upper-Egypt. Only two anti-smoking posters were observed in each of the three visited schools. These posters either had no explanatory text or had too much information written in small font sizes and placed in unsuitable locations, like stairs, or dark corridors, which makes them unreadable and unnoticeable by pupils. When asked, staff respondents indicated that these posters were prepared by staff or pupils in health education groups in the three schools, at least five years ago. The posters included either photos or long-text manually-drawn and handwritten on papers placed on walls that are exposed to sun and rain which made them either incomprehensible or unattractive. A leader of a school's health-education stated:

> *"We have one old poster made by health-education group many years ago… it is in the corridor of the boys' building… this corridor is dark… the poster has one hand-drawn picture with no text…a cigarette pulling people by chains around their neck, you need to think what messages are sent by this picture…"(Female teacher of sciences, mixed-gender school)*

Most pupil respondents did not mention school-posters when asked about sources of anti-smoking education in their schools. Only a few pupils mentioned seeing posters on smoking in their schools and some of them mentioned that teachers used these posters to explain smoking harms to them. Those pupils were unable to recall any information presented in school-posters on shisha smoking specifically. The difficulties in accessing information in anti-smoking posters were emphasised by those who had seen these posters in their schools. For example, one boy who likes reading said:

> *"There is a poster on smoking on the stairs but you can't read it easily, as the stairs are always busy. Pupils will push you and may step on you if you stop to read it…It has too many handwritten texts, contents are not clear to me because the sun absorbed the ink and made the paper opaque… I was curious to read that poster, so I waited until everyone entered classes to read this poster….It took me a long time to read it and the teacher shouted at me because I was late to come back to class.."(Boy, boys' school)*

Staff respondents emphasised that the limited schools budgets force teachers and parents to fund making school-posters. This caused using cheap unsustainable materials in designing limited numbers of less attractive posters. Most staff and pupil respondents in the three schools highlighted that well-designed posters were kept for schools competitions rather than been shown to pupils inside schools. For example, a media specialist responsible for presenting the extracurricular school activities to the ministry of education said:

"I know we don't keep good posters to be read by pupils inside the school because I pay from my salary or ask parents to pay for these posters… we keep good posters for schools competition where we have to show what we are doing to other schools and to our managers… I kept this poster [two pages text-article] on smoking harms in school for pupils to read because I just printed the text from the internet, it costed nothing"(Female, media specialist, girls' school).

6.3.1.4 Limited use of drama in anti-smoking school education

This theme discusses the utilization of schools play/drama to educate pupils on smoking consequences in preparatory schools of Upper-Egypt.

Staff explained that school plays are usually used to reinforce pupils' values and behaviour. Topics for plays are selected by staff from a list given by the educational authorities. When reviewed, this list included discussion of smoking consequences among other topics. However, in practice, only the girls' school used a short play to highlight smoking consequences of different body organs, only once during the past five years. The leader of the theatre group in the girls' school mentioned that she downloaded the script online and trained girls to represent this play in the theatre competition between schools.

"I found nice dialog between cigarettes and lungs, brain, hair, skin and mouth, all these organs were blaming cigarettes for harms happened to them while cigarettes replied blaming the person whom they are inside his body for deciding to smoke…. I liked it and decided to use it for schools competition last year… currently, theatre activities are for school completion only… we find relevant scenarios, train girls in the theatre group and present it in front of the competition committee but we never presented anything to girls inside the school but why not we could do that in the future"(Female teacher, leader of theatre activities, girls' school)

The quotation above and all staff and girls (only two) participants who contributed to plays at this school emphasised that this play was not presented to pupils inside the school and was only attended by the judging committee and pupils in theatre groups of all schools that participated in the competition. Other respondents in the girls' school stated that they did not watch this play.

No smoking-related plays were performed in the boys' or mixed-gender schools although they have active theatre groups. When asked, pupils stated that they are not consulted on plays' topics. Staff who contribute in plays in the boys' and mixed-gender schools, who are professionals or interested in theatre activities, stated that smoking is not an attractive topic that makes them win schools competition, so they did not and would not choose it. However, they mentioned that smoking consequences could be presented in short roleplays that are regularly presented by the media group in the morning assemblies inside schools which are attended by all pupils daily. Although the documents review revealed that smoking is an option for short roleplays in the annual plan for the media group in each of the three schools, most respondents from the three schools, pupils and staff, explained that smoking was never represented in the morning assembly in their schools. Staff who lead the media group explained that their lack of knowledge and unavailability of attractive short scenarios hindered representing smoking harms in assembles but they don't mind including it in the future.

"I can't tell you how hard to represent topics in these morning assemblies where hundreds of pupils are there, some talk, make noises in a big space and the microphone does not always work… unless attractive and short scenario represented, the majority wouldn't listen… if you give me a good scenario on

smoking, I will train my pupils to represent it tomorrow…"(Female media specialist, mixed-gender school)

6.3.2 Psychological capability: providing skills to avoid smoking

This meta-theme explains the manual used and training courses delivered at preparatory schools in Upper-Egypt to enhance pupils' skills, as part of psychological capability, to avoid smoking initiation.

6.3.2.1 Egypt-tailored simplified training manual on skills for smoking prevention exist

This theme discusses the availability of a manual of training on skills needed for smoking prevention and their utilization in preparatory schools.

The collected data indicated the availability of training manual which provides information and guidance on delivering skills needed to prevent pupils from smoking initiation. The manual was designed, by Egyptian experts at the National Addiction Control Fund, for training sessions that aim to equip pupils with skills they need to avoid smoking initiation.

The document review revealed that the manual consists of four parts. Part one focuses on the followings skills: problem-solving, recognizing negative peer-pressure and ways for establishing positive peer-pressure, methods of self-explanation and emotions expression. Each of these skills is explained in a separate chapter that starts with simple and concise theoretical information followed by some exercises and scenarios for group discussion. Part two corrects common false beliefs on smoking and addiction in questions and answers format and summarises, in one page, the opinion of Islam and Christianity about smoking and addiction. Part three includes information on cigarettes and Shisha, besides other substances, in term of compositions, symptoms of addiction and the impact of each substance on physical, sexual and psychological health, physical fitness, beauty, hair, smell, teeth and oral health, the environment, income plus consequences of secondary smoking. There is no information provided on e-cigarette which is of increasing importance (Murthy, 2017, Gostin and Glasner, 2014). Part four specifically targets school staff and peer-educators by skills required for educating pupils on smoking issues such as effective communication methods, teamwork and convincing skills.

This training manual is freely available online and written in simple Arabic language to enable the public and professionals to understand and utilize the content. However, almost all staff respondents in the three schools, including those who contributed to smoking prevention activities, were unaware of this manual and never read or used it. For example, the head of Smoking and Addiction Control Group in the boys' school stated:

"We did not get any training materials from any institute or ministry or NGO on smoking …we have some information in the school curriculum or you could search Google for more information"(Male social worker, boys' school)

Only three staff respondents were aware of this training manual: 1) a social worker in the girls' school who was given the manual during a training course delivered by the Addiction Control Fund on smoking and addiction which targeted pupils (girls) at her school. 2) A medical doctor who collaborates with the fund in delivering relevant training courses in schools and keep a hard copy of this manual. 3) A supervisor of social workers across schools who knew about the manual from one of her supervisee social workers in schools targeted by training sessions but did not receive copies of the manual, as she stated below:

"I heard from one social worker that the addiction control fund distributed manuals during a training course she attended… but I was not given this manual when I attended a similar course many years ago! May be because I was just visiting…. but I didn't see the manual myself with anyone else although I attended the five days of that course… I did not ask for it in that course because I did not know it exists"(Female supervisor of social workers across schools in Assuit)

The above quotation indicates that trainees were not always given the training manual or even made aware it is freely availabile online. Also, the staff at the girls' school who received copies of this manual stated that she kept it in a locked cabinet and never been shared with anyone including members of the school's Smoking Control Group to avoid losing it, as its online availability was not known. This lack of dissemination reduces opportunities for accessing the included information and skills, recalling the delivered skills after training and delivering similar training, by trainees, to target other pupils in schools.

The next section explains the utilization of this manual in delivering relevant training in preparatory schools at Upper-Egypt.

6.3.2.2 Few pupils were trained on skills to avoid smoking

This theme discusses that only few pupils in preparatory schools at Upper-Egypt received training about skills to avoid smoking initiation.

All the reviewed documents, FGDs, and interviews show that no training courses were delivered at the boys' and mixed-gender schools to enhance boys' or girls' skills in avoiding smoking. Conversely, documents, members and the head of the Smoking Control Group emphasised that few girls and social workers at the girls' school were targeted by a short smoking-related training course, although no cases of girls' smoking were reported in this school. The head of Smoking Control Group in the girls' school explained:

"Someone from the national smoking control fund visited our school and told us that the fund selected one girls' school, our school, to test girls' understanding of smoking and addiction… Initially, we refused to participate as smoking is a problem for girls in our school but when she showed us this manual [showed it to the researcher] we agreed because it will help girls as future mums to deal with their children's smoking…. The course was for 5 days and we selected girls and social workers to attend … I don't know if other girls' or boys' schools had this training or not. But it was not repeated in our school"(Female social worker, girls' school)

The training was delivered by Egyptian experts who used the training manual of the National Addiction Control Fund, discussed in secion 6.3.2.1. No evidence shows that the training course is planned to be repeated in the girls' school or delivered in the boys' or mixed-gender schools. It appears to be no systematic approach to cover all schools on a regular basis. The approach is haphazard with no clearly recognizable pattern.

"Our pupils or staff did not get any training from any institute or ministry or NGO on smoking… No one told me to deliver this kind of training in our school. If people need to know anything about smoking, they look at the school curriculum or search Google for more information or ask expert, but I don't know any training was done or planned to be done in our school or others schools I know or have friends working there"(Male head-teacher, boys' school)

Some staff participants, mainly social workers, across the three schools positively perceived excluding preparatory schools from smoking-related training courses because they believe that preparatory schools only targeted if pupils' smoking rate is high. This indicates that staff have poor awareness of the importance of preventing pupils' smoking. For example, a leader of the Smoking Control Group stated:

> *"The Smoking and Addiction Fund never approached our school regarding any training on smoking… Honestly, I will feel worried if this happened because this fund approach schools with many smoker pupils which indicates that social workers and management staff don't do their job properly to stop pupils from smoking at schools, so they needed external help... It is a shame and would stigmatize the school, no one would send his children to another school that have many smoker pupils"(Male social worker, mixed-gender school).*

6.3.3 Physical opportunities: restricting pupils' smoking in schools

This meta-theme explains how preparatory schools in Upper-Egypt reduce physical opportunities for pupils to initiate smoking.

6.3.3.1 Banning pupils' smoking or carrying of cigarettes inside school premises

This theme explains the restriction of smoking or carrying of cigarettes by pupils inside the premises of preparatory schools in upper-Egypt. All pupils and staff respondents in the three schools indicated that pupils are disallowed to smoke or carry cigarettes inside school premises and pupils are aware of that as they signed a form, at the time of admission, that they will not smoke or carry cigarettes at school, the form is also signed by their parents. This was also emphasised in one of the reviewed documents on school discipline rules, which explains rights, responsibilities and unacceptable behaviour of pupils, parents, and staff in relation to schools (The Egyptian Ministry of Education, 2016). This document, which is applicable to all Egyptian preparatory schools, includes a clear statement that pupils are not allowed to smoke or bring cigarettes inside school premises then lists three-stages to be followed if pupils smoke or bring cigarettes to school . The first stage, studying pupil's cases by social workers and psychologists at school who then should call and meet parents or guardians at school to inform them about pupils behaviour. Thereafter asking parents and pupils to sign a commitment form indicating that pupils will not smoke inside schools or bring cigarettes again. Seconds stage, if this behaviour is repeated again, pupil's case is referred to senior social workers at the district level and the pupil will receive a suspension from attending school for three days, then a week and two weeks based on how many times pupils broke school discipline rules. In the third stage, the pupil will be expelled from school if repeatedly found smoking or carrying cigarettes inside school premises which means that this pupil is not allowed to attend this school and has to find another school.

> *"First, we call parents, tell them your son smokes and this is not allowed, showing them the rules they both signed. Then we write a memo of what happened...parents and pupils should sign that this will not happen again, this is in the first time. The second time we suspended a pupil for three days then for a week if he smokes again. Next time we give final dismiss from school, bye-bye go to another school we don't want any more headache"(Male head-teacher, mixed-gender school)*

In the three schools, most staff respondents stated that the challenging and strict procedures in dealing with pupils' smoking prevent pupils from smoking and bringing or exchanging cigarettes at least inside school premises.

"School policy disallows pupils to smoke in schools.. It is used in the first place to warn pupils from smoking and makes them feel smoking is wrong and not allowed… Therefore they don't smoke at least inside schools. Even if some pupils want to smoke they will not be allowed to smoke inside schools,…They will be stopped"(Male psychologist, boys' school).

The majority of pupil respondents emphasised that restricting smoking inside schools reduces opportunities for pupils to smoke, even if they want to try smoking. For example, a leader and socially active boy stated:

"I know many pupils, even girls, want to try cigarettes but they can't smoke anywhere... Parents don't allow smoking at home. Pupils are allowed to go outside by themselves only to school but smoking is not allowed in schools, there is no way for them to smoke"(Boy, mixed-gender school).

6.3.3.2 Random screening of places and pupils inside schools for smoking or cigarettes

This theme explains how smoking by pupils is monitored in preparatory schools.

Most pupils and staff respondents highlighted that screening of pupils' bags and clothes is regularly done, in the three schools, at randomly-selected classes and unannounced times to search for cigarettes, and other prohibited items, brought to schools.

"Every few weeks, I or my deputy or social workers ask pupils to open their bags to be seen. Sometimes pupils will also be asked to show what they have in their pockets, especially if they look irritable or previously smoked or their peers observed them smoking. This procedure allows us to identify pupils who carry cigarettes to school …. Pupils don't know which class will be researched and when!.... It all happens suddenly"(Male head-teacher, boys' school)

Participants also stated that hidden places inside schools, like toilets, back gardens, are regularly screened for pupils' smoking.

"We make smoke inside the school difficult for pupils, how? Teachers regularly check toilets, gardens, playgrounds and other hidden places inside schools. At any time, pupils might see teachers in front of them so they don't smoke…No chance…"(Female social worker, mixed-gender school)

These screening procedures are also implemented in the girls' school, although girls' smoking rarely happens in Upper-Egypt at least in public, as the aim is to search for any prohibited items or behaviours.

"We search girls' bags and toilets for cigarettes, make-up and other prohibited things or behaviours inside schools.. we can't control pupils outside schools but at least we try to catch them at schools, pupils can't use schools as gates for bad behaviours"(Female social worker, girls' school)

Staff respondents in the three schools believe that these screening procedures reduce opportunities for pupils to smoke inside schools, as indicated in the above quotation. Many staff explained that pupils who are caught smoking or with cigarettes are usually kept, in the three schools, under close observation by parents at home and by staff inside schools who regularly screen their clothes and bags to prevent them from smoking. Moreover, most pupil respondents emphasised that regular screening prevents most pupils from smoking, exchanging or bringing cigarettes to schools even if they are offered cigarettes or curious to smoke because they believe staff will definitely prevent them.

"Mr…[the head-teacher] can find you if you smoke, even if you are in toilets. once I was in the toilet and suddenly we found him in front of us telling pupils next to me … Show me your pockets and found cigarettes with them, I don't know how he knew…. Pupils believe he has cameras everywhere and afraid to be seen by him if they smoke… There is no chance to smoke inside schools."(Boy, mixed-gender school)

One female psycholoist, explained that years ago a few girls were caught smoking in toilets during regular screening then put under close monitoring, inside schools by staff and outside schools by parents, to prevent them from repeating this behaviour.

Currently, schools in Upper-Egypt don't play any role in restricting pupils' accessibility to smoking in shops near schools.

6.3.4 Social opportunities: creating anti-smoking social-norm at schools

As explained in section2.3.1 social opportunity is defined as opportunity afforded by inter-personal influences, social cues (prompts), cultural norms that influence the way that adolescents think about smoking (Michie et al., 2014a). This meta-theme explains the anti-smoking social-norm at preparatory schools in Upper-Egypt to control social opportunities for pupils to initiate smoking.

6.3.4.1 Limited restriction of smoking by adults, as role models, inside school's premises (organizational factor)

This theme explains how preparatory schools of Upper-Egypt restrict pupils' social opportunities to smoke through restricting pupils' exposure inside school premises to smoking by parents, visitors, and teachers who are role models for pupils.

6.3.4.1.1 Restricting smoking by teachers, as role models for pupils of same-sex, mainly in pupils' presence

The collected data shows that it is not unusual that pupils observe male teachers' smoking inside school premises in the boys' and mixed-gender schools, not in the girls' schools while females teachers never been observed smoking in any school.

The School Discipline document, issued in 2015 (The Egyptian Ministry of Education, 2016), does not refer to teachers' smoking although it includes a section on teachers' behaviour at all schools. Only one old policy document (The Egyptian Ministry of Education, 2001), clearly states that all staff are disallowed by law to smoke inside educational premises and particularly inside classrooms in order to protect the environment and pupils from smoking. However, procedures to be taken or punishments applied when staff smoke inside educational premises were unexplained in school documents.

Most experienced staff respondents in the three schools explained that many years ago the Ministry of Education decided applying financial punishments, paying 10,000 Egyptian Pounds, on teachers who smoke inside school premises but this punishment never been applied and was abolished as this fee was more than the average annual income of most teachers.

"Many years ago, I don't remember when exactly, the Minister of Education said that teachers will pay about 10,000 Egyptian Pounds if they smoke inside schools…. During my 35 years of work, I never heard about any teacher was asked to pay this money… it is impossible to implement this law, no teacher can afford to pay this large amount of money. It is more than my salary for a year… the law was

cancelled and we don't hear about it these days"(Male teacher of sciences, girls' school).

This financial punishment was not mentioned by most of the staff respondents, including the head-teachers, in the three schools, and was not identified in any of the reviewed schools documents. When asked, head-teachers explained that the district education office update schools, at least annually, by documents of school-policies that should be applied and ask schools to destroy documents of old policies to avoid any confusion about the applicable school policies. All head-teachers explained that the current school policies don't apply any financial punishments when staff smoke inside schools, even if they smoke inside classrooms.

All staff respondents in the three schools are aware that they are not allowed to smoke inside classrooms and when it is reported, the educational authorities would send teachers who smoked inside classrooms a formal written warning, kept in their files, not to repeat that. However, all school managers mentioned that when teachers smoke inside classrooms, they are reminded they are role models and should not smoke at least in pupils' presence and it is unlikely to report that to educational authorities because they believe smoker teachers should be helped to quit first.

"We try to cover smoker teachers and encourage them to smoke only inside the teachers' room in pupils' absences. ....We feel sorry for them because they are addicted to smoking and can't stay without smoking during school hours, it is impossible to report them to the educational authorities who would formally warn them"(Male head-teacher, mixed-gender school)

The majority of staff respondents stressed that teachers never smoke inside classrooms in the three schools. However, most staff respondents in boys' and mixed-gender schools explained that some teachers still smoke inside school premises, mainly inside teachers' rooms but sometimes in front of pupils, in spite of their awareness of the law.

"Five percent of teachers smoke inside the school, teachers usually smoke in teachers' room or in the corridors or in front of classes but not inside classrooms"(Male teacher of sciences, boys' school)

Many pupil respondents observed some of their teachers smoking inside the premises of the boys' and mixed-gender schools, mainly in front of classrooms or in corridors but sometimes inside classrooms.

"It is normal to see teachers smoking inside schools… we see teachers smoking everywhere not only in teachers' rooms…. The English teacher gives us tasks to do, then he goes outside classrooms to smoke when he gets nervous. He becomes better after smoking"(Boy, boys' school)

In the girls' school, all staff respondents stressed that teachers only smoke in teachers' rooms. A participant who taught for 21 years in this school, stated:

"Teachers in this school only smoke in teachers' room which is in the other building away from girls… Girls are not allowed to go to the teachers' buildings... if Mrs…[the head-teacher] see a teacher smoking, she will shout at him loudly in front of everyone…She did that once years ago, since then no teacher in this school smoke outside teachers' room"(Male teacher of sciences, girls' school).

The majority of girls in the girls' school highlighted that it is unusual to see smoker teachers.

> *"I never saw teachers smoking in this school,....but in other schools, teachers smoke inside classrooms… I think it depends on the school"(Girl, girls' school)*

During the data collection period, the researcher observed teachers smoking in front of pupils in both boys' and mixed-gender schools but not in the girls' school.

The majority of male and female staff and pupil respondents believe that pupils might imitate teachers when they frequently observe teachers' smoking. Whereas some pupils mentioned teachers' smoking doesn't attract them to smoke, especially if those teachers don't treat pupils well; many pupils who self-reported smoking explained that teachers' smoking encouraged them to try their first cigarette, as a boy stated below:

> *"I get excited to hold cigarettes like my best teacher, I saw him smoking before entering our class, this was cool and he is good in everything"(Boy, boys' school).*

The influence of observing teachers' smoking was also mentioned by some girls in the two schools, as stated below:

> *"A genius teacher smokes, you feel you want to be like him when he smokes then solves difficult maths problems or says something wise"(Girl, mixed-gender school)*

However, most girl respondents in the two schools underlined they are influenced by female, not male, teachers and none of their female teachers smoke.

> *"Girls imitate Mrs not Mrs [female not male teachers]… Mrs [female teachers] never smoke anywhere, so I believe girls should not smoke…I don't care if a Mr smoke, he is male and I am female at the end"(Girl, mixed-gender school)*

> *"if female teachers smoke, girls will copy them, especially if girls like her"(Girl, girls' school)*

Most staff and pupils highlighted the difficulties of preventing teachers, especially heavy and regular smokers, from smoking inside schools during the five hours of school-day.

> "It is impossible to stop teachers from smoking inside school…heavy smokers go mad when they don't smoke and may hit us*"(Boy, mixed-gender school)*

Some staff respondents indicated that restricting teachers' smoking inside schools can't be enforced without having a smoking room for staff and smoking cessation services inside schools.

> *"The law disallows teachers to smoke inside classrooms but many teachers are addicted smoking they can't stay for hours without smoking, you can't apply the law before treating these teachers from addiction…some of them smoke for years, how the school could stop them while they struggle to quit?"(Female medical doctor, activist in smoking prevention across preparatory schools in Assiut).*

6.3.4.1.2 No restriction on smoking by visitors and parents inside schools

The collected data showed that there is no restriction on smoking of parents or other visitors inside school premises according to staff and pupils observations and the reviewed school policy and documents.

> *"Visitors will not smoke inside school only if they are kind and mindful of pupils' observation of their behaviour…We can't prevent visitors or parents from smoking or even tell them not to smoke.. there is no policy allow us to prevent them, so it is up to them"(Male head-teacher, boys' school)*

Most pupils and staff emphasized the cultural unacceptability of asking visitors, including parents not to smoke during schools visit, especially if these visitors fund schools activities or have authority over schools. Some staff believe that allowing adults to smoke inside school encourage pupils' smoking.

> *"Whatever you do will be useless if we don't prevent everyone from smoking inside schools even the president or head-teacher….. when pupils see important visitors are allowed to smoke inside schools, they will imitate them"(Female doctor activist in smoking prevention in schools)*

Many pupils had observed visitors and parents smoking inside school premises while visiting schools. The majority of these pupils expressed willingness to copy visitors' smoking or think it is unfair to restrict pupils' smoking while allow adults to smoke.

> *"Only pupils are expelled if they smoke... schools just want to control pupils... If smoking is dangerous, why are teachers and visitors allowed to smoke"(Boy, mixed-gender school)*

During the field visits the researcher did not see any no-smoking signs displayed at any of the three schools. The researcher also observed some visitors smoking inside the three schools without being told not to smoke inside schools.

6.3.4.2 Establishing Smoking Control Group at schools (organizational factor)

This theme explains the existence of Smoking and Addiction Control Group and its planned and current roles in creating anti-smoking social-norms in preparatory schools.

According to some staff respondents, schools social workers are supposed to establish and supervise a group of pupils (25-50) who are invited each year to take voluntary responsibility for delivering smoking-related educational activities and creating anti-smoking social-norm inside all preparatory schools in Egypt.

> *"Each year, social workers should establish Addiction and Smoking Control Groups in their schools… the group should include a minimum of 25 pupils in each school who with some teachers should, in theory, educate their peers on harms of smoking, drugs and addiction; correct pupils' attitude about smoking and addiction; and put pressure on smoker pupils to stop smoking and tell teachers if they see someone smoke or carry cigarettes inside schools.. these activities don't always happen in reality"(Supervisor of social workers across preparatory schools in Assuit)*

A smoking control group has been established, as indicated by at least one social worker, in each of the three visited schools. However, this group was not recognised by pupil and staff respondents in the mixed-gender school and its leader stated the group is inactive since it was established.

> *"Two years ago, we were asked to establish Smoking and Addiction Control Group. I did that last year. I can give you names of members if you want but honestly, we did not do anything...the school is big and we don't have time or money to do extra activities and smoking is not a big problem for our pupils"(Male social worker, mixed-gender school)*

Although the group should contribute to creating anti-smoking social norms at schools, its activities in the boys' school, was limited to designing one poster on smoking harms placed at the school's entrance to be read by pupils plus a discussion between members about smoking harms on human's organs, without inviting other pupils to attend this discussion. The leader of this group stated:

> *"We [the Smoking Control Group] designed the poster in the entrance... Five members discussed how cigarettes affect smoker's organs…I found the dialogue online, downloaded it and gave it to them to discuss in front of other members... It was a discussion not to play…other pupils didn't attend because they were in other groups doing different activities"(Male social worker, boys' school)*

Similarly, in the girls' school, the group activities were limited to designing posters on smoking harms, all kept for schools competition away from school's girls, as stated by staff and girls. A group member said:

> *"I am in the smoking control group.. we don't do anything, we only designed a poster about smoking harms, last year…This poster won in competition but other girls did not see the poster and we don't have it. Mrs [social worker] saved it somewhere"(Girl, girls' school)*

To enable members to play roles in smoking prevention, some members attended the smoking-related training course, explained in section 6.3.2.2. In girls' school, smoking was excluded from group discussion between members, instead girls' school focused on the addiction of coffee, tea, and medications because the group leader believes that girls don't smoke or are not interested in smoking, as she stated below:

> *"In my meetings with the addiction and smoking group, we discuss how drinking coffee and tea and using medications could lead to addiction… We did not speak about smoking because girls don't smoke in Upper-Egypt but they drink coffee and use tables to concentrate during exam periods" (Female social worker, leader of the Smoking Control Group, girls' school).*

Although names of some of the interviewed pupils were listed among members of the School Smoking Control Group, only one boy and one girl in each of the boys' and girls' school referred to activities delivered by this group in their responses even when the researcher specifically asked them about the group activities in their school. This indicates the poor recognition and infrequency of activities implemented by Schools Smoking Control Groups.

> *"I remember at the beginning of this year Mr [social worker] came to our class and asked who want to join Smoking and Addiction Group, I was selected but we did not do anything"(Boy, boys' school)*

Pupil participants did not indicate that members of the Smoking Control Group specifically report pupils' smoking or put pressure on peers to avoid smoking. Staff explained that these roles are unplanned and could be done by any pupil not only the group members.

Only in the girls' school, the implemented activities by the Smoking Control Groups were documented in annual reports. The Smoking Control Group was rarely mentioned in FGDs and interviews which highlight the poor recognition and inactivity of these groups. This was acknowledged by many staff and the supervisor of social workers across preparatory schools who blamed the busy schedule of social workers and ambiguity of what is expected from Smoking Control Groups to do in schools.

> *"Addiction and Smoking Control Groups are inactive in many schools, we encourage social workers to run this group but we can't put more pressure on them they have many problems to deal with in schools… Also, no one knows exactly what smoking control groups should do in schools, everyone has different opinions"(Supervisor of social workers across preparatory schools in Assuit).*

The collected data shows that there is a lack of training, guidance and mentoring of the activities of schools Smoking and Addiction Control Groups which set local goals and activities vary by the enthusiasm of the leader and members in playing active roles in smoking prevention.

6.3.4.3 Peer influence to avoid smoking (individual factor)

The utilization of peer influence to avoid smoking was rarely presented in staff interviews in the three schools. Staff's indication of using peer-influences to prevent smoking was limited to encouraging pupils to report pupils' smoking or carrying of cigarettes inside or outside schools and cut friendships with smokers.

> *"Pupils are encouraged to report any smoking or carrying cigarettes or even discussions about smoking, we [school staff] take that serious… We tell some pupils to be our eyes between pupils.. Some they report that immediately but others they give them [pupils] chances before telling teachers... This stop many pupils from smoking as they know someone will see them and tell teachers.. This is everything pupils could do to stop their peers from smoking."(Female social worker, boy' school)*

However, this contradicts responses from most pupils who explained that they practice peer influence to avoid smoking through advising peers if they see them smoking, carry cigarettes or express willingness to smoke, then cut their relationship with them until they don't repeat that. Most pupils believe that reporting smoker pupils to teachers is not a good way to prevent their peers from smoking and it could create enemy relationships between pupils as the applied punishment is harsh and they do not want to harm their peers. Some pupils, mainly girls, explained that they put pressure of their peers who smoke or have an intention to smoke by avoiding speaking to them to prevent them from smoking as well as protecting themselves from the shame when being close to young smokers. One popular and socially active girl said:

> *"Last term, Mr [psychologist] found cigarettes in some pupils' bag…….. we [some boys and girls] saw that and encouraged each other not to speak to these pupils until they stop, we like them and don't want them to lose their future by smoking…We also don't want to be called smokers' friends, it is a shame and we will be in trouble if parents or teachers think we smoke… They felt miserable as no one talked to them for weeks…Since then no one saw them touching cigarettes or talking about smoking"(Girl, mixed-gender school)*

The above quotation indicates the influence of peers to avoid smoking, although it is limitedly used in preparatory schools at Upper-Egypt.

6.3.4.4 Sustaining social norm of non-smoking girls (organizational factor)

This theme explains that preparatory schools keep girls' smoking confidential to sustain the social-norm of the unacceptability of girls' smoking in Upper-Egypt. The majority of staff, all in the girls' school, believe that when girls were caught smoking or carrying cigarettes, although this is rare in Upper-Egypt, schools should keep their cases confidential to avoid informing other girls that the social unacceptability of smoking could be broken in Upper-Egypt. One psychologist emphasised that this is how girls' smoking is dealt with in the girls' school and she, and the head-teacher in addition to those who observe the cases were the only people knew about one case of girls' smoking happened in this school. Most staff highlighted that announcing girls' smoking might encourage rebellious girls to try smoking and would stigmatise the school, other girls and staff when the public know that girls smoke in this school, although announcing punishment would discourage other girls from smoking.

> *"The head-teacher found three girls smoking flavoured cigarettes in toilets, she told me because I need to deal with their behaviour, other staff don't know about that… I dealt with those girls without telling others what mistake they did…. Girls' smoking could affect the reputation of the whole school, staff and other pupils.., so we keep it secret"(Female psychologist, girls' school).*

6.3.5 Reflective motivation: Persuasion and coercion toward decision making to avoid smoking

Reflective motivation refres to "the reflective processes involving self-conscious planning, intention and evaluations (beliefs about what is good and bad)" (Michie et al., 2014a. p. 63). This meta-theme explains how preparatory schools in Upper-Egypt reduce pupils' reflective motivation to initiate smoking.

6.3.5.1 Creating expectations of punishments in case pupils smoke

This theme explains how preparatory schools in Upper-Egypt reduce pupils' reflective motivation to smoke by creating expectations of punishment when pupils carry cigarettes or smoke inside schools.

A summary of the school policy of the unacceptable behaviour by pupils, that include smoking and carrying of cigarettes, inside schools and punishments applied when these behaviours are done, explained in section 6.3.3, was copied in different sizes and distributed in different visible locations inside all schools. At least one big-size copy of this summary was observed (by the researcher) in attractive colourful design and visible font size at the entrance of each of the three included schools. All pupils respondents, were met in the last school term, expressed their awareness of the unacceptability of smoking or carrying cigarettes inside school premises. All male and female respondents in the mixed-gender and boys' schools were aware of the punishments applied if pupils smoke or bring cigarettes inside schools premises.

> *"Everyone knows smoking is not allowed in schools and if you smoke your parents will be informed and you will be kicked outside school"(Female, mixed-gender school).*

Whereas only some girls in the girls' school were able to recall these punishments. The majority of girls and staff respondents in the girls' school explained that by the fact that pupils tend to remember applied rules only and as far as they know girls' smoking never happened in their school.

> *"If girls smoke, I think they call her parents… I am not sure…. It never happened in this school… I forgot what will happen, it is written in the big poster outside, all punishments are written there"(Girl, girls' school)*

Most staff and pupil respondents believe that knowing the punishments applied when pupils' smoking or even carrying of cigarettes school premises discourages pupils from smoking at least inside school premises because of pupils' fears from punishments by parents when they know and leaving schools if they smoke. The majority of staff, some boys and all girl respondents believe that difficulties of moving schools after being dismissed stop pupils from smoking or even trying a cigarette inside school premises. All pupil respondents are aware that smoking behaviour will be written in pupils' file which informs managers of other approached school about the reason for dismissing pupils. Most boys, girls and staff respondents believe that schools managers are unlikely to accept smoker pupils because they might break rules and smoke again in the new school. Additionally, all staff respondents indicated that pupils, in the three schools, were informed that the probability of attending a new school after the dismissal is limited to schools that have bad reputations or unaffordable private schools which may not be preferred by pupils or their parents.

> *"School policies discourage pupils from smoking inside schools….. We explain to pupils that other schools don't accept expelled pupils who will only go to rubbish schools where there is improper education or private schools which only care about money. …. Pupils who care about education will not smoke… The majority of pupils at this age and their parents care about education and they know that not all private school provide good education so pupils control themselves and avoid smoking and their parents would encourage that"(Male social worker, boys' school)*

Most boys and girls trust that when dismissed pupils are accepted in another school, the new school will ask them to sign a commitment not to repeat smoking and they will be recognized as smokers which may stigmatise them. Most staff respondents and pupils in the three schools consistently emphasised that pupils' awareness of the consequences of punishments applied to smoker pupils discourage many pupils from smoking, at least inside school premises, even if they are curious or face peer-pressure to smoke. For example, one boy said:

> *"I remember we signed something says what happen if you smoke. But we remember more what happened to pupils who smoke when social workers saw them… Some were kicked from school and they are sitting at home now, no other schools accepted them… This stopped many boys from thinking to touch cigarettes even if friends gave them cigarettes to try one"(Boy, mixed-gender school)*

A head-teacher with 29 years' experience in boys' schools who started smoking at the adolescent age stated:

> *"From my long experience, if pupils and their parents felt the school is serious about stopping pupils' smoking and smoker pupils are really dismissed, other pupils will not think to smoke, at least inside schools. Everyone knows they will not find another school as smokers are not welcomed by other schools"(Male head-teacher, boys' school)*

Some boys, in boys' and mixed-gender schools, and most girls, in both schools, stated they protect themselves from punishments by avoiding sitting next to smoker pupils even if they don't smoke themselves because the smoking smell would exist in their clothes and staff might think they smoke if they were found with smokers.

> *"We were in the morning assembly when Mr [social worker] looked at pupils' clothes to see who did not wear the school uniform, then he suddenly asked my friend to empty his pocket and found cigarettes in his pocket, I think he saw his pocket too full…Now I avoid sitting close to this boy, I don't want to be in trouble if they think I smoke like him…We are scared to touch cigarettes in school or even sit next to smokers anywhere… If school think you smoke you will be punished and expelled"(Boy, boys' school).*

In contrast, some staff respondents mentioned that awareness of prohibiting smoking inside schools and applied penalties not necessarily prevent all boys, from smoking and some boys try to smoke in secret inside the boys' and mixed-gender schools.

> *"Pupils were told smoking is not allowed in schools, they know what will happen if they smoke but you still see some boys smoking in the fourth floor or toilets, I think they take any chance to smoke maybe they will not be seen, this is the age of adventure"(Male teacher of Arabic and religion, boys' and girls' school)*

This was also emphasized by some pupils in these schools who explained that boys were caught, this year, smoking in toilets or back-garden knew that schools disallow pupils' smoking, teachers may see them and will punish them.

> *"We know smoking is banned inside schools but some pupils can't smoke at home and they want to try cigarettes, friends bring cigarettes and push them to try it, so they go and try it in schools toilets, sometimes it passes without teachers' recognition"(Boy, mixed-gender school)*

Many pupils and staff respondents in the three schools stated, as in the quotation above, that pupils who have smoker friends or exposed to peer-pressure to smoke are unlikely to be discouraged from smoking even when they know schools disallow smoking, punish smoker pupils and monitor them.

> *"Most pupils are scared of punishment but some pupils encourage each other to smoke and go together to smoke in toilets or back gardens….They know it is wrong, not allowed and they will be punished but they still try and hide their smoking… Those pupils usually have smoker friends who always speak to them about smoking"(Female media specialist, boys' school).*

6.3.5.2 Making written commitment /decision not to smoke in schools

Data from FGD, interviews and document review from shows that at the enrolment time, in the three schools, each pupil and their parents/guardians receive a copy of schools discipline rules and required to sign a form indicating their awareness of schools discipline rules and commitment to apply them. All schools use one centrally developed form (The Egyptian Ministry of Education, 2016. P.15), that states that `I am [pupil ‘s name] committed not to smoke or use drugs or bring cigarettes or other harmful substances to schools` followed by a statement for parents/guardians that ` I am the guardian of the pupil [name] confirm that I am aware of the schools discipline rules and committed to ensure that [name] will adhere to these rules, this included not smoking inside school. The signed forms are kept in each pupil’s file at schools. Few managers mentioned that at the beginning of each academic year, each pupil should receive a copy of these rules and reminded with their written commitment to apply it. However, most staff and most pupils exaplined that the copy is given only at enrolment time and pupils have accessibility to these rules in different places inside schools.

> *“When you [pupil] register in schools, you need to read the rules and sign that you will follow them and never break them, I remember that form! It had a long list of things to do and don't do, smoking was one of them…Teachers keep it [the form] in your file… If you about to do anything wrong, social workers remind you… [his name] remember you and your dad signed a paper not to do that”(Girl, mixed-gender school)*

All head-teachers, psychologists and social workers in the three schools stated that before applying penalty pupils are usually asked to renew their commitment not to smoke when there is any indication they smoke.

> *“Our role is to protect them from smoking, so we don't punish them immediately, depending on the case….If we feel pupils intent to smoke, or cigarettes found in their page but they say someone gave it to them, we remind them they committed not to do that, we ask them to sign a new one. Sometimes we ask their parents also to sign the commitment form again, parents will understand that pupils did something wrong and will monitor their behaviour more… ”(Female Psychologist, mixed-gender school).*

6.3.6 Automatic motivation: feeling anticipated penalty when pupils smoke or carry cigarettes

Automatic motivation refers to the "automatic process involving: emotional reactions, desires (wants and needs), impulses (urges/ wishes), inhabitations, drive states and reflex responses"(Michie et al., 2014a. p. 63). The collected data showed that preparatory schools reduce pupils' automatic motivations to initiate or continue smoking after experimenting it by punishing pupils who carry cigarettes or smoke inside schools which create negative emotions and impulses about smoking. This will be explained in this meta-theme.

6.3.6.1 Applying punishments stated in school policy

Staff and pupils in the boys' and the mixed-gender school consistently stressed that pupils are demotivated to initiate smoking because schools strictly apply punishments in case pupils are caught smoking or having cigarettes inside schools. In the girls' school, all staff and girl respondents believe that girls' smoking will be harshly dealt with but it never happened.

> *"Schools harshly punished smokers pupils, even if it is their first time or they just carry cigarettes and did not smoke yet... I know many pupils never smoked again or even touch cigarettes because they were harshly punished when they did it in the first time...Punishments work well in this age and demotivate many pupils to smoke whether they feel the punishments themselves or hear from others who were punished... Only some rebellious are not afraid of punishments but they will be stopped and punished if they smoke"(Male psychologist, mixed-gender school).*

During the field visit, the researcher did not observe any pupil smoking inside or around the three schools. However, few boys' were caught smoking in toilets and the researcher attended the investigation following procedures and punishments stated in school discipline rules in the boys' and mixed-gender schools. Similar cases were not observed by the researcher during the field visit in the girls' school or with girls in the mixed-gender school.

6.3.6.2 Announcing punishments applied to smokers

Staff participants in boys' and mixed-gender schools explained that names of pupils who smoked inside schools are announced in school assembly after explaining procedures taken against them, in case of suspension or sanction. The aims of these announcements are 1) further punishment of smoker pupils by making other pupils and staff recognize their smoking behaviour; 2) emphasising that school punishments are applied when pupils smoke; 3) scaring other pupils from facing similar punishments if they smoke inside schools. Many staff and pupils participants explained that this procedure demotivates pupils to initiate smoking as it makes them realize how harsh the punishment of smokers is.

> *"We inform other pupils that pupils were suspended from school because they smoked or carried cigarettes at the school. It is a scandal for them and makes other pupils scared to smoke or carry cigarettes in school... when we started announcing punishments, we get fewer accidents of pupils' smoking at the end...it definitely motivates them to repeat smoking and demotivate others to try smoking as well..."(Male head-teacher, mixed-gender school)*

In contrast, girls' smoking is not announced to avoid stigmatizing other girls, staff and the school, as explained in section 6.3.4.4. Although some staff and pupil respondents in the three schools believe that announcing names of smoker girls would make them ashamed and will not smoke again.

Some staff respondents, especially managers, in the three schools believe that announcing names of smoker boys in schools assembly is more important than considering the confidentiality of pupils who broke schools rules and would teach them and others not to smoke forever.

> *"We announce names of smoker boys in school's assembly explaining they have been suspended or dismissed because they smoked or cigarettes were found in their pockets or bags. I believe this is very important because it makes smoker pupils realising they made a big mistake and don't repeat it again…… This is not a confidential issue, they made a mistake by smoking or bring cigarettes to school, they should be punished and others should be informed"(Male head-teacher, boys' school)*

Some staff respondents in the three schools believe that announcing names of smoker boys or girls makes some of them continue smoking because of willing to recalcitrant, particularly the stubborn ones, or losing hope. For example, a popular teacher with 21 years of experiences stated:

> *"I disagree with announcing smokers' names in schools assembly or newsletters because this cut their way back to the right path in life and may not stop them to smoke... I know many pupils who were caught smoking secretly for the first time. They told me: after everybody else knew, we are called smokers.. Now we don't care and will continue smoking, there is no hope"(Male teacher of vocational training, mixed-gender school).*

This was also mentioned by most boy and girl respondents across schools. For example, a boy who experimented smoking stated:

> *"Sometimes pupils are urged to smoke and they can't smoke in other places, so they try one or two cigarettes in toilets...When schools let everyone know they smoked, they feel want to carry on because others will not forget they smoked one day"(Boy, boys' school).*

Also, a girl who has two smoker brothers explained:

> *"Yes everyone knows the policy but who don't make mistakes, schools should forgive them, they just smoked, they didn't kill someone… My brothers became regular smokers because it was announced to the whole school that they were suspended from school because the head-teacher saw them smoking in the toilet...It was just the second time in their life"(Girl, mixed-gender school)*

6.3.6.3 Informal punishments by teachers to discourage smoking by pupils

This theme explains punishments outside school policies that are applied in preparatory schools on pupils who experimented smoking or have an intention to smoke in order to create negative emotions and impulses about smoking and demotivate pupils to smoke.

Few pupils and most staff in the boys' and mixed-gender school stated that some popular teachers apply informal social punishment on pupils who smoke even outside schools, if seen, to discourage them from smoking again and make other pupils dislike smoking. For example, a girl who self-reported experimenting smoking said:

> *"Without mentioning names, two teachers saw my friend smoking outside the school, they hit her on the head in front of other others, it was not hard but ashamed …They did not tell her parents or the school but they didn't speak to her for three days…she told me it was harsh to be ignored when she spoke to them, they didn't even look at her… She didn't like that because she loves these teachers.. she apologized to them before they treated her normally again… I think this is worse than kicking from the school, If you have dignity you will not smoke… She didn't repeat smoking again, it was too much"(Girl, girls' school)*

After the FGD this girl informed the researcher that she refers in the above statement to herself, not a friend to avoid problems if other staff or girls know she smoked, following the researcher's encouragement of participants to tell depersonalized stories for confidentiality.

The identified informal punishments also include light physical punishments by teachers. For example, a boy who admitted experimenting smoking stated:

> *"Teachers hit pupils if they see them smoking even outside the school and may tell your parents. It happened to me once and I did not smoke again inside or outside schools.. You know they [teachers] do that because they like you... This makes you embarrassed to smoke again.."(Boy, boys' school)*

Many pupils and staff respondents highlighted that informal punishments are usually applied by teachers when pupils smoke outside school. A socially-active boys said:

> *"Good teachers use their power to discourage pupils from smoking, I know someone seen smoking by a favourite social worker, she did not tell him anything but ignored him for weeks. Then when recognising his mistake and cried of her ignorance, she finally spoke to him and asked him not to repeat it [smoking]… Otherwise, parents will be told …. Pupils were kicked outside school only when they smoked inside schools"(Boy, mixed-gender school).*

6.4 Key findings

This study concluded that preparatory schools in Upper-Egypt attempt to enhance pupils' capability, opportunity and motivation to avoid smoking initiation.

Schools provide limited knowledge on few consequences of smoking, mainly manufactured cigarettes not shisha or e-cigarettes, mainly on health, with rare explanations of the religious prohibition of smoking and social consequences. This knowledge are delivered through: 1) brief and limited curricular information on few smoking harms. 2) Targeting few pupils, mainly smokers, by limited, unplanned and voluntary extracurricular sessions/lectures on smoking harms delivered by external experts who provide complex information in uninteresting lecturing style and limited opportunity for discussion. 3) Short smoking-related discussion by volunteer teachers in classrooms, only when pupils are caught smoking in schools. 4) Few old and unattractive school-posters on smoking harms that are not always accessible to pupils. 5) Limited use of plays in anti-smoking school education that target pupils. This delivered knowledge, although limttied, contribute to enhancing pupils' ***psychological capability*** to avoid smoking initiation.

Egypt-tailored training manuals that explain a range of skills needed for preventing pupils' smoking with information and exercises are designed and made available online. These manuals are unknown by most schools staff and were rarely used to train a few pupils, only in girls' school, who are selected randomly. These manuals should be widely distributed and used, through training, to enhance pupils' skills and thus their ***psychological capability*** to avoid smoking initiation.

Pupils' smoking or carrying of cigarettes inside schools is *restricted* and random samples of pupils and places are regularly screened for smoking or cigarettes. This reduces pupils' ***physical opportunities*** to initiate smoking.

Attempts to create anti-smoking social-norm at preparatory schools were implemented through: 1) establishing schools smoking control groups, although mostly inactive, that occasionally discuss few smoking consequences, only among male members, and rarely issued posters on smoking harm on health. 2) Restricting smoking by teachers, as role models for pupils of same-sex, mainly in pupils' presence not everywhere in schools but smoking by visitors and parents is not restricted in any of the visited schools. 3) Enhancing peer influence to avoid smoking by encouraging pupils to report smoking and cut friendships with smokers. 4) Keeping girls' smoking confidential to enhance the belief that girls' smoking doesn't exist in Upper-Egypt and maintain its social unacceptability. These activities contribute to reducing pupils' ***social opportunities*** to initiate smoking.

Schools attempt to enhance pupils' decision making and reasoning to avoid smoking through: 1) creating expectations of *punishments* to be applied in case pupils smoke by informing pupils and parents on the prohibition of pupils' smoking and penalties if pupils smoke inside schools plus announcing names of boys who smoked in schools and their penalties. 2)Encouraging pupils to make written conscious decision to avoid smoking by signing *commitments* not-to-smoke in schools witnessed and signed by parents. These activities contribute to reducing pupils' ***reflective motivation*** to initiate smoking.

Schools create feelings of shame and embarrassment following applying anticipated penalties when pupils smoke or carry cigarettes which contribute to reducing pupils' ***automatic motivation*** to smoke or carry cigarettes. The applied penalties include: 1) suspending or expelling pupils who carried cigarettes or smoked inside schools, if seen, according to school

policy. 2) Announcing names of smoker boys to punish them socially and scare other pupils. 3) Teachers informally apply social and light physical punishments to pupils who smoke outside schools, if seen.

The following barriers of SBSPIs were identified:

- Poor schools capacity and resources restrict targeting all pupils by regular and interesting extra-curricular sessions; staff needs knowledge and resources to deliver smoking-related educational sessions.
- Pupils dislike being selected to attend smoking-related extracurricular educational sessions because others would believe only smokers are invited to these sessions.
- Limited schools resources hinder designing sustainable attractive school-posters and leave them in schools.
- Lack of quitting services and adults' smoking areas hinder preventing adults' and teachers smoking in schools.
- Due to the cultural unacceptability of restricting guests' behaviour, smoking by visitors and parents inside schools is not restricted.

6.5 Chapter summary

This chapter discussed the current role of preparatory schools in Egypt in preventing pupils from smoking initiation. The next chapter discusses the perspective of schools staff and pupils on how schools could contribute better in preventing smoking initiation by pupils and the perceived facilitators and barriers of SBSPIs in Upper-Egypt.

Chapter 7 – Findings on the Anticipated Role of Schools in Preventing Smoking Uptake by Pupils in Upper-Egypt (Study-3 Part C)

7.1 Introduction

The previous chapter explained the qualitative study's findings on the current School-Based Smoking Prevention Interventions (SBSPIs) in preparatory schools of Upper-Egypt. This chapter explains the findings on the views of school staff and pupils about what could be done in preparatory schools of Upper-Egypt to prevent pupils from smoking initiation as well as their perception of barriers and facilitators of implementing SBSPIs. The findings from all data sources in the three schools were integrated and differences between schools, males, females, staff, pupils and documents were explained only if exists.

7.2 How preparatory schools of Upper-Egypt could do better in preventing pupils from smoking initiation

Following an iterative process of coding, 13 themes emerged from the data. These themes were synthesised under seven meta-themes that explain what intervention functions could be used in preparatory schools to enhance pupils' capability, opportunity and motivation to avoid smoking (Table 24). Each theme is explained in a separate subsection below. The ways in which the codes related to each theme, intervention function and the components of the Capability Opportunity Motivation –Behaviour model (COM-B) are summarised in Appendix K.

Table 24 The coding frame on the anticipated SBSPIs in preparatory schools, Egypt.

Emerging Themes	Meta themes (Intervention functions)	The COM_B components
Educating pupils about various smoking consequences	Providing knowledge about smoking consequences.	Enhancing pupils' psychological capability to avoid smoking initiation.
Specifying harms of smoking each tobacco product		
Improving pupils' accessibility to smoking-related information		
Enhancing pupils' skills to avoid smoking initiation.	Provide training on skills needed to avoid smoking initiation.	
Continue implementing the current ban of smoking or carrying of cigarettes by pupils inside schools	Continue banning smoking or carrying of cigarettes by pupils inside schools	Reduce pupils' physical opportunity to smoke at schools

Minimizing pupils' exposure to smoking by staff inside school premises	Creating a smoke-free environment and anti-smoking social-norm at schools.	Reduce social opportunities at schools that enhance pupils' smoking.
Encourage modelling of non-smokers		
Use the influence of peers to prevent smoking and create non-smoking social-norm		
Stimulate thinking of the pros and cons of smoking and non-smoking.	Persuasion toward reasoning and making a self-conscious decision not to smoke.	Enhancing pupils' reflective motivation to avoid smoking.
Use persuasive and appealing methods to raise pupils' awareness of smoking consequences and correct pupils' false positive beliefs about smoking.		
Creating expectations of social punishments when pupils smoke.	Coercion to enhance pupils' decision to avoid smoking.	
Rewarding pupils who never smoked or supported non-smoking	Feeling anticipated rewards associated with non-smoking.	Enhancing pupils' automatic motivation to avoid smoking.
Encourage reducing negative emotions	Encouraging and facilitating alternatives to smoking behaviour.	
Encouraging good use of free time		

7.2.1 Psychological capability: providing knowledge about smoking consequences

This meta-theme explains respondents' views on issues that should be considered in providing smoking-related information through SBSPIs to enhance pupils' psychological capability to avoid smoking initiation. In this regard, three main themes emerged from the data: 1) delivering information on various consequences of smoking; 2) specifying contents and harms of each smoking form; 3) improving pupils' accessibility to information on smoking consequences inside schools.

7.2.1.1 Educating pupils about various smoking consequences

This theme encapsulates the information was considered, by pupils and staff participants, important for raising pupils' awareness of smoking consequences and enhance their psychological capability to avoid smoking. The collected data emphasised the importance of raising pupils' awareness of the short-term as well as the long-term consequences of smoking. The frequently emphasised, by participants, smoking consequences that pupils should know are consequences on: 1) health; 2) beauty and appearances; 3) physical fitness; 4) sexual ability; 5) social relationships; 6) income; 7) others and the environment; 8) the addiction; 9) plus the religious prohibition of smoking.

> *"We should give them a package, explaining how smoking harms their health, beauty, income, people around them, children in the future… How smoking cause aging, hair loss, social isolation, breaking relationships with parents and relatives, shaming their families and parents…Then let them decide to smoke or not"(Female media specialist, boys' school)*

The Problem Behaviour Theory and the Health Promotion Model explain that raising awareness on the short and long term harms of smoking is important base for addressing personality-related factors that encourage smoking (such as risk-taking orientation and curiosity) and enhancing other personality dispositions that promote non-smoking (such as increase personal value of health and physical fitness) (Perry and Jessor, 1985, Jessor et al., 2017b, Donovan et al., 2017). However, the collected data indicated that pupils' consideration of smoking consequences varies by their gender, personal interest and socio-economic and family background. Accordingly, pupils' awareness should be raised on different consequences of smoking to meet pupils' various needs, situations and interests.

> *"Not everyone cares about health, some people care about money, what parents would say or do, how people see them, what is allowed or not allowed in their religion… Girls care more about beauty and hair…Some boys also care about their appearance… All boys care about football… If everyone knows how smoking affects what he prefers, surely no one will smoke"(Female social worker, mixed-gender school).*

7.2.1.1.1 Providing Knowledge on health consequences

The importance of raising pupils' awareness of the health consequences of smoking was heavily presented in interviews and mentioned by some pupils. School-staff explained that some pupils might know the names of some smoking-related illnesses without understanding how smoking causes these diseases and how these illnesses affect body functions or health and quality of life.

> *"This generation knows something about many things but their knowledge is superficial and insufficient…They may tell you smoking causes cancer but they don't really understand what is cancer and what cancer cause in their bodies!! For example, they should know how respiratory system and lung work... How cigarettes and shisha contents disable lung function… Understanding that makes them value their health and protect their bodies by avoiding smoking"(Female teacher of sciences, mixed-gender school).*

Most staff believed that providing detailed information on smoking consequences on health would discourage pupils from smoking.

> *"If pupils know in details about how smoking destroys their health, they will not smoke or at least they will be less daring to smoke"(Female psychologist, mixed-gender school)*

Data collected from pupils highlight their poor awareness of smoking consequences on health.

> *"I don't think all smokers are ill or die early, many of my relatives smoke and they are ok…It may depend on how strong your body is and how well you eat"(Boy, mixed-gender school).*

The analysis highlighted the importance of explaining that the health consequences of smoking take some time to appear on smokers and smoking-related illnesses such as cancer, respiratory and cardiovascular disorders are not obvious in early stages but these illnesses are chronic and fatal.

> *"People say smoking leads to cancer or heart problems and then death but we see many smokers are ok, this makes you think smoking is not harmful to everyone… Pupils need to know how long after smoking these diseases will happen"(Boy, boys' school)*

An important issue emerged from the analysis is that focusing only on smoking consequences on health not necessarily would prevent pupils at adolescence age from smoking because 1) adolescents observe many smokers who appear to have no illnesses; 2) health consequences take long-time to appear while many adolescents are not concerned about their future health; 3) adolescents realize the short-term consequences and what they observe around them more than what may happen in the future.

> *"Even if you explain to pupils what smoking does to their bodies, some will still smoke as adolescents don't care about what might happen in their future, especially illnesses and deaths… Adolescents don't realise what they don't see until it happens…. So pupils should be told about all the problems caused by smoking not only illnesses"(Male head-teacher, boys' school)*

Another important issue emerged from the analysis is that focusing on the fatality of smoking on the long term is not always convincing to Egyptian pupils who believe that the death is pre-determined and unchangeable, so it doesn't matter what would be the cause of death.. For example, a girl who self-reported experimenting smoking said:

> *"Who cares about future …Health or death…We [pupils] care about what happens now.. Everyone will die one-day whether he smokes or not … Pupils need to know what will happen to them now if they smoke not in the future"(Girl, girls school).*

This indicates the importance of emphasising non-health consequences of smoking in educating pupils, as will be explained in the subsequent sections. The Importance of emphasising non-health consequences of smoking in educating pupils is explained by The Problem Behaviour Theory and the Health Promotion Model which indicates that this would influence the behaviour of adolescents who are concern about personal values other than heath such as the value of beauty and appearance, physical fitness, money and social relationships (Perry and Jessor, 1985, Jessor et al., 2017b, Donovan et al., 2017).

7.2.1.1.2 Emphasizing consequences on appearance, beauty and physical fitness

Some pupils and staff participants, mostly females and few males, stated that raising pupils' awareness of the consequences of smoking on smell, mouth, skin and hair would stop many adolescents, especially girls, from initiating smoking because pupils at adolescence age care about their appearance and beauty especially in front of the other sex. A boy who is socially active and self-reported never smoking and no intention to smoke stated:

> *"I think boys and girls would be scared to smoke if they know smoking makes you look old, causes wrinkles and Black Halos and changes teeth colures…. I swear if we tell pupils smoking causes hair fall and loss, no boy or girl will smoke… These days even boys care about their appearances and hair"(Boy, mixed-gender school).*

Boys who like sports, the majority, will consider not-to-smoke if they know that smoking reduces their physical fitness, as heavily emphasised by most pupils and staff participants.

"All boys love football, I am sure they will not smoke after knowing that smoking makes smokers unable to play football…. When I see boys lost their fitness I know they started smoking…Many of them stopped smoking when I explained to them that this happened because they smoked"(Male,sports teacher, boys' school).

A never-smoked boy stated:

"Many boys see their future in sports and admire it ...Everyone should understand how smoking destroys your future in sports and makes you unable to do any sports …I never smoked because I know that and I love football…"(Boy, boys' school).

The responses above indicate that pupils value their current situation more than their future welfare. So even if smoking has longer-term negative consequences, the current benefits or harms are more valued by pupils. This is called this is discounting which is a common phenomenon of human behaviour (Sozou, 1998), including smoking (Bickel et al., 2008). Therefore, SBSPIs should benefit from these phenomena and emphasise the short-term consequences of smoking as pupils give more value to their current welfare than their future welfare (Tønnesen, 2002, Murray et al., 1984). This has been used to prevent adolescents from smoking in other contexts (Marti and medicine, 2012, Slovic, 2000).

7.2.1.1.3 Explaining consequences on sexual ability

Some male participants (staff and boys) indicated that knowing that smoking could lead to sexual dysfunction would discourage male adolescents to initiate smoke, especially in Upper-Egypt society where masculinity is valued and sexual ability is of importance to all males. A boy mentioned in his written story that:

"I would encourage telling pupils how smoking causes sexual dysfunction… This will encourage many boys not-to-smoke because males in Upper-Egypt are expected to be sexually able and masculinity is important in our society"(Male social worker, boys' school)

A boy who self-reported experimenting smoking stated:

"My dad told me when he knew I smoked if I continue smoking I will have sexual problems in the future and may not have children... ... I never smoked again since I knew that"(Boy, mixed-gender school)

7.2.1.1.4 Explaining the consequences on social relationships and income

Most staff and some pupil respondents indicated that raising pupils' awareness of parents' disapproval and the social unacceptability of adolescents' smoking and consequences of that on their social relationships, would prevent many pupils, especially girls, from initiating smoking before being socially and economically independent adults.

"In Upper-Egypt, smoking by adolescents, especially girls, is refused by parents, families and the whole society…. People believe that smoker adolescents are naughty and were badly reared by parents... Reminding pupils how smoker pupils are badly treated would stop them to smoke, especially girls, as females usually do not break social-norms… I would always speak to boys and girls about how smoking will break their relationships with parents and relatives and stigmatizes their family... Explaining social life difficulties of smoker adolescents will stop many pupils from smoking because they are still young to resist the social and family unacceptability of smoking and consequent punishments" (Female social worker, boys' school).

Some staff and pupil participants stated that awareness of parents' and social unacceptability of adolescents' smoking is insufficient to prevent smoking by rebellious pupils or pupils who have smokers in their family, thus other consequences should also be explained.

The majority of pupils and staff respondents, in both sex, believe that raising awareness of the social unacceptability of females' smoking in Upper-Egypt would prevent girls from smoking initiation. A popular girl who never-smoked mentioned in her written story:

> *"Girls who want to marry, have friends and good social relationships consider how bad our society look at smoker females... Girls will never smoke if they are always reminded that girls are not allowed to smoke Upper-Egypt"(Girl, mixed-gender school).*

Most boys who referred to the impact of smoking on social relationships linked it with the consequences on income and emphasized the importance of raising awareness on both aspects to prevent pupils from smoking. For example, a boy said:

> *"No one will smoke if he knows smoking will make him poor, begging to get cigarettes and unrespectable by other people...Everyone wants respect and good income... If parents disallow smoking, smokers are disrespected for annoying their parents. Parents who allow smoking are disrespected for bad rearing of their children and their smoker children are disrespected because they practice unacceptable behaviour for their age."(Boy, boys' school)*

Some staff and pupil participants trust that explaining the cost of smoking and its consequences on the income of smokers and their families would discourage pupils to initiate smoking.

> *"If you smoke, you are burning the money you or your dad worked hard to get, this makes you decide not to smoke"(Girl, girls' school).*

> *"Counting how much money you lose because of cigarettes or shisha makes you dislike smoking especially if you have not started smoking yet because everyone wants to be rich, travel and have fun."(Boy, mixed-gender school).*

The importance of drawing pupils' attention to the social unacceptability of adolescents' smoking and the social and financial consequences of smoking addiction in preventing adolescents from smoking initiation is explained in some theories such as The Health Promotion Model, Problem Behaviour Theory (Perry and Jessor, 1985, Jessor et al., 2017b, Donovan et al., 2017) and the Social Cognitive Theory which emphasises the importance of social acceptance to individuals at this age (Bandura, 2004).

7.2.1.1.5 Explaining consequences on others and the environment

It was frequently mentioned, in FGDs and interviews, that raising awareness of the consequences of secondary smoking discourages pupils from smoking, as they dislike harming their loved people around them, especially their parents and future children.

> *"Boys and girls should know that smokers blow harm to themselves and people around them… Smokers harm and might kill their future children by smoking next to them or inside houses"(Girl, mixed-gender school)*

The importance of explaining the consequences of smoking during pregnancy in preventing girls' smoking was particularly emphasized, in FGDs with boys and girls.

> *"Girls should know that smoking during pregnancy harm babies and if girls start smoking now they might not stop smoking when they become pregnant.... Even if no one can see them smoking, they know they harm their children... Girls who want to be good mothers will not smoke"(Boy, boys' school)*

Only two girls referred to raising awareness about the environmental consequences of smoking, while no staff and boy participants did.

> *"Pupils should know that smoking causes pollution in our environment and harm all people"(Girls' school).*

7.2.1.1.6 Emphasizing the addictive impact of smoking

Raising pupils' awareness of the association between smoking and addiction was frequently suggested to increase pupils' capability to avoid smoking. The role of drawing pupils' attention to the social and legal consequences of addiction in preventing adolescents from smoking initiation is explained by the Health Promotion Model, Problem Behaviour Theory (Perry and Jessor, 1985, Jessor et al., 2017b, Donovan et al., 2017) and the Social Cognitive Theory which emphasises the importance of social acceptance to individuals at this age (Bandura, 2004). Many staff and some pupils stated that explaining the addictive impact of smoking and the challenges of treating addiction in Egypt as well as consequences of addiction would encourage many pupils not to smoke or experiment smoking.

> *"You can also say, if you start trying shisha or cigarettes once and twice, you may then addict it and could not stop... People who stop smoking after addiction get a headache and be nervous and irritated until they smoke again... Addicts could do anything to smoke like stealing, killing or beating parents …If these problems are explained to pupils before they start smoking, most pupils might not smoke and ask themselves why to smoke from the beginning if smoking causes all these problems"(Male psychologist, mixed-gender school).*

The addictive impact of smoking and consequences of smoking was mainly emphasised by pupils with smoker relatives as they see these consequences in real-life. For example, a girl with smoker relatives stated:

> *"What if a girl tried smoking, found it good and continued smoking until she cannot stop and get used to it... She might smoke heavily and can't hide smoking... Quitting smoking is not easy… Her family will definitely know…. I don't think mindful girls will experiment cigarettes after understanding that addiction is the end"(Girl, mixed-gender school).*

This indicates the role of using real-life stories and observation of addiction consequences on smokers in raising pupils' awareness of these consequences.

7.2.1.1.7 Explaining the religious prohibition of smoking

It was heavily emphasized in FGDs and interviews that for boys and girls from religious backgrounds, they will be convinced not-to-smoke if they are informed that smoking is prohibited by their religion, especially if this message is conveyed by their religious leaders.

> *"Pupils from religious families will not smoke if they are told by religious leaders that Islam and Christianity prohibit smoking"(Male psychologist, mixed-gender school).*

This was frequently stated by pupils who reported never-smoking. For example, a never-smoked girl said:

> *"I don't think religious pupils smoke because it is prohibited to harm your body as was said in the church…. If pupils know that God will ask them about their bodies and why they harm themselves, they will not smoke but they need to be told that by their trusted religious people: priest or Imam"(Girl, girls' school).*

However, some pupils and staff participants mentioned that focusing on the religious prohibition of smoking is insufficient to prevent pupils from smoking initiation, even those who are religious, because of the followings:

1. the influence of the religious messages depends on pupils' faith

> *"Some people wouldn't smoke if they know smoking is prohibited in their religion but others don't care too much about religion…Depends on their family and if they were taught to respect religions or not!"(Boy, boys' school)*

2. There no consistent agreements on the religious prohibition of smoking.

> *"Awareness of religious prohibition of smoking is not enough…Not all scholars agreed on smoking prohibition…… Pupils should be told religious and scientific messages together"(Male teacher of sciences, girls' school)*

3. Considering smoking as a sin might discourage pupils to continue smoking but not necessarily would prevent them from initiating smoking as sins could be forgiven

> *"If pupils consider smoking as a sin only, they might smoke then ask their God for forgiveness, they should know smoking is not only a sin it also harms them"(Female teacher of language and religion, girls' school).*

The Health Promotion Model explains the role of explaining the religious prohibition of smoking in preventing pupils who respect religious values from smoking initiation or those who live in religious environments (Perry and Jessor, 1985, Jessor et al., 2017b, Donovan et al., 2017).

7.2.1.2 Specifying contents and consequences of each smoking form

This theme explains the importance of explaining the contents of each smoking form and harms caused by each component to enhance pupils' awareness of consequences of smoking each type and thus enhance their capability to avoid all forms of smoking.

An Important issue emerged from the analysis is that there was poor awareness among pupils and staff on the harms of different smoking forms other than the regular manufactured cigarettes.

Some pupils believe that the traditional Water-pipe (Goza) is less harmful than regular manufactured cigarettes perhaps due to emphasising the discussion about smoking harms on

manufactured cigarettes with less emphasis on harms by water-pipe. Only a few pupils and staff emphasised that smoking Water-pipe is more harmful than smoking cigarettes, the majority of them obtained this information from self-reading outside the school-curriculum. Most pupils and some staff participants indicated their desperate to obtain information about the difference between cigarettes and Water-pipe in terms of components and harms caused by smoking each type.

> *" Pupils don't know much…. Even the basic information on what is inside cigarettes and shisha are new to them, I felt that in my discussion with some relative adolescents… Boys and girls need to be aware of what each of these contents does to smokers' bodies before smoking their first cigarette…. If they know cigarettes have rubbish, gas, tar, etc., they wouldn't put it in their mouth. They would it is disgusting"(Female psychologist, girls' school)*

The majority of pupils and some staff believe that flavoured cigarettes and flavoured Water-pipe (Shisha) are safe to smoke or at least less harmful than cigarettes, perhaps due to the taste of fruits or chocolates used.

> *"Chocolate cigarettes are full of chocolate, how they harm? … I think smoking apple shisha is ok, instead of eating apples, you inhale it….. Honestly, I am not sure, no one told us about that and I did not read about these types…"(Boy, boys' school)*

Some boy and girl participants indicated they or their friends experimented flavoured cigarettes or shisha because they believe this is harmless. For example, a boy who self-reported irregular smoking stated:

> *"Goza [traditional Shisha] is harmful but the modern Shisha is not harmful… It is evaporated flavours... apple, mint, fruits. .. How these harms. I and my friend smoke them normally but we don't smoke cigarettes because they harm us"(Boy, mixed-gender school)*

The majority of staff and pupils, in both sex, indicated their need to know the components of flavoured-cigarettes and Shisha, how they are different from the regular ones in terms of components and harms when smoked.

> *"Everyone, not only pupils, needs to know that cigarettes are cigarettes, with or without chocolate, apple, strawberry or other flavours they harm"(Male medical doctor, active in smoking-related health education in schools).*

The majority of pupils and staff participants believe that there are no problems caused by using electronic Water-pipe (vapes) and e-cigarettes and they are safe to be used by pupils who never-smoked or those who want to quit. Only a few staff and pupil participants received information on e-cigarettes and electronic Water-pipe, mainly through online search and self-reading.

> *"I heard some pupils saying that a teacher told them that electronic cigarettes and electronic Shisha are not harmful, they are just for decoration and anyone can smoke them... Later one, one classmate told us he smoked his uncle's e-cigarettes, if the teacher said they are harmless, then it is ok to be smoked. …. I personally don't know if this is correct or not, nothing in schools books tell me about that and I never read about that anywhere"(Boy, mixed-gender school).*

The collected data, like in the above quotation, indicates that poor awareness of contents of e-cigarettes among staff and pupils encourage pupils to initiate smoking e-cigarettes which are originally used to enable regular smoker adults to quit smoking while it is not recommended for youth because of its association with the risk of cigarette smoking initiation by schools pupils (Soneji et al., 2017) and unproved safety for adolescents (Gostin and Glasner, 2014, CDC, 2019). This suggests the importance of raising awareness of pupils and staff on components of e-cigarettes and when it should be used.

Some respondents, staff and pupils, stressed that explaining the contents of different forms of cigarettes and Shisha would enable pupils to realize the similarity and differences between various smoking forms in harming their bodies which is important to enable pupils avoiding smoking in general. It was frequently stated, by staff and pupils, that pictures should be used to illustrate components of different tobacco products for better pupils' understanding and easier comparison.

> *"We need pictures showing components of cigarettes and Shisha to educate pupils and let them remember ….When pupils see the components, they feel that smoking these things is disgusting or not as exciting as they initially thought... It is discouraging to smoke when pupils see cigarettes contain: tar which is used on roads, papers and wood to be burned and other rubbish and strange things…"(Female leader of social workers responsible for health education across schools in Assuit)*

The collected data indicated the importance of explaining other consequences of all smoking forms not only explaining harm on health. Explaining the cost of flavoured cigarettes and e-cigarettes, as well as consequences on others and the environment, were particularly emphasised.

7.2.1.3 Improving pupils' accessibility to smoking-related information

This theme explains respondents' views on improving accessibility to smoking-related information inside schools to improve pupils' awareness of smoking consequences. The collected data indicates the need for improving pupils' accessibility to smoking-related information inside schools through the followings:

1) Including more detailed information on smoking consequences in different subjects of the curriculum, as this would enable teachers to discuss these consequences with pupils and provide opportunities for correcting pupils' false beliefs about smoking during lessons time;

   "If smoking is not part of the curriculum, we can't cover it. First, there is no time for that. Second, teachers are not allowed to cover topics outside the curriculum during lessons' time… Teachers are punished if someone discovers that…. The best thing is to make smoking prevention as part of the curriculum"(Female teacher of sciences, mixed-gender school)

2) Providing attractive posters at accessible locations inside schools supported by pictures to illustrate various smoking consequences.
3) Opening frequent discussions with pupils about smoking through extracurricular activities delivered by external experts and relevant staff after training them and supporting them with the required knowledge's and equipment.

Most staff respondents suggested training popular who never smoked staff on smoking consequences, effective communication and persuasive skills by trusted experts plus

supporting schools with relevant resources and equipment such as video, books and laboratory equipment in order to enable staff educating pupils on smoking consequences because relying on external experts is unsustainable and not always convincing for pupils.

> *"We [school] don't have enough materials and specimens in our lab to show pupils how smoking harms human bodies…. Some schools have good labs. If some experiments run in these good labs, recorded by videos, explained in a clear language, these videos could be used in other schools to explain to pupils how harmful smoking is… If our school has these resources, staff will discuss smoking harms with pupils…Teachers are available in schools and more patients to discuss and convince pupils but we need to be told what to say. You don't want teachers to tell pupils wrong or old information….. It will be perfect if doctors or specialists train teachers what to say."(Female teacher of sciences, boys' school).*

Schools managers indicated that extra-curricular school activities should be authorized by local educational authorities, especially if delivered by experts, which prolongs and complicate the preparation process. Staff participants suggested including smoking-related extracurricular educational activities in the annual plan of schools activities by social workers, psychologists and media specialists to facilitate obtaining authorities' permission to deliver these activities.

> *"The security, educational and local authorities will not mind if these smoking-education activities are part of the schools annual plans of social workers, psychologists, health educators or other groups … They will allow it but it needs to be agreed at the beginning of the academic year, otherwise, it will be difficult to do these activities outside the annual plan"(Female deputy head-teacher, girls' school).*

7.2.2 Psychological capability: provide training on skills needed to avoid smoking

This meta-theme summarises respondents' views on the essential skills that should be acquired through schools to increase pupils' capability to avoid smoking initiation. Although raising awareness on smoking consequences is important base for personality-related interventions, as explained in section 7.2.1, providing this information is not suffering to prevent adolescents from smoking initiation as the intervention should address personality attributes that encourage smoking. Although personality is refractory to change, some of the personality attributes could be addressed though training. This is explained by some theories (Michie et al., 2014b), such as Problem Behaviour Theory and Health Promotion Model (Perry and Jessor, 1985, Jessor et al., 2017b, Donovan et al., 2017), Social Cognitive Theory (Bandura, 2004, McAlister et al., 2008) and the Theoritical Domains Framowrk (Michie et al., 2014b). The collected data suggested that pupils need training on the following skills to avoid smoking initiation: 1) refusal skills; 2) positive self-assertiveness by setting, monitoring and achieving personal goals; 3) emotion and stress management; 4) problem-solving and decision making. The subsections below explain why these skills are identified to prevent adolescents from smoking initiation.

7.2.2.1 Enhancing pupils' refusal skills

The collected data clarified the importance of enhancing pupils' refusal skills in order to prevent adolescents' smoking initiation because peer-pressure to smoke and free smoking offers by friends are important reasons for smoking initiation by the Egyptian adolescents, see section 3.4.3.2. Staff participants who deal with pupils' behaviour indicated that many pupils lack skills to refuse smoking offers and peer-pressure to smoke which makes them smoke based on the choices of others.

> *"Some pupils can smoke easily if their friends push them to smoke unless they know how to say no to their friends' offers of cigarettes and be able to resist friends' pressure on them to smoke"(Female psychologist, mixed-gender school)*

Some pupils indicated their or their relatives' or friends' need to learn skills of dealing with peer-pressure to smoke and expressed worries to lose friendships if they refuse smoking offers by friends. These worries were emphasized by boys and girls as in the quotations below:

> *"I know we have to say no to our friends when they pull our legs to the wrong way but sometimes you cannot say no to friends if they insist you should smoke… You are afraid to stay without friends if you refuse their offers, they will leave you and may ask others to leave you… I wish to learn how to say no and still keep my friends"(Boy, boys' school)*

> *"I will not take cigarettes from my friend, even, if she insists I will say no… but sometimes you don't want to be left without friends, so some girls might take the cigarettes and hide it somewhere or threw it in the bin rather than saying no to dominant friends"(Girl, girls' school)*

This emphasizes the need to train pupils, in both sex, how to refuse smoking offers and resist peer-pressure to smoke without being worry about losing friendships.

Only a few pupils, mainly girls perhaps due to the cultural taboo of females' smoking, clearly expressed their self-confidence in resisting peer-pressure and refusing smoking offers by friends.

> *"If my friend invited me to smoke, I should return the cigarettes to her and say no thank you or I might shout and scream and let everyone know what she did to me, I will not tell them she is my friend, I will say she is a devil."(Girl, girls' school).*

The Persuasive Communication Theory (Ajzen, 1992) explains that improving individuals' refusal skills and enabling them to formulate counter arguments and effectively communicate their reasons for refusing smoking behaviour is important for them to resist smoking persuasion by influent relatives and friends (Tormala, 2008, Griffin and Botvin, 2010). The assumption is that gaining these skills will change adolescents' attitude toward smoking, enable them to refuse smoking offers and therefore, prevent them from initiating smoking behaviour (Tormala, 2008).

7.2.2.2 Enhancing pupils' skills of positive self-assertiveness

The collected data clarified the importance of enhancing pupils' skills of positive self-assertiveness in order to prevent adolescents' smoking initiation as many adolescents smoke for self-assertiveness while those who have personal goals and trust that smoking affects the achievement of these goals are unlikely to initiate smoking. The analysis indicates that pupils need training on how to set, monitor and achieve personal goals in order to prove themselves positively as many adolescents lack these skills, which are not part of the training in Egyptian schools. Staff exaplined that the lack of personal goals or the inability to achieve goals minimizes the impact of raising awareness of smoking consequences in preventing pupils' smoking initiation.

> *"If boys or girls have no specific goals for their life and future, they may smoke or do other things…. When you speak to them about smoking hazards, they would say we will all die… as they don't have something to care about it.."(Female social worker, girls' school)*

Several pupils and staff respondents highlighted that opportunities of thinking to smoke to prove maturity, masculinity or due to stubbornness or self-assertiveness would be reduced if pupils have personal goals to achieve and know how to achieve their goals.

> *"If you have goals for yourself in the future, you will not smoke just for stubbornness or disobeying teachers or parents or to prove you are men or mature… You will do everything to achieve these goals and will not allow smoking to destroy your future, instead, you will focus on your study to be an important person in future"(Boy, boys' school)*

Aiming to be good mothers in the future was particularly emphasized by girls as a reason for avoiding smoking. A girl wrote in her story:

> *"Her friend told her: girls who choose to be good mothers in the future, they will not smoke just to prove that girls and boys are equal….Girls should learn how to focus on this excellent goal, to be a good a mother."(Girl, mixed-gender school)*

Some pupils and staff respondents stated that enabling pupils to set personal goals and monitor their achievement of these goals empower them to resist peer-pressure to smoke and enhances their ability to refuse smoking offers. For example, a never-smoked boy stated:

> *"Being motivated to be something good in future makes you select friends and tell friends who want you to smoke or offer you cigarettes: no I will not smoke like you, smoking harms me and make me a loser, accept me like how I am or leave me. I will not follow you in mistakes and lose my future...These friends will either leave you alone or stop talking to you about smoking"(Boy, boys' school).*

The role of enhancing pupils' skills of setting and achieving personal goals and other positive self-assertiveness in preventing them from risky behaviour such as smoking is explained by the Temporal Self-Regulation Theory (which was influenced by four behaviour change theories) and the Self-Efficacy Theory (which contributed into informing 23 theories that explain human behaviours), as was concluded in a compressive analysis of behaviour change theories (Michie et al., 2014b).

7.2.2.3 Enhancing emotion and stress management skills

The collected data clearly emphasized that many adolescents consider smoking as a stress-relieving method and the majority of pupil participants do not know other methods for relieving stress and managing negative emotions. A girl who experimented smoking stated:

> *"If I knew another way to relieve my tension, I would not have smoked... I do not want to kill myself and sham my family"(Girl, mixed-gender school)*

The above quotation and as most staff and few pupils respondents stated that knowing how to control emotion and manage stress would enable pupils to use other stress-relieving methods instead of considering smoking when exposed to stress or face psychological problems.

> *"Pupils are stressed because of study and exams, poverty, family problems, conflicts with friends, some they have to work and study…. Adolescents trust that smoking makes them feel better and less stressed… Unfortunately, pupils and even adults do not know other methods for relieving stress…. If they know that exercises reduce stress, they will play football instead of smoking but unfortunately, no one tells them that… It will be great if pupils are trained in schools about stress-management, this will solve many of our [teachers and parents] and their problems"(Male head-teacher, boys' school).*

The Temporal Self-Regulation Theory (which informed 23 theories that explain human behaviours) clarify the role of emotion and stress management in influencing risky behaviour such as smoking, especially among adolescents and youths (Michie et al., 2014b). Therefore this theory suggest the importance of enhancing pupils' ability to control their emotion and manage stress in order to prevent them from smoking initiation (Hall and Fong, 2007, Hall and Fong, 2010). Some studies suggested that cigarette smoking reduces stress psychologically (Kassel et al., 2003) and a recent experimental study also concluded that cigarette smoking decreased anxiety and relieves stress physically and psychologically (Choi et al., 2015). Based on this evidence and what respondents suggested above, enhancing pupils' ability to manage their emotion and stress is important to be included in SBSPIs in the Egyptian context as pupils believe it is needed and would work for them in this context.

7.2.2.4 Enhancing pupils' skills of problem-solving and decision making

The collected data emphasised that adolescents lack problem-solving skills, this makes some adolescents smoke to run from the problems they face. Enhancing pupils' skills of problem-solving, together with stress-management, was frequently suggested by several staff respondents to enhance pupils' capability to avoid smoking when exposed to problems.

> *"Pupils don't know how to deal with their problems. We do not teach them these skills at schools and not all parents discuss that with adolescents who are expected to be successful and well-behaved no space for mistakes or troubles… When pupils struggle to achieve parents' and teachers' expectations or face problems in their life they smoke to forget their problems and feel better, they believe in that… I believe if we teach pupils how to face and solve their problem they will not smoke"(Female supervisor of social workers across preparatory schools).*

Few pupils also suggested that. For example, a boy who experimented smoking stated:

> *"Boys and girls don't know how to behave in some situations. Someone should tell them how to think, decide and what to do when they are in trouble with parents or teachers or struggle in your lessons... Otherwise, some pupils might smoke to forgot problems and feel better."(Boy, mixed-gender school)*

Some respondents indicated that raising awareness of smoking consequences should be supported by enhancing decision-making skills to enhance pupils' capability to avoid smoking initiation.

> *"Some know smoking will harm them but they cannot make decisions not-to-smoke, they just follow friends or respond to their emotion or desire…They should be able to decide and action this decision"(Boy, boys' school)*

> *"I am not saying I want to smoke but smoking is self-freedom and I want to make my decision to smoke or not rather than following what parents want or copy what my friends do… I am a big girl now and I need to decide for myself… Give me the information, teach me how to decide and let me decide"(Girl, mixed-gender school)*

The above quotation indicates that enhancing pupils' decision-making skills together with raising awareness of smoking consequences is needed to enhance pupils' capability to avoid smoking.

Enhancing pupils' skills of problem-solving and decision making toward preventing them from risky behaviour such as smoking is supported by Self-Efficacy Theory which contributed to informing 23 theories explains human behaviours, as concluded in a compressive analysis of behaviour change theories (Michie et al., 2014b). Although the importance of enhancing pupil's skills of problem-solving and decision making has been clearly emphasised in the collected data, as indicated above, most participants were unable, when asked, to suggest clear options for how these skills could be enhanced through schools as the current role of schools is limited to providing knowledge while enhancing life skills outside the school curriculum is limited in the Egyptian context. Some participants suggested using the persuasive and appealing methods that were discussed in section 7.2.5.2 to enhance these skills as well as delivering educational messages on smoking.

7.2.3 Physical opportunities: continue banning pupils' smoking in schools

The majority of pupils and staff believe that continue the current ban of smoking or carrying of cigarettes by pupils inside schools would reduce opportunities for pupils to exchange cigarettes or smoke away from parents' observation. A boy who never-smoked but reported an intention to experiment smoking stated:

> *"Sometimes classmates speak about smoking in a way makes you want to try it but we can't smoke or bring cigarettes to the school, parents don't allow us to smoke at home... So we have no place to smoke... You can only smoke in your dreams!... If schools allow smoking, I will be the first one to smoke."(Boy, Boys' school).*

None of the participants (staff and pupils) suggested restriction pupil's access to cigarettes outside schools. This is explained by this issue is considered out of the school control, in the Egyptian context, as it happens outside the schools premises. This issue need to be explored more in further studies as some effective SBSPIs have manged to implement that in LMICs, see section 4.4.8. The need for exploring the applicability of this option to the Egyptian context in future research was recommended in section 8.5 as this was not fully explore in study-3.

The Change Theory, which informed four behaviour change theories (Michie et al., 2014b), explains that restricting access to tobacco products reduce the opportunities to smoke; therefore, the Theoretical Domains Framework (which was designed based on reviewing 33 behaviour change theories, emphasises the importance of reducing accessibility to environmental resources in behaviour change interventions in order to reduce physical

opportunities to initiate risky behaviours such as smoking (Cane et al., 2012, Atkins et al., 2017).

7.2.4 Social opportunities: creating anti-smoking social-norm and smoke-free environment at schools

This meta-theme explains respondents' views on creating anti-smoking social-norm and smoke-free environments at school to reduce pupils' social opportunities to initiate smoking. To achieve that, three main themes emerged from the data: 1) preventing smoking by staff inside school premises; 2) encourage modelling of non-smokers; 3) use the influence of peers to prevent smoking. The importance of creating anti-smoking social norm in preventing pupils from smoking initiation is supported by the social cognitive theory (Bandura, 1998, Bandura, 2004) and Health Belief Model (Rosenstock et al., 1988, Maiman and Becker, 1974) which explain the importance of social acceptance and peer relationships for individuals at adolescence age.

7.2.4.1 Minimizing pupils' exposure to smoking by staff inside school premises

This theme explains respondents' views on preventing smoking by staff inside schools to reduce pupils' social opportunities to initiate smoking. The collected data indicated that in order to prevent pupils' exposure to smoking behaviour inside schools, smoking by staff should be restricted inside school premises after educating staff on smoking harms and enable them to avoid smoking inside schools.

The importance of having smoke-free schools in preventing pupils' exposure to smoking and preventing them from smoking initiation was heavily emphasised in FGDs and interviews. The majority of male and female staff and pupil respondents believe that staff should not smoke in pupils' presence, inside or outside schools, because they are role models for pupils who might imitate them in smoking. For example, a teacher who started smoking at the adolescence age stated:

> *"My teachers used to smoke in front of us…This made me thinking of smoking early... I wish they didn't do that…..Teachers' should not let pupils see them smoking inside or outside schools or tell pupils they smoke…Some pupils imitate good teachers in everything....Teachers do not order them not to smoke or smoke but pupils see them as models in everything even in smoking… Now I know I shouldn't let pupils see me smoking, although it is hard"(Male teacher of sciences, boys' school)*

Some boys explained that teachers should be prevented from smoking in schools like pupils.

> *"The sciences teacher usually smoke in the corridor… I think teachers are allowed to smoke in schools but this is unfair, smoking should be prevented or allowed for all.. everyone not only pupils"(Boy, mixed-gender school)*

To prevent smoking by staff in schools, staff respondents suggested the followings:

1) Educating staff on smoking harms on them, pupils and peoples around them because not all staff are aware of smoking harms.

> *"Why we assume that teachers know everything, I personally don't know everything about smoking. ... Some teachers are busy in life, don't have time for extra-reading, no one told them about smoking harms… I think everyone needs education on smoking harms not only health but also other harms"(Female, media specialist, Girls' school).*

The collected data also indicated poor awareness of various smoking consequences among some staff, see section 7.2.1.

2) Reminding staff that pupils consider them as role-models.

> *"At least popular teachers should be reminded not-to-smoke in front of pupils because pupils will copy them in smoking… Teachers know that pupils copy them in everything but reminding them would stop responsible teachers from smoking when pupils present"(Male head-teacher, mixed-gender school)*

3) Provide quitting services to smoker staff inside schools or at least inform and connect them with quitting services available outside schools. A heavy smoker teacher who showed good awareness of smoking harms and intinition to quit stated:

> *"I tell pupils not to imitate me, smoking is bad... I know I should not smoke in schools but I can't because I addict to smoking and need treatment. I did not find clinics or doctors to help me to quit … if schools provide help to quit, I am ready to quit smoking from tomorrow, just tell me what to do and where to go"(Male spots teacher, boys' school)*

4) Revisiting the current punishments and consider more feasible financial-punishments on staff who smoke inside school premises. Clarifying the process of applying these punishments by specifying by who, when, how the punishments applied then enforce applying these punishments.
5) Considering non-financial punishments on staff who smoke inside school premises.

> *"Strict punishment should be applied to teachers who smoke inside schools because pupils copy them. The punishment should not be only money, other punishments might work better, like suspension for few days or changing grades or job description"(Male psychologist, boys' school).*

Theories that explain social norm, such as Social-Norm Theory (Lapinski and Rimal, 2005), explain the role of minimizing exposure to unwanted behaviour, like smoking, would create a social norm that this behaviour is unacceptable and reduce its prevalence, especially among adolescents as social acceptability is important at this age (Michie et al., 2014b).

7.2.4.2 Encourage modelling of non-smokers

The Social Learning Theory emphasises that modelling is essential in adolescents' learning process (Grusec, 1994, Turner and Shepherd, 1999). This theme explains respondents' views on using modelling inside schools to prevent pupils' smoking initiation. Respondents suggested using modelling of non-smokers through the followings:

1) Encouraging non-smokers staff to share with pupils their experiences about how they maintained their non-smoking behaviour so pupils can learn from their experience and imitate them.
2) Drawing pupils' attention to examples of people inside and outside schools who succeeded in different aspects of life and never smoked and encouraging pupils to imitate them in non-smoking.
3) Adding never smoking to the criteria for selecting ideal pupils and teachers.

Sharing with pupils non-smokers' experience of avoiding smoking and views on what is good about non-smoking and what is bad about smoking; was frequently suggested by staff and pupil respondents to enhance pupils' modelling of non-smokers, educate pupils on smoking consequences and correcting pupils' false positive-beliefs about smoking.

> *"Our teacher told us what happened to him when he was a child and how he decided not-to-smoke since that day. We trust him so much. He wants us to be better than him. … Since I heard his story, I decided with my friends never to smoke… We [pupils] all listen to this teacher and want to be like him. He is excellent in everything"(Boy, mixed-gender school)*

Some staff and pupils respondents referred to the importance of drawing pupils' attention to successful examples of non-smokers inside or outside schools such as actors, footballers and other famous people and encouraging imitating them in avoiding smoking.

> *"Every adolescent imitates a superhero, parent, friend, teacher or famous person. If we select non-smokers of these people and encourage pupils to imitate them, many pupils will decide never to smoke to be like them... adolescents believe in what they see more than what is being said"(Female teacher of Christianity religion, boys' school)*

Some staff and pupils respondents referred to using stories of adolescents who maintained non-smoking behaviour and the impact of non-smoking on different aspects of their life.

> *"Pupils should be told how well-known successful people refused to smoke, what happened to them later and what happened to their friends who smoked… These stories tell them how to avoid smoking"(Male head-teacher, boys' school)*

Pupil respondents were particularly interested in stories that explain how adolescents resisted peers' pressure to smoke.

> *"I heard Ramadan [a famous actor] had friends invited him to smoke when they were 12 years old… When he said no to them, they boycotted him but he still did not smoke… See where is he now! these friends are regular people but he is very famous… His story tells you to focus on yourself and say no to bad friends if they push you to smoke"(Boy, boys' school)*

Some pupil participants mentioned that announcing names of pupils, teachers and parents who never smoked in schools posters and assembly would encourage pupils to imitate them and avoid initiating or experimenting smoking. However, responses from staff and other pupils indicated challenges in selecting non-smoking role-models in the Egyptian context because of the followings: 1) Announcing names of non-smoker teachers and parents might be perceived that others are not respected and may cause unnecessary problems for the selected people and schools which depends on parents to fund many activities. 2) Pupils' smoking is usually hidden due to the anti-smoking school's policy and social unacceptability, so all pupils are expected to be non-smokers until proven otherwise. 3) The current anti-smoking school policies that punish smoker pupils and inform their parents reduce the accuracy of self-reporting of smoking by pupils as it increases pupils' worries from parents or punishments if they admit their smoking status. 4) Biochemical verification of pupils' smoking status is challenged by the limited schools resources and complexity of obtaining pupils' and parents' permission. For example, parents may think their children smoke if schools request permission to investigate their smoking status, which may cause unnecessary stress for both parents and pupils and does not help in achieving the aim of running this test. 5) Even after confirming the smoking status of pupils, it is not feasible to choose all non-smokers as role-models as this reduces the value of this selection. Announcing names of few pupils as non-smokers role-models indirectly may indicate that others are smokers and may cause negative impacts on other pupils who never-smoked but were not selected. For example, their parents might think they were not selected because they smoke and may punish them verbally or physically.

> *"It will perfect if there is a way to confirm who never smoked and inform other pupils in assembly how many pupils never smoked in their life even a puff…This will inspire many pupils not to experiment with smoking…But I am not sure if our school could pay for that test.. If you just ask pupils, no one will admit smoking because they would think schools will expel smokers or tell their parents"(Female media specialist, mixed-gender school)*

To overcome the last challenge, some staff and pupil respondents suggested adding non-smoking to the other criteria for the annual selection of ideal pupils and teachers instead of the standalone selection of non-smoking role-models. Pupils should be clearly informed that non-smoking was a criterion for selecting ideal pupils and teachers and encourage pupils to imitate ideal pupils and teachers in avoiding smoking. A boy mentined in his written story:

> *"How teachers will know who never smoked? Everyone says I don't smoke to escape the punishments at school and at home when parents know, no one would say the truth... The school of this boy selected perfect pupils then tested them. Names of pupils who really never-smoked were announced and teachers encouraged everyone to imitates them...Pupils imitate perfect pupils and want to be successful like them… This stopped many pupils to smoke in this school"(Boy, mixed-gender school).*

7.2.4.3 Use the influence of peers to prevent smoking and create non-smoking social-norm

This theme explains the perspective of school staff and pupils on using the influences of peers to prevent adolescents' smoking initiation and creating anti-smoking social-norm at schools. To achieve that, respondents suggested using non-smoker pupils in the following: 1) Informal peer-education of pupils on smoking consequences after training them and supporting them with attractive educational materials. 2) Creating peer-pressure to avoid smoking. 3) Providing support for pupils who are exposed to peer-pressure to smoke. These suggested roles are detailed in the subsequent sections. The influence of friends and the applicability of using peer-pressure to change adolescents' behaviour is explained in many theories such as the Social Cognitive Theory (Bandura, 2004), Problem Behavior Theory and Health Promotion Model (Jessor et al., 2017b, Perry and Jessor, 1985).

7.2.4.3.1 Use informal peer-education

Most staff and pupil respondents stated that using pupils to educate their peers about smoking consequences in formal settings such as classrooms, is negatively perceived by most Egyptian pupils because formal peer-education is not used in Egyptian schools and pupils would think that peer-educators commanding them through these educational sessions.

> *"Pupils will be angry if I stand in the class and say: I am here to tell you about smoking… Even if it is an advice, mostly they will not listen saying: why do you talk to me, who are you?"(Girl, girls' school)*

Some pupils and school managers prefer delivering formal education sessions on smoking consequences by specialists, social workers or popular teachers rather than peers. In contrast, it was strongly emphasised, by staff and pupils, that using social, convincing and respected pupils who never-smoked to discuss smoking consequences and advantages of non-smoking with their peers in informal settings, for example during break times or before and after lessons, would be highly acceptable by most pupils.

> *"They [adolescents] don't always listen to adults... They listen better to each other. They share experiences on what worked and what didn't work…If you want to*

convince them, let them tell each other as friends about smoking harms.. Educate some of them and they will spread it to the whole school in their free time… The results will be amazing"(Female social worker, girls' school).

A class-leader said:

"If I want to speak to pupils about smoking inside our classroom, it is not going to work, they will laugh at me when I behave like a teacher. …. But they will listen to anything when we speak in the playground as friends"(Boy, mixed-gender school).

Many pupils expressed their willingness to discuss smoking harms with their peers but they requested obtaining detailed information on smoking consequences plus pictures-supported educational materials to use during the discussion and distributed afterward.

"I love my classmates and want to help in preventing them from smoking risks… Happy to speak to everyone...But what if they ask me questions I don't know?... If you tell me what to say or give me information to read, I can tell them in our break"(Boy, boys' school)

It was frequently stated that peer-educators should be social, respectful, persuasive and never-smoked but the challenge of identifying pupils' smoking status was raised. Some staff and pupils respondents suggested nominating peer-educators by classmates first then check their suitability by the main class-teachers. The need for training peer-educators on communication and convincing skills to enhance their capability of delivering informal peer-education was also emphasised.

Some pupils, especially girls, raised a concern about being targeted without others by smoking-related training, as others might think they are smokers, therefore, were selected. This concern is believed to discourage pupils from attending smoking-related sessions or sharing the received information after attending.

"Last year my friends went to a lecture on smoking because Mr [name] chose her. She told me not to tell anyone because girls will think she was invited to this lecture because she smokes... She did not even tell me what she learned there… If I was in her situation, I will do the same"(Girl, girls' school).

Using informal peer-education is supported by the Social Learning Theory which emphasises that modelling and informal discussion among peers are essential in adolescents' learning process (Grusec, 1994, Turner and Shepherd, 1999). The Social Inoculation Theory support three aspects related to peer-education among adolescents: 1) peers are important source of information and advice for adolescents; 2) peer-educators could be considered as role models to enhance positive behaviour; 3) informal peer-education is more acceptable among adolescents who don't accept education by others (Turner and Shepherd, 1999).

7.2.4.3.2 Create peer-pressure to avoid smoking

Most staff and pupils respondents indicated that non-smoker pupils could put pressure on their friends to avoid smoking if they were asked and trained to do that.

"Good friends put pressure on you not-to-smoke, saying they will leave you if you smoke…. Pupils listen to friends as they love them. No one wants to lose their best friends and stay alone because of smoking….. If you smoke some friends warn you then tell your parents .. If these are your friends, then better you don't smoke. You don't want to be in trouble"(Boy, boys' school)

Some staff respondents indicated that they use peer-pressure by sociable and leader pupils in changing unwanted pupils' behaviour and this could be used to prevent pupils' smoking.

> *"Pupils with leadership and social skills could be trained to put pressure on their peers to avoid smoking… I am sure they like their friends to behave well but we need to tell them what to do and how… We use peer-pressure to correct other unwanted behaviours, why not to use it in smoking prevention"(Females social worker, mixed-gender school).*

The Problem Behavior Theory emphasises the role of peer-pressure in smoking initiation among adolescents and the Health Promotion Model explains that peer-pressure could be used to prevent adolescents from smoking uptake by resisting peer-pressure to smoke when exist. (Jessor et al., 2017b, Perry and Jessor, 1985).

7.2.4.3.3 Peers' support for pupils who face peer-pressure to smoke

Some staff and pupils respondents suggested supporting pupils who are exposed to peer-pressure to smoke in order to enable them to resist this peer-pressure and remain non-smokers; as many Egyptian adolescents may initiate smoking responding to peers' pressures to avoid losing friends. A boy who self-reported experimenting smoking due to peer-pressure to smoke stated:

> *"What if teachers or popular pupils help in making new friends? They know everyone in the school and can tell other pupils to be your friends... If teachers could do that and pupils know about it, I think many pupils will say no to smoking without fears to be left alone... "(Boy, boys' school)*

The Health Promotion Model and Problem Behavior Theory consider providing social support is essential for adolescents to maintain non-smoking behaviour as it minimises the negative impact of the environmental factors that encourage smoking (Jessor et al., 2017b, Perry and Jessor, 1985). Respondents suggested providing this support through the anti-smoking school's committee by considering the followings:

1) Giving memberships of the anti-smoking school's committee to non-smokers, pupils and staff, only.
2) Announcing members' names in schools posters or news.
3) Encouraging pupils to approach committee members when exposed to peer-pressure to obtain support.
4) Training members on problem-solving, counselling and peer-support skills.
5) Offering accompanies/friendship and support for pupils who lost or at risk of losing friends because of refusing peer-pressure to smoke, at least until making alternative friendships and social networks.

> *"Anti-smoking school committees are led by social workers whose role is to support pupils solving their social problems including making new friendships… Pupils members should be motivated to be friends of those who want to stay non-smokers, therefore they should be non-smokers themselves and should be trained on how to consult and support their peers"(Female supervisor of social workers across preparatory schools).*

7.2.5 Reflective motivation: Persuasion toward reasoning and making a self-conscious decision not to smoke

This meta-theme explains respondents' views on the role of schools in enhancing pupils' reflective motivation to avoid smoking initiation. The coercion and persuasion intervention functions were suggested in three main themes related to reflective motivation emerged from the data: 1) stimulate thinking of the pros and cons of smoking and non-smoking; 2) using persuasive and appealing methods to explain smoking consequences and correct pupils' false positive beliefs about smoking; 3) creating expectations of social punishments when pupils smoke.

7.2.5.1 Stimulate thinking of the pros and cons of smoking and non-smoking

This theme explains respondents' views on stimulating pupils' thinking of potential pros and cons of both smoking and non-smoking behaviour instead of focusing only on smoking consequences.

Some staff respondents highlighted the importance of explaining the advantages of non-smoking and avoid focusing only on the consequences of smoking. Some pupil respondents explained that this approach allows considering the benefits of non-smoking against reasons for smoking. A socially active and leader boy who experimented smoking stated:

> *"If only the harms were explained, pupils may still want to smoke for different reasons, reducing stress, stubbornness, to prove themselves or other reasons... We [adolescents] are fed up from instructions, do that and don't do that, we need to decide…If you tell pupils to think about what you would get if you smoke and what you would lose? They may realise that nothing valuable is gained from smoking and reasons for smoking are silly... They will not be excited to smoke"(By, boys' school)*

Staff and pupil respondents, as in the quotation above, exaplined that stimulating pupils' discussion of the pros and cons of smoking and non-smoking provides options for pupils to choose from and more convincing than only commanding pupils to avoid smoking.

The importance of encouraging pupils' critical observations of the life of smoker and non-smoker relatives, teachers, neighbours or friends was highlighted by some staff and pupil respondents who believed that these observations would enable pupils to realise various smoking consequences and thus decide not-to-smoke. For example, a staff whose father smoked said:

> *"I feel that many of my pupils dislike smoking when I tell them that smoking made us live in poverty because my dad smoked daily, saved money only for his cigarettes and left us to starve in old clothes…If pupils were told to observe how miserable the life of smokers around them, I am sure they will not smoke especially the poor"(Female teacher of vocational training, mixed-gender school).*

7.2.5.2 Using persuasive and appealing educational methods

The collected data emphasized that SBSPIs should consider using appealing and persuasive methods that enable pupils to realize the disadvantages of smoking and the advantages of non-smoking to be convinced not to initiate smoking. The Persuasive Communication Theory (Ajzen, 1992) emphasises the importance of using persuasive methods to convince adolescents why smoking is not good behaviour in order to create negative attitude toward smoking and enable adolescents not to smoke. the persuasive methods should effectively communicate reasons not to smoke and address the common misbeliefs about smoking and enable

adolescents to communicate these reasons internally then externally with their relatives, friends and peers (Tormala, 2008). This theme explains participants' views on the suitable educational methods for persuading pupils about smoking consequences and correcting their false positive beliefs on smoking. Pupils and staff participants suggested the following persuasive educational methods in SBSPIs: 1) real-life stories of smokers and non-smokers; 2) field-visits to observe consequences on smokers; 3) laboratory experiments to explain physical consequences of smoking; 4) photos/pictures; 5) videos; 6) school-plays; 7) open discussion rather than lecturing approach; 8) using social media to guide pupils' discussion of smoking-related issues. The following subsections discuss each method separately.

7.2.5.2.1 Real-life stories of smokers and non-smokers

This subtheme explains respondents' opinions on using life-stories in schools to reduce pupils' motivation to smoke. Staff and pupil participants stressed that using stories of real-life examples of smokers and non-smokers would enable pupils to realise the advantages of non-smoking and the disadvantages of smoking on different aspects of their life and demotivate them to smoke, especially if these examples are well-known and the stories explain the impact of smoking or non-smoking on different aspects of their life. Some staff participants stated that adolescents realise better what they observe therefore using stories of famous smokers and non-smokers would enable them to realize the long-term consequences of smoking and enhance pupils' thinking about the future impacts of smoking and non-smoking.

> *"Tell them about people who were successful then ended up in prison because of smoking. Explain how this journey started with accepting cigarettes from friends, lead to bad relationships with parents and friends, stealing to buy cigarettes, then being in prison… When they hear real stories, they understand better how bad their life could be if they smoke... They will then prefer not-to-smoke"(Female media specialist, mixed-gender school)*

Girls referred frequently to using stories of singers plus romantic and drama actors while boys referred more to footballers and action actors. Both sexes referred to stories on smokers and non-smokers.

> *"I will never-smoke to be like Salah [a famous footballer].. My coach told me Salah never-smoked and I want to be like him in everything, he is my hero"(Boy, boys' school)*

Most staff and pupil respondents referred to using real-life stories of adolescents rather than adults or if stories of adult smokers are used, it is important to select stories of people who started smoking at adolescence age, explain their age at initiating smoking and factors that encouraged them to smoke before explaining smoking consequences on their life. For example, a boy who experimented smoking stated:

> *"I am not interested in stories of old people... I want to hear stories of people my age… or I need the story from the beginning, what happened when they [smoker adults] were young?… How did they think about smoking? How did they start? Did their parents know they were smoking or they smoked in secret? What happened when people know they smoke? how their parents treated them?.....Then what happened to them later? Did they die? of what? At what age and what happened to their kids….When my dad told me all that about his friend, I decided not to smoke again"(Boy, mixed-gender school).*

Girls were particularly interested in real-life stories of Egyptian females who started smoking in adolescence age and how smoking influenced their life.

> *"I want to know stories of Egyptian girls who experimented smoking in my age… What happened to them in everything... Why they smoked, Was it because of their life problems? …Did smoking help them or made it worse... How they lived? Did the community accept them? ... I am curious to know if they were in Upper-Egypt or not...This makes me understand what could happen to smoker girls"(Girl, mixed-gender school)*

Respondents frequently mentioned, as in the last two quotations above, that attractive and convincing stories should explain: 1) reasons that encouraged these adolescents to smoke; 2) their smoking journey and changes in the type, times and frequency of smoking over time if any; 3) if they hid or announced their smoking behaviour, why and how they did that; 4) thereafter explaining smoking consequences on various aspects of their life like health, fitness, beauty, income, relationships with parents, friends, and society.

7.2.5.2.2 Field-visits to observe consequences on smokers

This subtheme explains respondents' views on using school field visits to smokers with complications to demotivate pupils to initiate smoking.

Visiting patients of smoking-related illness was frequently suggested, by pupils and staff, as an effective method for convening convince them not to smoke and make them realize smoking consequences on health. Places suggested for field-visits included: hospitals, cancer treatment centres and psychotherapy centres. Some staff suggested visiting orphans-care centres to observe the situation of orphans whose parents died of smoking-related illnesses. Some pupils suggested visiting Juvenile care homes and relatives of prisoners who were arrested because of smoking and addiction; as they believe that this would reduce pupils' intention to smoke and enhance their understanding of smoking consequences on socio-economic status. However, the majority of staff mentioned the impossibility of visiting Juvenile care home or meeting prisoners' relatives due to pupils' safety. Some female staff and girls raise a concern of exposing pupils to psychological trauma when they see suffers of smokers or their relatives.

> *"Pupils hear smoking causes many problems but if they don't see these problems by their eyes they would not realize what damage smoking could cause… To convince pupils to avoid the smoking path, schools should take them to see smoking's patients in cancer hospitals and psychotherapy centres...or meeting children who became orphans, or poor because of their fathers' smoking... This might shock some pupils but it will stop the majority from even think about smoking."(Female psychologist, mixed-gender school)*

Some pupils indicated that field-visits enabled them to develop clear intention not-to-smoke after recognizing smoking consequences on smokers and their relatives, as this quotation explains:

> *"Feeling how smokers and their families would suffer stop you from thinking of smoking, even if your friends tell you to smoke… Last year, I visited the orphan-care centre to distribute charity with my dad...I will never forget those three miserable children, their dad died, he smoked a lot and had cancer… Since that visit, I decided not-to-smoke... first, I do not want to die. Second, I am not selfish to smoke and leave my children to suffer"(Boy, mixed-gender school)*

Parents' unacceptability, pupils' unsafety, limited schools resources and difficulties in obtaining local authorities' permission were mentioned, by staff, as barriers of organizing field-visits for pupils, especially girls, which could be overcome by using audio-visual recorded field-visits that could be watched by pupils inside schools.

7.2.5.2.3 Use laboratory experiments to explain the physical consequences of smoking

Many pupils and some staff participants believe that using laboratory experiments to demonstrate how smoking harms bodies' organs is an effective and attractive method to raise pupils' awareness of the physical consequences of smoking and demotivating them to initiate smoking. A never-smoked boy stated:

> *"I will never forget the experiment I saw in my primary school. The teacher put a cow's lung in a glass, then put Shisha close to it… The lungs' colour changed from pink to black after 10 minutes…He did the same with cigarettes... since that day I hate smoking and sitting next to smokers"(Boy, mixed-gender school)*

Staff respondents, especially teachers of sciences, referred to resources' limitations as barriers of using experiments to demonstrate smoking harms inside schools laboratories and alternatively suggested using recorded videos of experiments. Staff participants suggested running these experiments once in a well-equipped school, audio-visually record the whole experiments together with full explanations of the process and results, then distributing the recorded experiments to be used in other schools. The majority of staff and pupils nominated teachers of sciences as the best people to run, record and use laboratory experiments to raise pupil's awareness of the physical harms of smoking.

7.2.5.2.4 Photos/pictures

This subtheme explains respondents' views in using pictures/photos to illustrate various consequences of smoking and thus reduce their motivations to smoke.

The role of photographs and pictures in enhance pupils' understanding of smoking's impacts and reducing their motivation to smoke was heavily emphasised by staff and pupils. Pupil respondents suggested comparing photographs of organ specimens from smokers and non-smokers to illustrate smoking impacts on different body organs.

> *"Pupils will never smoke if they see photos of normal lung, brain, and other organs compared with photos of smokers' lung, brain, liver, and cancer... This makes them understand what smoking could do to their body, then think thousands of times before touching cigarettes or shisha"(Girl, mixed-gender school)*

Pupils and staff participants frequently suggested using photos of smokers before they started smoking to be compared with photos of the same people after a period of smoking to demonstrate smoking consequences on beauty, hair, mouth, face, and skin. This believed to be more than using photos of different people who might have different colour and nature of skin, hair and teeth even if their age and duration of smoking are the same.

> *" Pictures will show pupils how smokers look older with grey hair, black teeth and wrinkles after a short period of smoking and may lose their teeth or hair"(Female health visitor, girls' school)*

> *"you can't convince pupils that these changes happened because of smoking unless they compare photos of smokers before and after smoking as some youth have wrinkles or grey hair without smoking.. How do we know they did not have them before smoking…"(Girl, girls' school)*

In explaining the physical consequences of smoking, respondents highlighted the importance of using photographs rather than illustrative pictures drawn by artists because photos represent real people, provide more details and colures, and thus enable pupils to reflect on real scenarios that might happen to them if they smoke.

> *"Photos of a man lost hair and woman with wrinkles because they both smoke since they were teenage…How discouraging these photos are! No one will smoke... but we use photos not drawn pictures, so pupils feel these are real changes, not imagination…"(Boy, boys' school)*

Respondents also suggested using photos or illustrative pictures to explain the consequences of smoking on friendships, social relationships, and physical fitness. Some respondents encouraged using imagination in pictures to represent smoking consequences on social relationships and fitness. For example, pupils suggested using the illustrative pictures in Figure 15 to demonstrate how smoking disable people from practicing exercises and encourages sport-active pupils to avoid smoking to remain physically fit.

Figure 15 Examples of illustrative pictures suggested by pupil respondents

The suitability for pupils' age, clarity and self-explanatory of photos/pictures were heavily emphasized. While boys stressed using pictures illustrating smoking consequences on fitness, girls emphasised the use of beauty-related pictures. Pictures about the consequences on health and social relationships were stressed by both sexes.

The majority of staff and pupil respondents suggested using combinations of pictures and photos that represent different aspects of smoking consequences in school-posters with limited explanatory text to raise pupils' awareness of smoking consequences.

> *"Pupils love pictures, no one will be interested to read text, they can hardly read their lessons …. Few sentences under each picture are enough to send the messages"(Female media specialist, boys' school)*

> *"Photos of normal and black lung, cancer…then photos of black and normal teeth… Then pictures of a smoker boy and girl with bad smell make their friends run away… Then a smoker boy coughing all the time and can't run because of breathlessness and stay alone like old people while other boys playing football happily… When pupils see all problems caused by smoking in one poster, they would feel how bad smoking is and will be discouraged to smoke!"(Boy, mixed-gender school)*

Respondents referred to the following advantages of having school's posters on smoking consequences: 1) increasing pupils' accessibility to the information on smoking consequences; 2) facilitating peers' education and discussion of smoking harms as peer-educators could use the photos/pictures to explain smoking consequences; 3) reminding pupils, teachers and peer-educators on different aspects smoking consequences were discussed in previous training or educational sessions. The attention to the design and locations of posters were frequently mentioned to achieve these benefits.

"Pupils read all school-posters if they are good, colourful and well-designed... We could talk about pictures and ask: what do you think, what I think?… Just give us one picture of each problem caused by smoking and we will convince each other, we need something in school to remind us… I will forget, but the poster will remind me… we could ask teachers to explain more…"(Boy, mixed-gender school)

The above findings highlighted the importance of using pictures and photographs to persuade pupils on smoking consequences. Accordingly and as explained in section 5.3.6.3 pupil respondents were asked, during the FGDs, to identify some pictures and photos that could be used in school-poster to raise pupils' awareness of the different consequences of smoking. The initially selected photos and pictures were discussed by other pupils and staff respondents in terms of clarity, persuasive, cultural-acceptability plus age and gender appropriateness. Photos and pictures, that were agreed by most staff and pupils respondents to be clear, persuasive, culturally-acceptable as well as gender and age-appropriate to be used in educating Egyptian pupils in preparatory schools, were used by pupils' participants to design school-poster. The collectively designed poster was discussed with pupils and staff participants across the three schools and modified several times based on participants' comments and suggestions. See Figure 16 for the final version that was agreed by most staff and pupils respondents.

Figure 16 The collectively designed school-poster

7.2.5.2.5 Videos

This subtheme explains respondents' views in using videos for persuading pupils on smoking harms and thus reducing their motivations to smoke.

The majority of staff and pupil participants strongly recommended using videos to persuade pupils on smoking harms and correct their false positive beliefs on smoking and they considered videos as effective methods to provide concise information, attract pupils' attention and stimulate discussion about smoking consequences and advantages of smoking avoidance.

"Short videos should be used to introduce true and false beliefs about smoking... After showing the video, pupils could be asked questions like what did you like and did not like? Do you think this is true or wrong and why… From there, you can tell them what you want and convince them…Through videos, you can take pupils, without imagination, to the smoking world and make them see how bad smokers life is... This is enough to demotivate these young pupils to smoke"(Male social worker, boys' school)

Respondents referred to the following criteria to be considered in selecting good videos that persuade pupils on smoking harms and correct false positive believe on smoking: 1) short videos; 2) clear sounds and images, 3) clear and understandable Arabic language, preferably in Egyptian dialect. Respondents stressed that videos' contents should be appropriate for adolescents' age and the Egyptian culture and don't conflict with the Christianity and Islam religions.

> *"I watched an online video about smoking, the song was fun but I didn't understand anything, their language was different, it was Jordanian…I can't show it to my friends because girls were without scarves and girls were dancing with boys. that is unacceptable in Upper-Egypt"(Girl, girls' school)*

Pupils and staff respondents suggested the contents to include real-life stories, field visits, implemented activities, laboratory experiments, songs or role-play rather than long speeches or lectures. Older pupils were less interested in cartoon videos than those who just moved from primary schools, first preparatory grade pupils. Using Egyptian people, clothes and environment in the videos enhance pupils' acceptability of the contents as many respondents highlighted.

> *"Showing short videos followed by discussion works better than long speeches… Don't show pupils non-Egyptians because they may say but our situation and cigarettes are different… If you can even get people from Assuit, please do, in order to convince them"(Female leader of social workers responsible for health education across schools)*

It was frequently mentioned that videos could be used by school staff to overcome barriers of using experts, laboratory experiments and field-visits to persuade pupils on smoking consequences through schools.

7.2.5.2.6 School plays

Most respondents mentioned using school plays, as an attractive and educational method and popular extra-curricular activity, to demonstrate various smoking consequences and enhance pupils' discussion, with teachers, parents and friends, on the advantages of non-smoking versus smoking disadvantages. Pupil respondents expressed their interest in scenarios of real-life stories of adults who started smoking at young ages and adolescents who dealt differently with smoking, free offers of tobacco and pressure to smoke and the consequences of each decision made. A theatre group leader stated:

> *"School theatre is our popular local media, we use it to tell pupils anything...Plays are convincing for pupils if the right scenario was used to send the right messages... Plays should speak to and about adolescents and how smoking started and what smoking led to? This makes them think about what they could do differently… Discuss together or with their teachers and parents who could then advise them"(Male social worker, boys' school).*

Most pupils respondents were motivated to attend school plays that tell real-life stories of adults who started smoking at young ages or smoker and non-smoker adolescents, explaining how adolescents speak about smoking, what made them smoke or not then demonstrating consequences of smoking and non-smoking on their relationships with parents, friends, and community; future health; income and economic status. Demonstrating he cultural taboo of females' smoking in plays was particularly highlighted by girls.

"Plays should also tell girls how they will be punished by parents, isolated in the society and no one would be their friends when they smoke"(Girl, mixed-gender school).

Appropriateness of the selected senior for pupils' age and the Egyptian culture without conflict with the Christianity and Islam religions was frequently stated by staff respondents. Using local Egyptian dialect and clothes and only including non-smoker pupils (never-smoked or quitters) in these plays were considered, by pupils and staff, important for enhancing contents acceptability by pupils.

"Some plays touch your heart… When actors are in your age, speaking your dialect, wearing like you, saying what comes to your mind, showing what you face in life, then you see what happened to them when they did this or that...this summarises the journey from the end and makes you decide what way you should take to reach what you want"(Girl, girls' school)

The findings highlighted the feasibility of using school plays in SBSPIs in Egypt. All the visited schools have theatre groups consisted of pupils with talent in acting and staff with an interest and experience in theatre activities. Staff who lead school theatre groups explained that plays' topics are selected by them in consultation with pupils from a list provided by local authorities which includes smoking. According to staff, plays aimed at correcting pupils' behaviour won the theatre competition between schools in the past few years, one of them was about smoking consequences presented by another boys' school. The importance of presenting plays to all pupils inside schools before the outside presentation in annual competitions was frequently mentioned by staff and pupils.

7.2.5.2.7 Open discussions rather than lecturing

It was frequently stated that adolescents prefer using open discussion rather than lecturing and long speeches in educational and training sessions. Respondents explained that discussion allows pupils to express their opinions, discuss their beliefs and problems in relation to smoking and obtain solutions for their personal situation rather than listening in silence to uniformed information in lectures or long speeches that might not address their problems and personal circumstances. A teacher who led health-education activities for 33 years in girls' and mixed-gender preparatory schools stated:

"I am against theoretical education, it doesn't work… You speak as much as you can and pupils forgot or sometimes don't even listen… You need to engage them, discuss with them and let them reach the right conclusion instead of telling them what to do... from my experience, discussion works better in changing pupils' behaviour"(Male teacher of sciences, girls' school)

Some staff respondents believe that without discussion, it is diffuclt o reduce pupils' motivations to smoke even if smoking consequences were explained by experts. Most pupil respondents prefer discussions with school staff, particularly popular teachers, psychologists or social workers, than external experts who are commonly perceived to be busy, don't have time to listen and understand personal circumstances. However, few pupils, mostly girls, believe that teachers usually make assumptions about pupils' intentions and attitudes based on previous events or situations and may inform parents about pupils' beliefs which makes discussions with experts more neutral.

"You can ask external people any question to know what to do. They don't know you so you are not scared that your parents may know what you said…Teachers and social workers are nice and want you to be good but sometimes you know what they will say to you. if you did mistakes in the past, teachers always assume you will never change"(Girl, girls' school).

Respondents frequently suggested using videos, pictures, photos, posters, studies or experiments to stimulate discussion with pupils about their knowledge and beliefs about smoking.

7.2.5.2.8 Using social media and online resources

Few boys suggested referring pupils, mainly through schools webpage on Facebook, to free online YouTube videos they could watch and discuss, with friends and parents, outside schools. However, the majority of staff and pupil respondents mentioned that most pupils will not benefit from online videos because they don't have Facebook accounts or accessible intent at home, are not allowed to use internet cafes, mainly girls, or can't afford the cost of downloading online videos.

"It could have been nice if the online videos could be shown in school webpage on Facebook to educate pupils and parents but there are two problems here: one is not all pupils have Facebook or even internet at home. We don't even have internet at schools… Second, if parents see many educational materials about smoking on the school webpage, they will think that many pupils smoke in this school… Unfortunate this would affect the school repetition, so we can't do it all the time"(Male head-teacher deputy, mixed-gender school)

Pupils and staff did not have internet access inside the three visited schools which indicates the infeasibility of using social media and online resources in smoking prevent currently in Egypt but this might change in the future.

7.2.5.3 Creating expectations of social punishments when pupils smoke

This theme summarises respondents' perspectives about using coercion to enhance pupils' decision to avoid smoking by creating an expectation of social punishments by parents and the society when pupils smoke.

Some pupils and staff respondents indicated that reminding pupils of parents' disapproval and the social unacceptability of smoking by adolescents together with explaining smoking consequences on social relationships would discourage many pupils, especially girls, from smoking initiation.

"Boys and girls don't smoke easily in adolescence age not because they are convinced but because they are scared of parents' punishments and the scandals… This should be used to prevent pupils from smoking... We should warn boys from parents' punishment and girls from shaming themselves and their family when they smoke"(Male social worker, boys' school).

The majority of pupils who self-reported never-smoking explained that considering parents' disapproval and social unacceptability of smoking are reasons for them or their friends to avoid smoking initiation. For example, a girl who reported having no intention to smoke said:

> *"If someone sees me smoking and tell my father, I will be in trouble, better not to smoke, I don't know what he could do.. Thinking that you will sham the family makes you decide not to touch cigarettes or Shisha"(Girl, girls' school).*

The social cognitive theory (Bandura, 1998, Bandura, 2004) and Health Belief Model (Rosenstock et al., 1988, Maiman and Becker, 1974) explain the importance of social acceptance for individuals at adolescence age. Therefore these theories provide support for creating expectations of social punishments when pupils smoke as this would create anti-smoking social norm among adolescents which may prevent them from smoking uptake.

7.2.6 Automatic motivation to avoid smoking

This meta-theme explains respondents' views on the role that schools could paly to enhance pupils' automatic motivation to avoid smoking initiation. Two main themes emerged from the data in this regard: 1) feeling anticipated rewards when avoiding smoking; 2) encouraging alternatives to smoking behaviour.

7.2.6.1 Feeling anticipated rewards whenpupils avoide smoking or support non-smoking behaviour.

This theme explains the importance of rewarding pupils who never-smoked and those who supported non-smoking in preventing pupils from smoking initiation.

Some pupils and staff respondents indicated that in order to motivate pupils to avoid smoking initiation, pupils who never smoked and support their peers to avoid smoking should be rewarded alongside applying the current formal and informal punishments, discussed in section 6.3.5.1, on pupils who smoke or bring cigarettes to schools.

> *"Punishing smokers make pupils scared to smoke and see smoking as a big mistake to deserve these harsh punishments …. But some pupils still smoke although they know they will be punished if someone sees them...Rewards work better with pupils who don't fear penalties…It is better to have both rewards and punishments."(Boy, boys' school)*

Many staff and pupils respondents, as in the quotation above, explained that punishments do not always prevent pupils, especially the stubborns, from smoking initiation while rewards are more motivating than punishments at adolescence age. Respondents suggested financial or social rewarding of pupils who maintain non-smoking behaviour during the academic year, as the quotation below indicates:

> *"Instead of only punishing smokers, schools could also reward never-smoked pupils. Give them some money or voucher or at least by announcing their names in assembly or putting their names in school's posters... This will motivate other pupils not to smoke or even experiment smoking... Unfortunately, schools focus at the moment only on punishments, no rewards"(Female media-specialist, boys' school)*

The role of social and financial incentives in changing adolescents' behaviour is explained by some behaviour change theories such as Incentive theory (Logan, 1968, Killeen, 1981, Ellingsen and Johannesson, 2008) and the Theory of Motivation (Michie et al., 2014b).However, the challenges of identifying non-smoker pupils, discussed in 7.2.4.2, were raised.

Moreover, respondents suggested rewarding pupils who educate and support their peers to avoid smoking because this would motivate peer-educators not-to-smoke and avoid advising others not-to-smoke whereas they do and encourages others to imitate them in supporting non-smoking to obtain similar rewards.

> *"Pupils need encouragement to educate and support each other not-to-smoke. They can do that without rewards but it is nice to acknowledge their efforts and give them even small money vouchers so they continue supporting and educating others, continue avoiding smoking and inspire other pupils to copy them in avoiding smoking"(Female librarian, girls' school).*

7.2.6.2 Encouraging and facilitating alternatives to smoking behaviour

This theme explains the respondents' views on the role that schools could play to motivate pupils to use alternatives to smoking behaviour by encouraging and facilitating the practice of exercises and hobbies as methods for reducing negative emotions and good use of free times.

It was frequently mentioned, by staff and pupils, that filling pupils' free time by practising sports and other hobbies reduce pupils' motivations to initiate smoking as many adolescents smoke because they have unoccupied free times. Respondents stated that schools should provide guidance for pupils about useful ways of using free times and training on different sports and hobbies that pupils could practise inside and outside schools during their free times.

> *"To draw pupils' attention away from smoking, they should be busy, do exercises for example... Girls should be trained on how to cook, sew, make decorations or draw. Boys could learn how to fix things at home, grew plants and other useful things…"(Boy, mixed-gender school)*

The majority of pupils and some staff participants emphasised the role of sports, which is popular among adolescents especially boys, in occupying free times, releasing stress, enhancing self-confidence and strengthening friendships with non-smokers, as smokers unlikely to practice exercises. Therefore, they expect that practising sports would reduce pupils' motivation to smoke as many pupils initiate smoking for self-assertiveness, reducing stress and negative emotion or due to peer-pressure to smoke or smoking offers.

> *"Schools should help pupils to practice sports... If pupils exercise, they will never think of smoking, they will not have time for smoking.... The exercises burn-out stress and give self-confidence"(Male psychologist, mixed-gender school).*

A boy who self-reported experimenting smoking due to peer-pressure to smoke stated:

> *"If you practice hobbies or sport you can make better friendships, you don't need your smoker friends or those who force you to smoke... Friends and sports give confidence… But not everyone can pay to go to clubs... My mum does not allow me to play football in the street because not everyone is good there... But definitely, she will let me come to school to play in the afternoon if that's for free"(Boy, boys' school)*

Some respondents, as in the quotation above, indicated that providing facilities and services for sports, leisure and entertainment, inside or outside schools, which pupils could use for-free outside school-times would motivate pupils to use them instead of smoking in free times, as these facilities are currently either unaffordable or inaccessible to many pupils. However, respondents referred to the limited resources at schools as a barrier for facilitating pupils' practice hobbies and sports.

> *"Sometimes schools do not have materials and money to teaches us useful skills like drawing or sewing, sometimes you can't borrow books to read at home because not many books are available at schools"(Girl, girls' school).*

The Stages of Change Theory (Ajzen, 1991, Bledsoe, 2006) and the theory of planned behaviour (Ajzen, 2011) support encouraging adolescents to practice alternatives to smoking behaviour and facilitating practising this alternative behaviour as this would reduce the attitude toward smoking uptake(Michie et al., 2014b).

7.3 Key findings

Findings from this study suggest that the role of preparatory schools in preventing pupils' smoking initiation could be improved by enhancing pupils' psychological capability and automatic and reflective motivations to avoid smoking and reducing physical and social opportunities at schools that enhance pupils' smoking.

Regarding ***psychological capability***, pupils need to be *educated* on various smoking consequences and *trained* on skills that enable them to avoid smoking such as positive self-assertiveness, stress management, problem-solving and decision-making plus refusal skills. Smoking consequences on health, beauty and appearance; physical fitness; sexual ability; social relationships, income, the environment, and secondary smoking should be emphasized in addition to explaining the addictive impact and religious prohibition of smoking. Smoking consequences on beauty, hair, appearances and social relationships should be emphasised in educating girls which consequences on physical fitness and sexual ability should be emphasised in educating boys. The contents and consequences of each smoking form should be explained, including regular, flavoured and electronic cigarettes and Water-pipe. Pupils' accessibility to smoking-related information should be improved through 1) including more information on smoking consequences in the curriculum; 2) opening frequent smoking-related extracurricular discussion with pupils by experts as well as staff after training staff by trusted experts to deliver smoking-related education. 3) Providing more attractive, accessible school-posters that illustrate various smoking consequences.

Creating smoke-free environments and anti-smoking social-norm at schools would reduce ***social opportunities*** for pupils to smoke. To achieve that pupils' *exposure to smoking behaviour* inside school premises should be minimized by 1) disallowing staff to smoke inside school premises; 2) considering non-financial and more feasible financial punishments when staff smoke in schools; 3) raising staff awareness about harms of active and passive smoking; 4) reminding staff they are role-models for pupils; 5) supporting smoker staff to quit. Additionally, *modelling of non-smokers* should be stimulated through 1) encouraging pupils to imitate examples of successful people inside and outside schools who never smoked after drawing pupils' attention to these examples. 2) Encouraging non-smoker pupils and staff to share their experiences of smoking avoidance. 3) Adding never smoking as a criterion for selecting ideal pupils and teachers. Moreover, the *influence of peers* could be used in 1) creating peer-pressure to avoid smoking; 2) informal peer-education on smoking consequences and avoidance; 3) supporting pupils who face peer-pressure to smoke.

To enhance pupils' ***reflective motivations*** and ability to make conscious decisions to avoid smoking, persuasive and appealing methods should be used to raise pupils' awareness of smoking consequences and correct pupils' false positive beliefs about smoking. This includes: using real-life stories of smokers and non-smokers; field-visits to observe consequences on smokers; using laboratory experiments to explain the physical consequences of smoking; using photos/pictures, videos and school-plays to explain various consequences of smoking; using open discussions rather than lecturing; plus encouraging critical observations and reflections on the life of smoker relatives, teachers, neighbours or friends. Moreover, pupils' thinking of the pros and cons of smoking and non-smoking should be stimulated through open-discussions. Additionally, it is believed that pupils' motivation to smoke, especially females, could be reduced by creating expectations of social punishments when pupils smoke by encouraging pupils to consider parents' disapproval and social unacceptability of adolescents' smoking.

Pupils' ***automatic motivations*** to avoid smoking could be enhanced by 1) rewarding pupils who never-smoked and those who supported non-smoking behaviour among their peers. 2) Encouraging and facilitating pupils' useful usage of free time plus practising exercises and hobbies to reduce negative emotions.

The study also identified some ***perceived barriers and facilitators*** of implementing SBSPIs in preparatory schools of Upper-Egypt, which will be discussed against the barriers and facilitators of SBSPIs that were implemented in Arabic and/or LMICs, see chapter 4, in the next chapter.

7.4 Chapter summary

This chapter discussed the perspective of schools staff and pupils on how preparatory schools of Upper-Egypt could contribute better in preventing adolescents from smoking initiation and the perceived facilitators and barriers of SBSPIs in upper-Egypt. The next chapter discusses factors that influence Egyptian adolescents' capability, opportunities and motivations to initiate smoking (findings from study-1) and what is currently implemented and suggested to be implemented at preparatory schools to enhance pupils' capability, opportunities and motivations to avoid smoking (findings from study-3) against what was used in effective SBSPIs in Arabic and/or LMICs in this regard (findings from study-2).

Chapter 8 - Discussion and conclusions

8.1 Introduction

This PhD thesis aimed to develop a better understanding of what should be considered in school-based interventions to prevent Egyptian adolescents from smoking initiation and make recommendations for designing a culturally-sensitive School-Based Smoking Prevention Interventions (SBSPIs) to contribute toward controlling the rising epidemic of smoking in Egypt. This aim was achieved through three complementary sub-studies: 1) a literature review which identified factors that influence adolescents' smoking in Egypt (study-1); 2) a systematic review which identified factors that influence the effectiveness of SBSPIs in Arabic and/or Low and Middle income countries (LMICs) (study-2); 3) and an exploratory qualitative study which identified the current role of preparatory schools in preventing adolescents from smoking initiation in Upper-Egypt and explored how this role could be improved considering the barriers of implemented SBSPIs from the perspective of schools staff and pupils (study-3). Findings of each sub-study are detailed in separate chapters, see Figure 3. This chapter summarises and discusses the main findings from the three sub-studies, outlines a set of recommendations for strengthening the role of preparatory schools to enhance pupils' capability, opportunity and motivation to avoid smoking initiation in Upper-Egypt, and details key implications for future research then discusses the strengths and limitations of this thesis.

8.2 Key findings

This thesis brings an in-depth analysis of the factors that influence the capability, opportunity and motivation of Egyptian adolescents to smoke (discussed in section 3.5) and how these factors are and could be addressed through schools in Upper-Egypt to prevent adolescents from smoking initiation (discussed in sections 6.4 and 8.2), drawing on lessons learned from the effective SBSPIs in Arabic/or LMICs (discussed in section 4.5.4 and 4.5.8). Table 25 summarises the key findings from the three sub-studies in relation to the COM-B model. Findings from this thesis suggest that schools could enhance pupils' capability, opportunity and motivation to avoid smoking initiation through: curricular and extracurricular educational activities using persuasive and appealing methods to raise pupils awareness on various consequences of smoking and correct their false positive beliefs on smoking (knowledge and persuasion); training on skills needed to avoid smoking such as positive self-assertiveness, stress management, problem-solving and decision-making plus refusal skills (training); continue banning smoking and carrying of cigarettes by pupils inside schools besides introducing measures to disallow smoking by staff and visitors inside school premises (restriction); encourage modelling of non-smokers and use the influence of peers to prevent smoking and create non-smoking social-norm (modeling and social reconstruction); creating expectations of social punishments alongside the current penalties of pupils who carry cigarettes or smoke inside schools (coercion); consider rewarding never-smokers (Incentivisation); encouraging and facilitating pupils' practice of hobbies and exercises as alternatives to smoking (enablement). These key findings are discussed in details in the next subsection.

Table 25 The conclusions from the three sub-studies of this PhD

COM-B Component	Influencing factors that could be addressed in SBSPIs (study-1)	Key components in the effective SBSPIs in Arabic and/or LMICs (study-2)	The current role of preparatory schools of Upper Egypt in preventing adolescents' smoking (study-3)	Suggestions of staff and pupils to strengthen the role of preparatory schools in preventing adolescents' smoking initiation (study-3)	Conclusion on what should be considered in SBSPIs to prevent pupils from smoking initiation in Upper-Egypt.
Psychological capability	- Poor awareness of the long and short term harms of active and passive smoking and the addictive effect of tobacco products. - Poor awareness of the religious prohibition of smoking. - Poor school education on smoking harms. - Poor refusal self-efficacy, especially for free smoking	- Raising pupils' awareness of the social, environmental and mental consequences of smoking in addition to the health consequences of smoking. - Clarifying how smoking could lead to addiction. - Educating pupils about the negative emotions that motivate pupils to smoke. - Ensuring pupils' high exposure and accessibility to information on smoking consequences through posters, booklets or newsletters in schools. - Improving pupils' skills and ability to avoid smoking and resist smoking offers in their society through training courses that explain how to	- Brief and limited information on some smoking harms is included in the current curriculum of preparatory schools, not always obligatory to be taught in lessons. Harms of shisha and flavored cigarettes are not included. - Limited and opportunistic extracurricular sessions/lectures on smoking consequences, targeting few pupils, mainly smokers, due poor capacity; are occasionally delivered by external experts who deliver complex	- Providing knowledge of various smoking consequences. - Specifying the contents and consequences of each smoking form. - Improving information accessibility. - Training pupils on skills needed to avoid smoking such as positive self-assertiveness, stress management, problem-solving and decision-making plus refusal skills because most Egyptian adolescents smoke for self-	- Schools should raise pupils' awareness of consequences caused by each form of smoking on various aspects of life. - The focus should not be only on harms on health as consequences on appearance and beauty, physical fitness, sexual ability, income, social relationships, the environment and others should also be explained - SBSPIs should emphasises the addictive impact of smoking tobacco and the negative emotions caused by smoking. - Explaining the religious prohibition of smoking is believed to enhance Egyptian adolescents' capability to avoid smoking. - More comprehensive and detailed information on various smoking consequences need to be implemented through curricular and extra-curricular school activities to improve pupils' accessibility to information and

	offers by friends.	perform these skills, provide opportunities for pupils to practice these skills, obtain feedback on their performance and discuss ways to improve their skills. - Informing pupils on the social and environmental situations and events that predict smoking and advising pupils how to recognize and analyse direct and indirect pressure to smoke from peers, family, advertisements and adults. - Supporting and training pupils to monitor their emotional reactions, manage and cope with anger, stress, anxiety and depression. - Building pupils' confidence in their ability to have a healthy future and win sports-competitions by maintaining non-smoking behaviour.	information in uninteresting lecturing style and limited discussion with pupils. - Voluntary opportunistic smoking-related discussion by teachers in classrooms, only when some pupils were caught smoking in schools. - Only a few old, unattractive school-posters on smoking harms are located in schools, sometimes inaccessible (in both presentation and location). - Smoking harms are presented in plays in school competitions without inviting pupils and are rarely presented inside schools. - Egypt-tailored smoking prevention training manuals that cover a range of skills needed for preventing pupils' smoking are available online for free but are	assertiveness or to relieve stress and initiate smoking based on friends' requests or offers.	discussions on smoking consequences at schools - Supporting schools with appealing educational materials on smoking consequences would improve information accessibility to pupils and staff. - School-poster is a good source of information; if made accessible, attractive and supported by pictures and photos. - Training relevant school staff (who deal with pupils' behaviour) by trusted experts would improve pupils' accessibility to information as frequent educational sessions could be implemented inside schools to target all pupils and allow more opportunities for pupils' discussion instead of relying on busy external experts who are less familiar with pupils' behaviour and teaching. - The thesis identified opportunities for integrating smoking-related educational and training activities in various extracurricular school activities such as health education, plays, assembly, and media activities. However, to facilitate the integration, these activities need to be part of the annual plans.

			unknown by schools staff and were used rarely to train pupils in preparatory schools. - Staff neither received any smoking-related educational or training activities nor were given any resources on smoking consequences.		- Pupils should be trained on how to refuse smoking offers without losing friends to avoid smoking initiation due to peer-pressure. - Pupils need training on stress management, problem-solving, decision-making and positive self-assertiveness in order to avoid smoking. - The freely available and Egypt-tailored training manuals that cover all these skills could be used to deliver these require training.

COM-B	Influencing factors that could be addressed in SBSPIs (study-1)	Key components in the effective SBSPIs in Arabic and/or LMICs (study-2)	The current role of schools of Upper Egypt in preventing adolescents' smoking (study-3)	Suggestions of staff and pupils to strengthen schools role in preventing adolescents' smoking (study-3)	Conclusion on what should be considered in SBSPIs to prevent pupils from smoking initiation in Upper-Egypt.
Physical opportunity	- Smoking by family members or at home (due to accessibility). - Smoking offers by friends - Accessibility to tobacco products close to schools. - Tobacco offers by friends, relatives and others. - Having smoker friends, parents, siblings and relatives (increase access to tobacco products).	- Establishing and enforcing antismoking school-policies that restrict smoking, by pupils, teachers, parents and visitors inside school premises. - Encouraging community members, when possible, to enhance and enforce the national anti-smoking policy.	- School policy bans smoking or the carrying of cigarettes by pupils inside schools. - Pupils and places inside schools are randomly screened for smoking or cigarettes. - Restricting pupils' accessibility to smoking in shops near schools is not currently considered by schools in Upper-Egypt	To continue implementing the current ban of smoking and carrying of cigarettes by pupils inside schools.	- Schools should continue restricting pupils' smoking and carrying of cigarettes as well as the frequent screening of cigarettes and smoking inside schools as this would reduce pupils' opportunities to initiate smoking at least inside schools. - Reducing pupils' accessibility to smoking in shops near schools is not currently considered by schools in Upper-Egypt. However, this need to be considered in the future, despite the challenges, because restricting pupils' smoking inside schools is insufficient as pupils might find alternative places to smoke outside schools, especially in places close to school. Schools could play a role in encouraging community members to support the national smoking policy or inviting pupils to sign a petition presented to decision-makers requesting a ban on tobacco advertising, similar to what some SBSPIs did in some LMICs.

Social opportunity	- Smoking by family members or at home (due to modelling). - Having a smoker friend / Attachments to friends. - Peer-pressure /encouragement to smoke. - Overestimation of smoking rates among peers and adults. - Teachers' smoking - Poor anti-smoking school policy which increases pupil' exposure to smoking behaviour by adults inside schools.	- Increasing pupils' exposure to non-smoking role models at schools. - Drawing pupils' attention to important people in their society who never-smoked. - Using non-smokers in roleplays, pictures and videos to present issues and demonstrate skills that enhance non-smoking behaviour. - Repeatedly presenting smokers and tobacco products in disliked images, through roleplays, pictures or posters at schools, as this would discourage pupils to initiate smoking. - Encouraging never-smoked pupils to identify themselves as role models in never-smoking who could be imitated by other pupils. - Encouraging and empowering non-smoker pupils to take an active role in convincing their peers, relatives and friends to avoid or quit smoking, and if possible, taking a voluntary social role in smoking prevention outside schools. - Using peer-pressure to enhance positive attitudes toward non-smoking behaviour. - Training well-recognized volunteers of never-smoked pupils and enable	- Smoking by staff, as role models for pupils of same-sex, is poorly restricted in pupils' presence in all locations in the schools. - Visitors and parents are not restricted from smoke in schools due to the cultural unacceptability of restricting guests' behaviour. - Preventing adults' smoking inside schools is hindered by the absence of quitting services and adults' smoking areas in schools. - Avoid announcing names of girls who smoke to sustain the social unacceptability of girls' smoking and enhance the belief that girls' smoking doesn't exist in	- Disallowing smoking by staff inside school premises. - Considering non-financial and more feasible financial punishments when staff smoke in schools. - Encouraging staff to avoid smoking by: 1) educating staff on harms of active & passive smoking; 2) reminding staff that they are role-models;3) upporting smoker staff to quit. - Encourage modelling of non-smokers by: 1) drawing pupils' attention to examples of successful people inside and outside schools who never smoked; 2) encourage non-smoker pupil and staff to share their experiences of smoking avoidance; 3) consider adding never-smoking to the criteria for	1) SBSPIs should ***reduce the social opportunities for pupils to initiate smoking*** through minimising their exposure to smoking behaviour at schools. This could be done through: - Continue the current restriction of pupils smoking at school. - banning smoking by staff, parents and visitors inside school premises - considering non-financial and more feasible financial punishments when staff smoke in schools - Enabling smoker staff and parents to access quitting services **after** educating them on harms of active and passive smoking and reminding them they are role-models for pupils who might imitate them in smoking**.** - Presenting examples of successful people inside and outside schools who never smoked and encouraging pupils to imitate these examples - Sharing experiences of smoking avoidance - Add never-smoking to the criteria for selecting ideal pupils and teachers**.** 2) SBSPIS could also use the influence of peers to prevent smoking and create non-smoking social-norm through: - encouraging peer-pressure to avoid smoking

		them to provide consultation to their peers on how to avoid smoking and ways for attracting others without self-harm and encourage them to share their experiences of avoiding smoking with their peers. - Encouraging pupils to obtain consultations and social support from their parents, friends or teachers to avoid smoking initiation. - Allowing pupils to practice peer-education skills over a reasonable period in the presence of professionals.	Upper-Egypt to discourage girls from smoking. - Pupils are encouraged to report smoking by their peers - Some pupils put pressure on their friends not-to-smoke - Establishing schools Smoking Control Groups but they are inactive /non-functional.	selecting ideal pupils and teachers. - Use the influence of peers to prevent smoking and create non-smoking social-norm by: 1) encouraging peer-pressure to avoid smoking; 2)using informal peer-education; 3) peer support for pupils whp face peer-pressure to smoke.	- using informal peer-education about smoking consequences - using peer-support for pupils who face peer-pressure to smoke. - Train nominated popular volunteers of pupils who never-smoked, probably members of schools smoking control groups, on communication, counselling and persuasion skills and allow them to practice these skills during the training and under close observations. Provide continuous support for these pupils after the training and enable them to lead these peer-related activities**.** 3) SBSPIs should represent smokers and tobacco products in unpopular images, through roleplays, pictures or posters at schools in order to create negative images about smoking and anti-smoking social-norm among pupils.

Reflective motivation Reflective motivation	- Having positive attitudes and beliefs on smoking. - Having religious beliefs on Smoking prohibition. - Having an intention to smoke. - Curiosity.	- Explaining the pros and cons of smoking and non-smoking. - Encouraging pupils to think about the advantages and disadvantages of smoking before deciding to smoke or not after explaining smoking consequences using memorable educational methods such as videos, role plays and discussion. - Encouraging pupils to compare the negative emotions that motivate pupils to smoke with the emotional impact of smoking. - Encouraging pupils to set proximal and distal personal-goals then explaining to them how smoking could hinder them from achieving these goals. - Enabling pupils to make a conscious decision to avoid smoking and make it a personal goal. - Encouraging pupils' self-confidence in their ability to remain non-smokers. - Asking pupils to make a verbal or written commitment to avoid smoking. Encouraging pupils who never smoked to make a conscious voluntary decision to be recognized as role-models and continue non-smoking. - Encouraging pupils to consider parents' disapproval of adolescents' smoking and punishments.	- Requesting making written conscious decision to avoid smoking by asking pupils to sign commitments not-to-smoke in schools witnessed and signed by their parents. - Creating expectations of punishments in case pupils smoke by: 1) informing pupils and their parents in advance about the expected penalty when pupils smoke or carry cigarettes inside schools. 2) announcing names of boys who smoked in schools and their penalties to scare other pupils.	- Correct pupils' false positive beliefs about smoking and persuade pupils about smoking consequences through persuasive and appealing methods which include: real-life stories, field-visits, laboratory experiments, photos/pictures, videos and school-plays, open discussions, and maybe social-media and online resources in future. - Stimulate pupils' thinking of the pros and cons of smoking and non-smoking through open discussion and encouraging critical observations of the life of smokers and non-smokers in the	SBSPIs should *stimulate pupils' reasoning and making a self-conscious decision not-to-smoke* ***(reflective motivation)*** through: 1) persuading pupils about smoking consequences using a mixture of the following persuasive, appealing memorable educational methods: real-life stories of smokers and non-smokers; field-visits to observe consequences on smokers; laboratory experiments to explain the physical consequences of smoking; photos/pictures, videos and school-plays, open discussions instead of lecturing. 2) Stimulating pupils' thinking of the pros and cons of smoking and non-smoking through open discussion and critical observations of various smoking consequences on relatives, parents and friends who smoke or never-smoked. 3) Continue requesting written commitments from pupils not to smoke or carry cigarettes in schools, witnessed and signed by parents, after informing pupils about the

				surrounding environments. - Creating expectations of social punishments when pupils smoke by encouraging pupils to consider parents' disapproval of smoking and the social unacceptability of adolescents' smoking, especially by females.	penalties applied if they do. This should be accompanied by creating expectations of social punishments when pupils smoke through encouraging pupils' consideration of parents' disapproval of smoking and the social unacceptability of adolescents' smoking, especially by females. 4) Building pupils' confidence in maintaining non-smoking behaviour, encouraging pupils who never smoked to be recognized among peers as none-smokers. Also the link between smoking avoidance and achieving personal goals should be emphasized.

COM-B	Influencing factors that could be addressed in SBSPIs (study-1)	Key components in the effective SBSPIs in Arabic and/or LMICs (study-2)	The current role of preparatory schools of Upper Egypt in preventing adolescents' smoking (study-3)	Suggestions of staff and pupils to strengthen schools role in smoking prevention (study-3)	Conclusion on what should be considered in SBSPIs to prevent pupils from smoking initiation in Upper-Egypt.
Automatic motivation	- Lack of practicing hobbies / Physical inactivity. - Exposure to stress and anxiety.	- Rewarding pupils, and where possible teachers and parents, who have never-smoked, at least socially through announcing their names in school posters and newsletter as this encouraged other pupils to imitate them and remain non-smokers. - Encouraging pupils to monitor their reactions to emotions and usage of free time. - Discussing different ways of enjoying free time without smoking and providing access to affordable community services to motivate and facilitate pupils' practice of leisure, hobbies and physical activities in order to release their negative emotions and beat boredom.	Applying the punishments stated in school policy when pupils smoke which involve: - suspending or expelling pupils who carry cigarettes or smoke inside schools - announcing names of smoker boys to punish them socially and discourage them to smoke again - social and light physical punishments applied by some popular teachers when pupils smoke outside schools.	- Rewarding, financially or socially, pupils who never-smoked and those who encouraged their peers to avoid smoking. - Encouraging and facilitating pupils' practice of hobbies and exercises as alternatives to smoking and effective methods of good use of free time and releasing negative emotions.	In order to enhance ***pupils' automatic motivation*** to avoid smoking initiation and support non-smoking among peers, SBSPIS should implement the following: - Pupils should be encouraged, trained and enabled to practice alternatives to smoking in releasing negative emotions and use of free time, such as practising hobbies and exercises . - The currently applied penalties in case of pupils caught smoking or carrying cigarettes inside schools should be accompanied by rewarding pupils(financially or socially) who never-smoked or those who encouraged their peers to avoid smoking.

8.3 Discussion of the key findings

This section discusses the key findings from the three studies in relation to the available literature about the intervention functions and barriers of SBSPIs. The discussion in this section is organized using the inner-layer of the BCW (intervention functions) to avoid repetition because some interventions functions overlap across the COM-B model components, as shown in Figure 6. Thereafter the findings of this discussion will be used in the next section to identify the key intervention functions that are relevant and recommended to be used in SBSPIs in Upper-Egypt to enhance the capability, opportunities and motivations of pupils to avoid smoking initiation.

8.3.1 Education

The thesis concluded that in orderto prevent pupils in Upper-Egypt from smoking initiation, schools should raise pupils' awareness of consequences caused by each form of smoking on various aspects of life. The focus should not be only on harms on health as consequences on appearance and beauty, physical fitness, sexual ability, income, social relationships, the environment and others should also be explained. The educational messages should not only focus on the fatality of smoking on the long term as this is not always convincing to many Egyptian pupils who believe that the death is pre-determined and unchangeable, so it doesn't matter what would be the cause of death. Similar findings have been identified in other contexts where focusing on the quality of life seems to be more convincing to avoid smoking uptake than focusing only on the premature death due to smoking (Hansen et al., 2010, Golechha, 2016). The addictive impact of smoking tobacco and the negative emotions caused by smoking should be emphasized as these showed effectivness in preventing adolescents' smoking initiation in Arabic and/or LMICs and are assumed to influence Egyptian adolescents' psychological capability to avoid smoking.

Egyptian adolescents' smoking is influenced by their religious beliefs on smoking and religious values are commonly respected in the Egyptian context, as study-1 and study-3 concluded. Therefore, explaining the religious prohibition of smoking is believed to enhance Egyptian adolescents' capability to avoid smoking. A systematic review of 43 adolescents' behaviour change interventions that involved religiosity or spirituality-related activities concluded that 84% of these interventions showed effectiveness in changing adolescents' behaviour in the USA (Rew and Wong, 2006). In LMICs, only one identified SBSPI emphasised the religious prohibition of smoking and showed a significant reduction in pupils' current smoking rate in the short-term only (Tahlil et al., 2013b). This immediate impact was not significant after six-months of follow-up (Tahlil et al., 2015). This intervention was implemented in Indonesia where smoking is encouraged in some religious and social events (Ng et al., 2006). Variance in pupils' religiosity or spirituality was not assessed before developing the religious contents of this intervention which were based on reviewing all religious-based education programmes worldwide (Tahlil et al., 2013b) plus a consideration of the opinions, through in-depth interviews, of a convenient sample of (16) teachers and educational-policymakers during the preparation stage of this intervention (Tahlil et al., 2013a). This intervention neither involved adult-stakeholders during the implementation process nor considered adolescents' opinions at any stage of this intervention. Weak involvements of youths and poor cultural-tailoring of interventions' contents usually cause a cultural mismatch between spiritual interventions and youths' needs (Benson and Roehlkepartain, 2008). This could explain the long-term ineffectiveness of this SBSPI, although it employed spirituality which is, from the adults' perspective, important in the Indonesian culture (Tahlil et al., 2013a). In this thesis, both staff

and pupils emphasized the importance of explaining the religious prohibition of smoking to prevent Egyptian adolescents from smoking initiation.

This thesis identified that contents and harms of each tobacco form should be explained to pupils in SBSPIs, especially Shisha, flavoured cigarettes and e-cigarettes because there is poor awareness among Egyptian pupils on that. Other studies show that Shisha smoking by youths is increasing globally, in Egypt and the Middle-East region (Maziak, 2011, Warren et al., 2009, Morton et al., 2014, Jawad et al., 2016). This emphasises the importance of raising awareness of harms of shisha smoking. A qualitative study included female adults from Arabic countries, including Egypt, indicated that females tend to choose Shisha smoking over cigarettes because of the cultural taboo on cigarette smoking by females (Khalil et al., 2013), this belief may be also transferred to female adolescents in the near future enhancing more Shisha smoking by girls. Shisha smoking has serious consequences on health (Akl et al., 2010, Chaouachi, 2007) and increases susceptibility to cigarette smoking in the Arabic context (Veeranki et al., 2015, Kheirallah et al., 2016b). However, adolescents in the Egyptian and other Arabic contexts commonly believe that Shisha smoking is safe (CDC, 2009, Labib et al., 2007, Kheirallah et al., 2016a, Al-Haddad and Hamadeh, 2003, Khader et al., 2009, McKelvey et al., 2013).

This thesis concluded that the contents of e-cigarettes should be explained to pupils in Upper-Egypt. There is a global trend of e-cigarette smoking by youths who commonly believe it is safe (Palipudi et al., 2016). Although e-cigarettes provide safe and sensibly effective help toward smoking cessation (Shahab and Goniewicz, 2014), its safety for adolescents is unproven and it is not an alternative form of smoking for those who never-smoked (Gostin and Glasner, 2014, CDC, 2019). E-cigarette smoking increases the intention and susceptibility to smoke cigarettes by youths in many countries (Moore et al., 2016, Wang et al., 2015, Wills et al., 2015, Soneji et al., 2017). However, this thesis identified that e-cigarette smoking was not well-researched in the Egyptian or the Arabic context.

This PhD concluded that pupils have limited access to information and discussions on smoking consequences through schools which could be improved by providing more comprehensive and detailed information on various smoking consequences through curricular and extra-curricular activities. A multiple regression analysis of the National Longitudinal Study of Adolescent Health, which included a nationally representative school-based sample saturated school sample in the USA, concluded that schools with good accessibility to anti-smoking information have lower smoking by pupils than schools with limited school-based information on smoking consequences (Alexander et al., 2001). However, this is not a straight forward option due to the complexity of the school system as has been identified by Littlecott et al. (2019) who recommended understanding social networks of school staff and the dynamic of the school systems to facilitate engagement with school-based health-promotion interventions. Accordingly, this PhD obtained the opinion of staff and pupils in the preparatory schools of Upper-Egypt on how SBSPIs could enhance access to information on smoking harms. Study-2 and study-3 concluded that school-poster is a good source of information; if accessible, attractive and supported by pictures and photos. Supporting schools with appealing educational materials on smoking consequences would improve information accessibility to pupils and staff. Similar findings were identified by a systematic review of school-based smoking prevention trials with long-term follow-up(Wiehe et al., 2005) which concluded that improving pupils' accessibility at schools to comprehensive information on smoking harms through lectures, demonstrations, films, posters, and books is associated with low smoking prevalence among pupils on the long-term in some context. Moreover, study-3 identified that training relevant school staff (those who deal with pupils' behaviour) by trusted experts would improve pupils' accessibility to information as frequent educational sessions could be

implemented inside schools to target all pupils and allow more opportunities for pupils' discussion instead of relying on busy external experts who are less familiar with managing pupils' behaviour and teaching. In the Egyptian context, the thesis identified opportunities for integrating smoking-related educational and training activities in various extracurricular school activities such as health education, plays, assembly,and media activities; to facilitate the integration, these activities need to be part of the annual plans of the schools' extracurricular activities..

The Problem Behaviour Theory and the Health Promotion Model explain that raising awareness on the short and long term harms of smoking is important base for addressing personality-related factors that encourage smoking (such as risk-taking orientation and curiosity) and enhancing other personality dispositions that promote non-smoking (such as increase personal value of health and physical fitness) (Perry and Jessor, 1985, Jessor et al., 2017b, Donovan et al., 2017). Emphasising the short-term consequences of smoking benefits from the discounting phenomenon of human behaviour (Sozou, 1998), which applies to smoking (Bickel et al., 2008) as pupils give more value to their current welfare than their future welfare (Tønnesen, 2002, Murray et al., 1984). However, providing knowledge on smoking consequences is insufficient to prevent adolescents from smoking initiation unless supported by training on skills needed to avoid smoking, as was concluded in study-2 and other systematic reviews of SBSPIs RCTs that were implemented in different contexts (Thomas et al., 2013, Gee et al., 2016, Buhler, 2016, Thomas and Perera, 2006, Thomas, 2002). The skills to be provided in these trainings will be discussed in the next section.

8.3.2 Training

Although raising awareness on smoking consequences is important base for personality-related interventions, as explained in section 8.3.1, providing this information is not suffering to prevent adolescents from smoking initiation as the intervention should address personality attributes that encourage smoking. Although personality is refractory to change, difficult to be measured and evaluated, and raise many ethical concerns, it is important to pay more attention to personality attributes in prevention interventions to enhance the effectiveness. Some of the personality attributes could be addressed though training as explained by some theories (Michie et al., 2014b) such as Problem Behaviour Theory and Health Promotion Model (Perry and Jessor, 1985, Jessor et al., 2017b, Donovan et al., 2017), Social Cognitive Theory (Bandura, 2004, McAlister et al., 2008) and the Theory of Motivation (Michie et al., 2014b). Systematic review of tobacco prevention interventions showed that the interventions that provide information on smoking harm without paying attention to personality attributes are ineffective in tobacco prevention among youths (Thomas et al., 2013, Thomas and Perera, 2006).

The thesis concluded that pupils in Upper-Egypt should acquire skills to be able to avoid smoking initiation. For example, there are poor refusal skills among Egyptian adolescents who are frequently exposed to free smoking offers, especially by friends, which makes many adolescents start smoking to keep their friendships and avoid being alone. This allies with the Persuasive Communication Theory (Ajzen, 1992) explains that improving individuals' refusal skills and ability to formulate counter arguments and effectively communicate their reasons for refusing smoking behaviour is important for resisting smoking persuasion by influent relatives and friends and thus would prevent adolescents from initiating smoking behaviour (Tormala, 2008, Griffin and Botvin, 2010). Training pupils how to refuse smoking offers without losing friends was effective in preventing adolescents' smoking initiation in Arabic and LMICs and was strongly suggested by schools staff and pupils to prevent adolescents smoking initiation in Egypt, as study-2 and study-3 respectively identified. However, the last Cochrane

systematic review (Thomas et al., 2013) which reviewed 134 SBSPIs concluded that providing training on social influence (resist smoking offers) skills alone is insufficient to prevent adolescents from smoking initiation unless it is supported by training on social competence skills. The findings of this thesis showed that exposure to stress and problems plus self-assertiveness are other reasons for adolescents' smoking initiation in Egypt. Some studies suggested that cigarette smoking reduces stress psychologically (Kassel et al., 2003) and a recent experimental study also concluded that cigarette smoking decreased anxiety and relieves stress physically and psychologically (Choi et al., 2015). Based on this evidence and what respondents suggested in study-3, it is important to provide training on stress management, problem-solving, decision-making and positive self-assertiveness in order to prevent Egyptian adolescents from smoking initiation, as pupils believe it is needed and it would work for them in the Egyptian context. However, the SBSPIs in LMICs that provided training on social competence skills alone were effective in reducing pupils' intention to smoke without a significant reduction in their smoking rates, even after two years of the follow-up (Resnicow et al., 2008, Perry et al., 2009). Therefore, Egyptian pupils' trainings should cover a range of refusal and social competence skills in order to enhance their psychological capability to avoid smoking initiation. The freely available and Egypt-tailored training manuals that cover all these skills, see section 6.3.2.1, could be used in SBSPIs, although they were rarely used in school-based training in Upper-Egypt. Opportunities for pupils during the training to practice these skills, obtain and discuss feedback on their performance to enhance their skills were provided in effective SBSPIs in Arabic and/or LMICs.

8.3.3 Restriction of smoking

Theories that explain social norm, such as Social-Norm Theory (Lapinski and Rimal, 2005), explain the role of minimizing exposure to unwanted behaviour, like smoking, would create a social norm that this behaviour is unacceptable and reduce its prevalence, especially among adolescents as social acceptability is important at this age (Michie et al., 2014b). In this regard, the thesis highlights the role of restricting smoking inside schools in preventing adolescents in Upper-Egypt from smoking initiation. Stuy-1 concluded that having smoker friends increases adolescents' accessibility to tobacco products as friends tend to share cigarettes in the Egyptian context. Findings from study-2 and study-3 explain that restricting adolescents' smoking inside schools showed effectiveness in preventing adolescents' smoking initiation in Arabic and/or LMICs and is strictly applied in the preparatory schools of Upper-Egypt which also restricts carrying cigarettes inside school premises and frequently screen random samples of pupils and places inside schools for smoking and cigarettes. However, study-3 found that smoking by staff, as role models for pupils of same-sex, is restricted in pupils' presence but not everywhere in these schools and schools don't restrict smoking by visitors and parents in schools due to cultural unacceptability of restricting guests' behaviours. A review of anti-smoking school policy (Schreuders et al., 2017) identified the following conclusions on school policy that restrict smoking inside school building: 1) it makes pupils think they will get sanctioned if they got caught smoking which prevent them from smoking inside school building. However pupils might find alternative places to smoke outside schools. 2) Challenging pupils to smoke during school hours facilitates maintaining their non-smoking behaviour but the sanction of smokers from school might make pupils dislike attending schools and any school activities on smoking. 3) Although anti-smoking school policy reduces pupils' exposure to smoking behaviour and reduces pressure on them to conform with smoking behaviour of others, it could attract adolescents to smoke through creating a belief that smoking means adults opposition. 4) Prohibiting smoking inside schools creates beliefs among pupils that smoking is a bad behaviour. However, allowing teachers or visitors to smoke inside schools building or weak enforcement of this policy make pupils believe that smoking is not too bad. The review recommended considering these issues in SBSPI that use antismoking school policy

to avoid the adverse outcome of this policy. Study-3 suggested that restricting pupils' smoking should be accompanied by restricting smoking by adults inside schools, rewarding non-smokers and raising awareness on smoking consequences to maximize the benefits of the current anti-smoking school policy in preventing Egyptian adolescents from smoking initiation.

Anti-smoking school policy is identified as a key factor in preventing adolescents' smoking based on systematic reviews included SBSPIs in European and non-European countries (Schreuders et al., 2017, Nishio et al., 2018, Das et al., 2016, Park, 2006) and was also commonly used in the effective SBSPIs that were implemented in LMICs, as identified in study-2 of this thesis (see section 4.4.8). However, the association between adolescents' smoking and anti-smoking school policies varied over time in some countries. For example, in 2001 a UK-based study (Moore et al., 2001) identified an association between the strength and enforcement of anti-smoking school policy and the prevalence of adolescents' smoking. These findings suggested introducing antismoking school smoking policies in order to reduce adolescents' smoking in the UK. However, a multi-level logistic regression analyses from a recent nationally representative cross-sectional survey that included a representative large (7376) sample of adolescents (aged 11–16 years) in Wales identified that there was no evidence of an association of antismoking school policies with adolescents' smoking (Hallingberg et al., 2016). The study concluded that antismoking school policy currently exerts less influence on adolescents' smoking than they did in the past when adolescent smoking prevalence was more prevalent in the UK. The changes in this association suggest the need for longitudinal studies to examine the potential influence of antismoking school policies on adolescents' smoking in the Egyptian context and explain this association over time.

Reducing pupils' accessibility to smoking in shops near schools is not currently considered by schools in Upper-Egypt and was not suggested by pupils or staff who believe that this is not feasible in the Egyptian context. However, as discussed in section 4.4.8. However, few effective SBSPIs in Arabic and/or LMICs aimed to restrict smoking beyond schools environment by encouraging community members to support the national smoking policy or inviting pupils to sign a petition presented to decision-makers requesting a ban on tobacco advertising (Perry et al., 2009, Reddy et al., 2002). In future research, there is a need to explore the feasibility of restricting pupils' accessibility to smoking in shops near schools in the Egyptian context and investigate how the Egyptian schools could contribute toward stimulating and implementing that.

8.3.4 Creating non-smoking social-norm and modelling at schools

A review of systematic reviews showed that school-based strategies that create smoke-free social norms and enhance pupils exposure to non-smoking role models were effective in preventing smoking in early adolescence age (Gee et al., 2016) because peer relationships and social acceptance is important to individuals at this age in general, as explained by the social cognitive theory (Bandura, 2004) and the Health Belief Model (Rosenstock et al., 1988, Maiman and Becker, 1974). The thesis highlighted the importance of creating non-smoking social-norm at preparatory schools to prevent pupils in Upper-Egypt from smoking initiation. Study-1 explains that Egyptian adolescents' smoking is influenced by observing smoking behaviour by friends and adults, particularly parents and teachers. Study-2 showed that creating smoke-free environments and non-smoking social-norms at schools was used in effective SBSPIs in Arabic and/or LMICs and was suggested by staff and pupils, in study-3, to reduce the social opportunities for pupils in Upper-Egypt to initiate smoking. Study-3 concluded that preparatory schools in Upper-Egypt, currently, don't play role in educating parents or staff on smoking consequences or supporting smokers to quit, although these

approaches would reduce pupils' exposure to smoking behaviour at home and schools. Targeting parents (quitting services and educational activities about smoking consequences) showed effectiveness in reducing smoking by pupils as concluded by some effective SBSPIs that were implemented in LMICs (Perry et al., 2009, Lotrean et al., 2013, Reddy et al., 2002), as discussed in section 4.4.2. Study-3 concluded that targeting parents and teachers by quitting services and educational activities sessions was considered, by school staff , appropriate for overcoming the challenges of restricting adults' smoking inside school premises in the Egyptian context where smoking by visitors and teachers is unrestricted.

Study-2 found that to create anti-smoking social-norms, some effective SBSPIs in Arabic and/or LMICs included repeatedly presenting smokers and tobacco products in disliked images, through roleplays, pictures or posters at schools and encouraged never-smoked pupils to present themselves as role models in never-smoking. Study-3 demonstrates that Egyptian pupils are currently encouraged to report smoking by peers to schools staff and put pressure on their peers to avoid smoking and study-2 identified that these approaches showed effectiveness in preventing adolescents' smoking initiation in Arabic and/or LMICs by creating negative attitudes toward smoking among pupils. Based on staff and pupils suggestions and lessons learnt from effective SBSPIs, creating non-smoking social-norms at preparatory schools also requires: 1) increasing pupils' exposure to non-smoker role-models; 2) providing peer-support for pupils who face peer-pressure to smoke; 3) encouraging informal peer-education on smoking consequences to be led by selective and trained volunteers of pupils who never-smoked under supervision of never-smoked staff. In study-3, members of the currently established Smoking Control Groups at preparatory schools of Upper-Egypt have been suggested to deliver these peer-led activities.

The thesis findings on modelling and informal discussion among peers are supported by Social Learning Theory and The Social Inoculation Theory. The Social Learning Theory emphasises that modelling and informal discussion among peers are essential in adolescents' learning process (Grusec, 1994, Turner and Shepherd, 1999). The Social Inoculation Theory support three aspects related to peer-education among adolescents: 1) peers are important source of information and advice for adolescents; 2) peer-educators could be considered as role models to enhance positive behaviour; 3) informal peer-education is more acceptable among adolescents who don't accept education by others (Turner and Shepherd, 1999). The effectiveness of peer-led SBSPIs, that involved peers in delivering teaching sessions, being close-friends or mentor of other pupils in relation to smoking prevention, was demonstrated in a recent meta-analysis of 10 RCTs, that targeted 13,706 pupils, aged 11-21 years, in 220 schools, all in the USA or high-income European countries, except one (Lotrean et al., 2010) implemented in a LMIC (Romania), and followed them for at least six weeks after completing the interventions (MacArthur et al., 2016). A critical review of comparative studies concluded that peer-led interventions are more effective than adults-led intervention in preventing smoking uptake by adolescents in European countries (Mellanby et al., 2000). An old meta-analysis concluded that peer-led interventions are more effective than adults-led interventions in preventing adolescents' smoking only in the short-term, not after a year or more of completing the intervention (Cuijpers, 2002). The last Cochrane systematic review, included 11 peer-led SBSPIs, two of them in LMICs, concluded that adults-led SBSPIs are more effective than peer-led in preventing smoking uptake by pupils in the short and long term (Thomas et al., 2013). While evidence from the ASSIST project which implemented SBSPIs in a western context indicates that informal peer-education is effective in preventing pupils from smoking initiation (Campbell et al., 2008). All the identified reviews didn't explain the effectiveness of peer-education in relation to the SBSPIs context and identified poor-reporting of the contents,

frequency and density of training peer-educators, their ages, types, frequency and density of peer-led activities and pupils' attendance rates of peer-led activities. Proper reporting of these issues could have helped to make a better assessment of the effectiveness of peer-led SBSPIs. Although there is contradiction in the available evidence of the effectiveness of peer-led SBSPIs, systematic reviews (Harden et al., 2001, Mellanby et al., 2000) emphasize the acceptability and preference of peer-led education compared with teachers-led education, as adolescents feel relaxed during the educational session, able to communicate better with their peers, consider peer-leaders as good source of information and more able than teachers to understand their problems in relation to smoking behaviour. To enhance acceptability of peer-led activities, systematic reviews indicated the importance of nominating peer-leaders by their classmates, training peer-educators, and allowing space for more informal education and interaction in peer-education rather than formal lecturing as adolescents do not like peer-educators to act like teachers (Harden et al., 2001, MacArthur et al., 2016, Cuijpers, 2002).

Study-3 showed that pupils currently have limited accessibility to social-media in Upper-Egypt. However, using social-media in SBSPIs in Upper-Egypt could be considered in the near future because of the increasing global trend of its use by youths and the effectiveness of social network in influencing peers to avoid smoking (Valente et al., 2003). Also, there is some evidence on the feasibility, acceptability and preliminary effectiveness of social media interventions for smoking cessation (Naslund et al., 2017) which might be applicable to smoking prevention.

Study-1 identified that Egyptian adolescents' smoking is influenced by their overestimations of smoking rates among peers. Study-2 found that none of the effective SBSPIs in Arabic and/or LMICs used normative education which aims to correct pupils' overestimation of smoking behaviour among peers by providing information on the national smoking rates among adolescents. The importance of correcting the overestimation of smoking rate in preventing smoking at early adolescents was highlighted in a meta-regression (Onrust et al., 2016) although a meta-analysis in the last Cochrane systematic review of SBSPIs concluded that normative education has insignificant impacts on preventing adolescents' smoking initiation (Thomas et al., 2013). This Cochrane meta-analysis included only three RCTs that used normative education and met the inclusion criteria, the three RCTs were implemented in the USA and one RCT was very old (Rabinowitz and Zimmerli, 1974). The other two SBSPI RCTs showed insignificant impacts on preventing adolescents' smoking after one year of delivering normative education (Howard et al., 1996) and (Sun et al., 2008). Other RCTs concluded that normative education in SBSPI significantly reduced adolescents intention to smoke (T-test 3.88, P-value< 0.05) (Brown et al., 2010) and past week smoking rate (OR=0.88, 95% CI=0.80–.98) but insignificantly reduced last-month smoking rate (OR=0.96, 95% CI=0.88–1.04) (Eisenberg and Forster, 2003). This contradiction might be due to differences in context which were not described in any of the above studies.

Study-3 demonstrated that that when girls were caught smoking or carrying cigarettes, although this is rare in Upper-Egypt, schools keep these cases confidential to avoid informing other girls that the social unacceptability of smoking could be broken in upper-Egypt. It was also emphasised that girls' smoking should be kept confidential to sustain the social-norm of the unacceptability of girls' smoking and enhance the belief that it doesn't exist in Upper-Egypt. Additionally, it is commonly believed that announcing girls' smoking might encourage rebellious girls to try smoking and would stigmatise the school, other girls and staff in this school if the public know that the school has smoker girls, although announcing punishments of smoker girls would discourage other girls from trying smoking. Although hiding girls' smoking is believed to discourage girls from smoking initiation and maintain the social

unacceptability of girls' smoking in Upper-Egypt, it might not be sufficient in the near future as girls' smoking is heavily emphasized in the recent television Egyptian drama based on the researcher's observations. This heavy emphasis in the drama informs the public on the existence of girls' smoking in Egypt and may change the social norm toward girls' smoking in the near future which would encourage girls to smoke in Upper-Egypt. Evidence from different contexts indicate that adolescents decision not to smoke, especially girls, is markedly influenced by the social unacceptability of smoking while social acceptability encourage more girls over time to experiment and counties smoking (McKelvey and Halpern-Felsher, 2017, Chen et al., 2010, Sansone et al., 2015). Accordingly, girls should be targeted by smoking prevention interventions and girls' schools should not be excluded as relaying on the social climate in preventing girls from smoking is not a promising strategy to prevent girls from smoking initiation over time.

8.3.5 Persuading pupils to avoid smoking

The Persuasive Communication Theory (Ajzen, 1992) emphasises the importance of using persuasive methods to convince adolescents why smoking is not good behaviour in order to create negative attitude toward smoking and enable adolescents not to smoke. the persuasive methods should effectively communicate reasons not to smoke and address the common misbeliefs about smoking and enable adolescents to communicate these reasons internally then externally with their relatives, friends and peers (Tormala, 2008). In this regard, the thesis concluded that having positive attitudes and beliefs on smoking encourage Egyptian adolescents to initiate smoking. However, providing knowledge on smoking consequences would not necessarily influence pupils' beliefs and attitudes towards smoking which are parts of a behaviour-influencing system that also combines personal knowledge, experiences, values and morals (Fishbein, 1963, Hayden, 2013). Nevertheless, pupils' beliefs and attitudes would be influenced if the educational activities included persuasive, appealing and memorable educational methods; encouraging pupils' critical observations of the life of smokers and non-smokers in the surrounding environments; plus explaining the pros and cons of smoking and non-smoking through open discussion with pupils (Wagner and Waldron, 2001, Wanger et al., 2001). Study-2 identified that these approaches were used in effective SBSPIs in Arabic and/or LMICs and strongly recommended by staff and pupils in preparatory schools, in study-3, to be used in SBSPIs in Upper-Egypt to discourage pupils from smoking initiation. Study-2 also concluded that effective SBSPIs encouraged pupils to compare the negative emotions that motivate pupils to smoke with the emotional consequences of smoking, set proximal and distal personal-goals and then discuss with pupils how smoking could hinder them from achieving these goals as well as enabling pupils to make a conscious decision to avoid smoking and make it a personal goal. Study-3 concluded that these approaches would persuade pupils in Upper-Egypt to avoid smoking. The result of RCT (Aveyard et al., 2001) that included 4,227 pupils in 26 schools and 4,125 in 26 schools in the UK showed, through a logistic regression, that using persuasive educational methods, such as enhance the effectives of SBSPIs in preventing smoking by adolescents. The persuasive methods used in this RCT are explaining and discussing the pros and cons of smoking (to enhance making balance decision about smoking uptake) as well as open discussion about pupils' beliefs about smoking. However, this study used interactive computer programme to deliver this intervention, which is not available at the Egyptian context due to the limited school resources. Although access to individual computers is a limitation of implementing similar approach, using computer programs, in the Egyptian context, using persuasive methods could still be used within the available school resources. Study-3 identified that the following persuasive and appealing methods could be used in SBSPIs within the available school resources in Upper-Egypt: using real-life stories, field-visits,

laboratory experiments, photos/pictures, videos and school-plays, open discussions. While social-media and online resources are not feasible to be used in schools currently due to limited access to computers and internet at schools of Upper-Egypt, these approaches might be considered in the future with better school resources.

8.3.6 Coercion

The thesis identified the role of coercion in preventing pupils from smoking initiation. The current policy of preparatory schools punishes pupils, first by suspension then sanction, who smoke or bring cigarettes inside school premises. At admission, pupils are requested to sign a form, witnessed and signed by their parents and renewed annually, acknowledging their awareness of this policy and applied penalty and committing not-to-smoke in schools. Outside the school policy, preparatory schools in Upper-Egypt also announce, written or verbally, names of pupils who were caught smoking or carry cigarettes inside schools and penalties applied to them in schools news, as a social punishment. Additionally, some popular teachers apply social and light physical punishments to smoking pupils. These approaches are believed to create expectations of punishments in case pupils smoke or carry cigarettes inside schools and discourage pupils from smoking at least inside schools to avoid punishments, as study-3 concluded. A similar punishing school-policy showed effectiveness in reducing adolescents' smoking initiation in contexts other than Arabic or LMICs (Schreuders et al., 2017). Although some theories (Grant and Valier, 2002) support using punishments in preventing risky behaviour, some behaviour change theories emphasise that punishment alone is insufficient in preventing risky behaviour, especially at adolescence age, as it is important to balance creating expectations of punishments when practicing a forbidden behaviour with rewards when avoiding this behaviour (Butler, 2013, Michie et al., 2014b).

Study-2 revealed that none of the included SBSPIs in Arabic and/or LMICs used punishments to prevent pupils from smoking initiation. Although, the use of social ostracism have not commonly mentioned in the literature in high-income/Western societies, there is some evidence that social ostracism (such as ignoring or avoided talking with pupils who have smoked by both peers and staff) markedly influence adolescents' behaviour in some societies, as explained by Williams (1997). Instead of school punishments, some effective SBSPIs in Arabic and/or LMICs encouraged pupils to consider parents' disapproval of adolescents' smoking and punishments. Pupils and staff at preparatory schools, in study-3, believe that encouraging pupils to consider parents' and society's disapproval and expected punishments when adolescents smoke would prevent smoking initiation by adolescents, especially girls, in Upper-Egypt where parents and social-norms are well-respected.

Study-3 demonstrated that pupils in preparatory schools in Upper-Egypt are requested to sign written obligatory commitments not-to-smoke in schools that are witnessed and signed by their parents. Whereas study-2 identified that pupils were asked to make a verbal or written voluntary commitment to avoid smoking in some effective SBSPIs in Arabic and/or LMICs.

Study-2 concluded that the effectiveness of using coercion intervention function in preventing adolescents from smoking initiation in the Arabic and LMICs were poorly explained in the available evidence, see section 4.4.8. However, the role of punishing pupils who smoke at school in preventing other pupils from smoking initiation has been emphasised in the literature from different countries (Darling et al., 2006, Flay, 2000). The evidence indicates that the effectiveness of antismoking school policies that include punishment is enhanced by consistently informing pupils on these policies and integrating the anti-smoking polices into the comprehensive school policies (Paek et al., 2013, Flay, 2000). The literature also indicates

that combining anti-smoking school policies that apply penalties on pupils who smoke at schools with educational activities on smoking harms enhances the role of these policies in preventing pupils from smoking initiation. For example, a study included 4,697 pupils in 31 schools in Australia showed, in logistic regression, that schools that educate pupils on smoking harms then punish pupils who are caught smoking at schools have lower smoking rates than schools that relay only on punishment (Hamilton et al., 2003). The findings of this study also suggested that the actions taken to deal with students who violate smoking policy restrictions is more important in preventing pupils from smoking than the presence of anti-smoking policies or committees at schools. Accordingly, preparatory schools in Upper-Egypt should also continue to inform pupils and parents on the current anti-smoking policies and maintain enforcing these anti-smoking policies as part of the general school policy. There is also a need to combine implementing these current policies with strong school activities to educate pupils in smoking harms, the suggested educational activities are discussed in section 8.3.1.

8.3.7 Incentivisation

The findings explain the role of incentives in preventing adolescents from smoking initiation through SBSPIs. No incentives are currently utilized in preventing pupils from smoking at preparatory schools in Upper-Egypt, as study-3 showed. However, study-2 concluded that effective SBSPIs in Arabic and/or LMICs considered rewarding pupils who never-smoked, financially or socially, which was also recommended by staff and pupils, in study-3, to be used in preparatory schools of Upper-Egypt in order motivate pupils to avoid smoking initiation. The role of social and financial incentives in changing adolescents' behaviour is explained by some behaviour change theories such as Incentive theory (Logan, 1968, Killeen, 1981, Ellingsen and Johannesson, 2008) and the Theory of Motivation (Michie et al., 2014b).

The limited utilization of incentives in preventing smoking uptake by adolescents was indicated in two Cochrane systematic reviews (Hefler et al., 2017, Johnston et al., 2012). All the included SBSPIs in these two reviews were implemented in Europe and used smoke-free class competition to prevent pupils from smoking uptake by distributing small to moderately-sized prizes, usually through a lottery system, to whole classes that have 90% or more never-smoking rates among pupils after at least six months of follow-up after intervention completion. The meta-analysis of the recent one of these reviews (Hefler et al., 2017), pooled the result of three RCTs targeted 3056 pupils aged 11-14 years, identified insignificant effects of smoke-free class competition in preventing smoking initiation among adolescents in the long-term, pooled relative-risk= 1.00, 95% CI= 0.84 to 1.19. The ineffectiveness of the smoke-free class competition in preventing smoking uptake by adolescents who never smoked have been also identified in other systematic reviews (Johnston et al., 2012, Isensee and Hanewinkel, 2012), although smoke-free class competition was effective in reducing current smoking rates among pupils in three European countries (Finland, The Netherlands and Germany), as was concluded in a meta-analysis of RCTs SBSPIs targeted 16,302 pupils (Isensee and Hanewinkel, 2012).

All the identified systematic reviews that aimed to assess the effectiveness of incentive SBSPIs did not include any SBSPIs implemented in Arabic or LMICs, were unable to analyse the dose-response relationship or cost-effectiveness of the incentive SBSPIs due to insufficient information available. These reviews highlighted the need for more high-quality RCTs to assess the impact of incentive SBSPIs in preventing smoking uptake by pupils (Johnston et al., 2012, Isensee and Hanewinkel, 2012, Hefler et al., 2017). The limited resources in LMICs could explain why financial incentives were not used in LMICs. One RCTs used smoke-frees class completion approach to prevent pupils from smoking in an Arabic country with middle income,

Jordan (Al-sheyab et al., 2012). However, this intervention used pledge instead of incentives and identified insignificant changes in the ever-smoking rates by pupils after four-months of follow-up. This study was not eligible for inclusion in study-2 review because the follow-up period was less than six-months (Al-sheyab et al., 2016). Accordingly, further exploration of the applicability and impact of incentives in SBSPIs in the Arabic and/or LMICs is required.

8.3.8 Enablement

The importance of enabling people to avoid or quit unwanted behaviour is emphasised in some behaviour change theories such as the Theory of Enablement (Wagner, 2003) and the Integrative Model of Health Attitude and Behaviour Change by Flay (Michie et al., 2014b). in this regard, the thesis concluded that enabling pupils to practice hobbies and exercises as alternatives to smoking and effective methods of good use of free time and releasing negative emotions was used in effective SBSPIs in Arabic and/or LMICs and strongly recommended by staff and pupils for preventing pupils in preparatory schools in Upper-Egypt from smoking initiation as many Egyptian adolescents initiate smoking to relieve their stress or fill their free time.

In study-3, school staff and pupils also suggested enabling smoker pupils, teachers and parents to quit smoking as this would reduce pupils' exposure to smoking behaviour at home and in schools. Providing quitting services was considered in effective SBSPIs that were implemented in LMICs and was effective in preventing pupils from smoking initiation in other contexts (Buhler, 2016, Langford et al., 2015).

8.3.9 Combining intervention functions in SBSPIs

According to the above discussion and based on the findings of the three sub-studies it was concluded that: 1) there are several factors that influence smoking initiation by Egyptian adolescents, as study-1 identified. 2) These factors require different intervention functions to be addressed, staff and pupils respondents in Study-3 suggested what interventions function could be used in SBSPIs within the available school resources in Upper-Egypt. 3) Study-2 concluded that there is no clear agreement on the minimum number and type of components required for enhancing the effectiveness of SBSPIs. Study-2 also concluded that effective interventions used more than one intervention function to prevent adolescent from smoking initiation. The effective SBSPIs in Arabic and/or LMICs used at least three intervention functions, the education, training and persuasion, alone (Motamedi et al., 2016) or in addition to the restriction function only (Reddy et al., 2002), or modelling only (Lotrean et al., 2013), or modelling and environmental-reconstruction functions (Mohammed et al., 2016), or used all other functions except the coercion function (Perry et al., 2009).

None of the identified reviews used the BCW intervention functions to review SBSPIs which limited the comparability of study-2 findings with other evidence. However, the last Cochrane systematic review, that included 134 SBSPIs in different countries, demonstrated that all effective SBSPIs included training of pupils about skills to avoid smoking initiation (Thomas et al., 2013). Another systematic review of studies that evaluated the impact of school-based programs on preventing smoking in African countries, four in South-Africa and four in Nigeria, between 2000 to 2016, concluded that effective SBSPIs in Africa included multiple components such as providing training on smoking refusal skills using video and interactive discussion, encouraging peer-education and enforcing antismoking school policy (Nishio et al., 2018). However, this review included only two RCTs out of the six included studies. Evidence from other reviews and SBSPIs indicates that multiple components are efficient in delaying the onset of adolescents smoking in different contexts (Mishra et al., 2005, Thomas et al., 2013,

Schreuders et al., 2017, Park, 2006, Das et al., 2016). The Problem Behaviour Theory, explains that a comprehensive intervention should include and balance attention to two types of complementary strategies to prevent smoking, one aims to weaken, reduce and eliminate smoking behaviour and the other type of strategy aims to strengthen, increase and enforce non-smoking behaviour (Perry and Jessor, 1985, Donovan et al., 2017).

The behaviour change wheel (BCW) allows linking factors that influence human behaviour with the intervention functions that are required to change this behaviour (Michie et al., 2014a). As described in section 2.3.1, this link is established around the core layer of the BCW (the COM-B model) which explains that individuals' behaviour is influenced by their physical and psychological capability, physical and social opportunities and automatic and reflective motivation to perform this behaviour (Michie et al., 2014a). The BCW also allows comprehensive analysis of the influencers of individuals' behaviour around the COM-B model as well as integrating several interventions functions, through the middle layer of this wheel, to address various influencers of this behaviour in order to change the physical and psychological capability, physical and social opportunities and automatic and reflective motivation of individuals to perform this behaviour, as Figure 5 demonstrates. Accordingly, the BCW is a powerful tool in designing behaviour change interventions and it was considered by many researchers as an appropriate tool for designing the contents of their behaviour change interventions as indicated by Michie and Wood (2015) in a review of this tool. These researchers unexclusively include: Chiang et al. (2018) who evaluated the use of BCW in designing interactive two-way mHealth interventions for improving medication adherence; Gould et al. (2017) who used BCW in designing an implementation intervention smoking cessation; Sinnott et al. (2015) who used the BCW in designing intervention to improve medication management in multi-morbidity; and Seppälä et al. (2018) who used the BCW to guide a national policy for the promotion of physical activity and healthy nutrition at workplaces in Finland.

As the BCW was designed to guide an efficient design of feasible interventions that could address several influencers of human behaviours by integrating several intervention functions, the BCW was used in this thesis which aims to contribute in designing a feasible SBSPIs for Egypt. This thesis concluded that there are several factors that influence smoking by Egyptian adolescents (identified in study-1), these factors require different intervention functions to be addressed in SBSPIs (as study-2 concluded) and several interventions functions could be used in SBSPIs within the available schools resources to prevent adolescents from smoking initiation in Upper Egypt (as study-3 suggested). Therefore, it was felt appropriate to use the BCW in the three substudies of this thesis. Using the BCW in this thesis allowed comparing and contrasting the findings of the three subsidies, in Table 25, about 1) what factors that influence smoking by Egyptian adolescents could be addressed through schools, 2) what interventions functions were used to prevent adolescents from smoking uptake in Arabic and/or LMICs and 3) the interventions functions are or could be used in SBSPIs in Upper-Egypt within the available resources at schools. The BCW allowed identifying several intervention functions that could be integrated in SBSPIs to address several factors that influence smoking by Egyptian adolescents in order to enhance the capability, opportunities and motivations of pupils in the preparatory schools of Upper Egypt to avoid smoking initiation. The multiple intervention functions to be used in designing SBSPIs at Upper –Egypt are summarized in Figure 17 .

Study-3 aimed to explore what could be done at the Egyptian schools to prevent pupils from smoking initiating within the current school activities using the available resources. The host and many respondents emphasised that making structural changes in schools will be either impossible or very challenging in the Egyptian context. Egypt similar to other LMICS where resources are limited and structural changes take a long time and need strong political decisions and interests, which are unusually influenced by research (Vindigni et al., 2011). In these contexts, it is more feasible to introduce changes at school level if they are within the current school activities without the need for such complex and bureaucratic processes that take time and need political permission (Jessor, 2017a, Jessor, 2017b, Wagner, 2003). Additionally, the evidence shows that individual motivations in making changes within organizations lead to structural changes in these organizations in the future, if people are convinced, committed and their motivations are maintained in the long-term (Skara and Sussman, 2003, Flay, 2009, Jessor, 2017a, Jessor, 2017b). Accordingly, implementing the combined intervention functions that are discussed above within the current school structure and resources is a good start to participate in addressing factors that influence individual motivations and is assumed to gradually enhance structural changes in schools in the future for a better role of schools in preventing adolescents from smoking initiation.

8.3.10 Gender difference to be considered in SBSPIs in Upper-Egypt

This thesis concluded that although girls' smoking is hidden in Upper-Egypt due to the social unacceptability and cultural taboo of females' smoking, it is important to target girls along with boys in SBSPIs because females' smoking has continuously increased in Egypt, as have been observed during the field visit and recognized in the literature (Sreeramareddy et al., 2018, MOHP et al., 2009, WHO and CDC, 2009a, WHO and CDC, 2014b).

While most of the identified intervention functions are applicable to both sex, study-3 revealed that girls in Upper-Egypt are more concerned about consequences of smoking on beauty, appearance and social relationships, especially with parents, friends and relatives, as well as the cultural unacceptability of females' smoking than boys. Whereas boys are more concerned about the consequences of smoking on physical fitness and sexual ability. These gender-differences should be considered in emphasizing smoking consequences in SBSPIs in Upper-Egypt.

The WHO Framework Convention on Tobacco Control recognises the gender difference in smoking predictors and the need for gender-specific prevention strategies for more effective control of the smoking epidemic (WHO, 2004). A systematic review (de Kleijn et al., 2015) investigated gender-specific approaches to preventing smoking suggested that gender-specific interventions might be more effective than gender-neutral interventions at preventing smoking among girls. This conclusion was also supported by other girls-specific intervention studies (Schinke and Schwinn, 2005, Dino et al., 2001, Botvin et al., 1999).

A meta-analysis that investigated gender-specific approaches to preventing smoking concluded that, on the long-term, teacher-led interventions have a more significant impact than peer-led educational activities on preventing girls from smoking initiation (RR = 0.57; 95 % CI; 0.33–0.99) (de Kleijn et al., 2015). The review identified that girls are more influenced by adults' smoking behaviour, either actors or teachers, than boys who are influenced by peers more than girls (de Kleijn et al., 2015). However, this gender difference was not identified in the Egyptian context, either in study-1 or in study-3. Moreover, the last Cochrane systematic review identified no significant difference between teacher-led and peer-led SBSPIs on girls on either the short-term or the long-term (Thomas et al., 2013). The limited number of gender-

specific SBSPIs challenges identifying girls-specific issues that enhance the effectiveness of SBSPIs in preventing girls from smoking initiation. These issues should be addressed in future studies.

8.3.11 The perceived barriers and facilitators

This thesis identified some perceived barriers and facilitators of implementing SBSPIs in preparatory schools of Upper-Egypt. The framework by Bauld et al. (2009) was used to categorize these factors into the following five groups:

A) Factors related to the characteristics of the targeted pupils. This included: 1) Pupils' considerations of the unacceptability of adolescents' smoking and parents' punishments would enhance the acceptability of SBSPIs. 2) The diversity of pupils' experience and observations of smoking would enrich pupils' discussion of smoking harms. 3) Gender-differences in pupils' beliefs of smoking and reasons to smoke as well as differences in pupils' smoking status and exposure to smoking at home and in the society would challenge uniformity of SBSPIs contents.

B) Concerning creating smoke-free environments at schools, facilitators included: 1) the existing and enforced anti-smoking school policy that prevent pupils' smoking at schools; 2) and the existing, although unenforced, anti-smoking school policy that restricts teachers' smoking inside schools. Whereas barriers included: 1) poor enforcement of school policy that restrict staff smoking inside schools; 2) inability of applying the identified financial penalty on teachers if they smoke inside schools and lack of clarity of the process; 3) absence of written policy restricting visitors' smoking inside schools; 4) the cultural unacceptability of restricting guests' behaviour, including smoking, during school visits; 5) absence of adults' smoking areas inside schools away from pupils; 6) unavailability of smoking-quitting services inside or linked to schools.

C) Factors related to peer-led activities. 1) unacceptability of peer-led teaching sessions unless informal sessions delivered by persuasive, respectful and social pupils who never-smoked and nominated by other pupils. 2) Difficulty to identify never-smoked pupils based on self-reporting in schools. Peer-education could be facilitated by 1) nomination of peer-educators by pupils. 2) Consulting class-teachers on the appropriateness of the nominated peer-educators. 3) Training peer-educators on effective communication and convincing skills. 4) Supporting peer-educators by persuasive educational materials.

D) Barriers related to delivery methods, mechanisms and context included: 1) the intensive school curriculum, with limited smoking-related information, busy timetables, overloaded teachers and regulations restrict covering extra-curricular topics during class time. 2) Inaccessibility to free internet, mainly due to limited finance, hinders using free online educational resources. 3) Poor laboratory resources limit using experiments in explaining physical smoking consequences. 4) Complexity of obtaining permissions of parents and authorities of education and security due to issues related to pupils' safety and cultural unacceptability, especially for girls, hinder organizing field-visits for pupils to observe smoking consequences on smokers. 5) Unsustainability of smoking-related education by external experts. 6) Lack of credibility of smoking-related education delivered by smoker staff. 7) Dominance of fear-based and lecturing approaches which are less convincing than the attractive open discussions of the pros and cons of smoking and non-smoking.

Facilitators of delivering SBSPIs included: 1) downloading online educational videos and audio-visual recorded experiments to be saved in schools. 2) Possibility of integrating the

intervention contents and activities in different subjects of the school curriculum as well as the existing extra-curricular activities such as theatre activities. 3) Involving pupils and school staff in developing the educational materials to ensure relevance, feasibility and acceptability. 4) Delivering interventions by popular and non-smoking schools staff, after raising their awareness of smoking consequences and training them on communication and persuasive skills, instead of relying on external professionals to ensure sustainability. 5) Involving trusted external professionals (like doctors and religious leaders) in training selected non-smoker staff and pupils with high self-efficacy to deliver the intervention activities and enhance quality. 6) Available schools resources could be used in raising awareness and stimulating discussion on smoking consequences. 7) Pupils' discussion on smoking harms could be guided through social media, particularly schools'Facebook webpages, in the future. However, this is currently unfeasible due to pupils' unaffordability and inaccessibility to online social media channels inside or outside most schools.

E) Factors related to the context inside and outside schools. Social unacceptability of smoking by pupils, especially girls, and the positive attitude of staff in the visited schools toward preventing adolescents' smoking is expected to facilitate implementing SBSPIs. Context-related barriers include: 1) stigmatizing schools that are specifically targeted by smoking preventing activities might hinder implementing SBSPIs unless all schools are targeted. 2) High exposure of pupils to smoking behaviour outside schools at an early age might challenge preventing pupils from smoking initiation in the Egyptian context.

Only a few of the identified studies explicitly explored barriers and facilitators of SBSPIs in various contexts. The systematic review by Bauld et al. (2009) that included 21 qualitative research on SBSPIS from different countries is one of the important source of evidence on barriers and facilitators of SBSPIs. A protocol for a more recent systematic review of qualitative studies that explore barriers and facilitators of SBSPIs has been published (Dobbie et al., 2018) but findings are unavailable yet.

Some of study-3 findings on barriers and facilitators in Upper-Egypt align with findings from the systematic review of by Bauld et al. (2009) and those identified in study-2 in relation to SBSPIs in Arabic and/or LMICs, see section 4.5.7. The common findings across the three studies include:

- Having strongly enforced anti-smoking school policy enhance the effectiveness of SBSPIS, informing pupils and parents on this policy facilitate its implantation while permitting adults (teachers or visitors) to smoke inside school is an important barrier that seems to be challenging to tackle in the context of Arabic and/or LMICs like Egypt due to the cultural values.
- Timing the intervention activities to suit school assessment period and involving teachers, parents as well as other organization were identified by Bauld et al. (2009) as facilitators of SBSPIs. However, study-2 and study-3 emphesised the difficulties in involving parents and community members in SBSPIs due to their busy schedule at school-time and the poor partnership between parents and schools in relation to the smoking behavior in the Arabic, LMICs and Egyptian contexts.
- The diversity of smoking behaviour of pupils as well as their parents and community is a barrier against delivering consistent contents to all recipients and adaptation of contents is required to enhance effectiveness (Bauld et al., 2009). This was also emphesied in study-2 and study-3 suggested that introducing SBSPIs at early age before pupils initiate smoking is important to overcome this barrier.

- Pupils' reluctance to discuss smoking issues with their teachers as well as teachers heavy workload have been identified in study-2 as barriers of delivering SBSPIs by teachers in Arabic and LMICs. The review by Bauld et al. (2009) suggests delivering SBSPIS by external professionals to overcome these barriers. However, study-3 strongly emphasised the importance of involving popular non-smoker teachers in delivering SBSPIs in the Egyptian context, after training them by trusted external professionals, as relying on externals is unsustainable and requires complex procedures based on the current regulations in Egypt.
- The importance of involving only non-smokers in delivering the intervention is emphesised in the three studies. However, study-3 suggested that involving people who quitted smoking or suffered from smoking consequences should be considered in the Egyptian context, as it is more convincing in explaining the consequences of smoking.
- The three studies identified that the limited financial resources hinder implementing comprehensive interventions over a reasonable period, especially in LMICs. Study-3 particularly clarified the limited school resources in Egypt and the poor access to internet and technology at schools which hinders using advances technology in delivering attractive and innovative educational interventions.
- The review by Bauld et al. (2009) suggested nominating peer-educators by fellow pupils, training them outside schools and providing continues support by externals to enhance the effectiveness peer-led SBSPIs activities. However study-2 identified the difficulties in providing ongoing training for peer-educators in LMICs. Additionally, study-3 empshiesed the unacceptability of peer-led education in the Egyptian context unless it is delivered in informal sitting though persuasive, respectful and socially active pupils who never smoked and nominated by their fellow peers in consultation with class-teachers. This also have been identified in the ASSIST SBSPIs which was implemented in a western context (Campbell et al., 2008). Study-3 also emphasised the importance of improving accessibility to persuasive educational materials, such as attractive comprehensive posters, at schools to facilitate informal peer discussion on smoking harms during their free times.

8.4 Recommendations for SBSPIs in Upper-Egypt (Implications for practice)

Based on the findings from the three sub-studies and the discussion above, the followings are recommended to improve the role of preparatory schools in Upper-Egypt in preventing male and female adolescents from smoking initiation. The BCW was used to present the findings of this thesis on what could be done at preparatory schools of Upper-Egypt to prevent pupils in Upper-Egypt from smoking initiation. The session below discusses the recommend intervention functions for reducing physical and social opportunities for pupils to smoke and to enhance their psychological capability as well as reflective and automatic motivation to avoid smoking initiation. Table 26 summarizes the recommended strategies and actions needed to influence each of the CBW component as well as the relevant interventions function to be used.

Although the social taboos around female smoking in Upper-Egypt prevent many girls from smoking initiation, the thesis concluded that this should not stop schools from targeting girls in SBSPIs to enhance their capability, opportunity and motivation to avoid smoking instead of relying on the social taboo as a stand-alone preventive measure which might be weakened in the future. Accordingly, the recommendations below are applicable for boys', girls' and mixed-gender schools; gender-related differences will be highlighted below if required.

8.4.1 To enhance pupils' psychological capability to avoid smoking initiation

Pupils should be made aware of the short and long term consequences of active and passive smoking on health, income, social relationships, the environment and others; as well as the addictive impact and the religious prohibition of smoking. Moreover, consequences on appearance and beauty should be emphasized with girls while consequences on physical fitness and sexual ability should be emphasized with boys. Pupils should be educated about the contents of the regular, flavoured and electronic cigarettes and Water-pipe (Shisha) and harms of each tobacco product. Moreover, pupils' accessibility to information on smoking consequences should be improved by: 1) including more information on smoking consequences in the curriculum; 2) opening frequent smoking-related extracurricular discussions with pupils by experts and staff; 3) training staff by trusted experts to educate pupils on various smoking consequences; 4) providing attractive, accessible school-posters that illustrate various smoking consequences and involve pupils in designing these posters. **(Education)**

Pupils should be trained on skills of refusing smoking offers, especially offers by friends, positive self-assertiveness, stress management, problem-solving, decision-making, and goals' setting, with monitoring of achievements. The online freely-available Egypt-tailored smoking prevention training manuals which cover these skills in detail with exercises could be used to facilitate training pupils in schools. During the training, pupils should be given opportunities to practice these skills, obtain and discuss feedback on their performance in order to enhance their skills. The training on goal setting and positive self-assertiveness should be linked with having a healthy future, good social relationships and win sports-competition as these seem to be of interest to adolescents in Upper-Egypt. **(Training).**

8.4.2 To reduce pupils' physical opportunities to initiate smoking

Preparatory schools in Upper-Egypt should continue informing pupils and parents on the current anti-smoking policies and should maintain enforcing these anti-smoking policies as part of the general school policy. Schools should continue restricting pupils' smoking and carrying of cigarettes plus the frequent screening of cigarettes and smoking inside schools as this would reduce pupils' opportunities to initiate smoking at least inside schools **(Restriction).** However, implementing these anti-smoking policies should be accompanied by strong school activities to educate pupils on smoking harms for more effective impact on preventing pupils from smoking initiation.

Reducing pupils' accessibility to smoking in shops near schools need to be considered in the future, despite the challenges, because restricting pupils' smoking inside schools is insufficient as pupils might find alternative places to smoke outside schools, especially in places close to school. Schools could play a role in encouraging community members to support the national smoking policy or inviting pupils to sign a petition presented to decision-makers requesting a ban on tobacco advertising, similar to what was implemented by effective SBSPIs in some LMICs **(Restriction).**

8.4.3 To enhance pupils' social opportunities to avoid smoking initiation

Pupils' exposure to smoking behaviour at schools should be minimized by: 1) banning smoking by staff, parents and visitors inside school premises **(Restriction)**; 2) considering non-financial and more feasible financial punishments when staff smoke in schools **(Coercion)**. 3) Enabling smoker staff and parents to access quitting services **(Enablement)** after educating them on harms of active and passive smoking **(Education)** and reminding them they are role-models for pupils who might imitate them in smoking **(Modelling).**

Presenting examples of successful people inside and outside schools who never smoked and encouraging pupils to imitate these examples; sharing experiences of smoking avoidance and consider adding never-smoking to the criteria for selecting ideal pupils and teachers **(Modelling).**

Use the influence of peers to prevent smoking and create non-smoking social-norm **(Social environmental reconstruction)** through: encouraging peer-pressure to avoid smoking plus using informal peer-education about smoking consequences and peer-support for pupils who face peer-pressure to smoke. Nominated popular volunteers of pupils who never-smoked, probably members of schools smoking control groups, should be trained on communication, counselling and persuasion skills and allowed to practice these skills during the training and under close observations and continuous support after training in order enable them to lead these peer-related activities **(Training and Enablement).**

Smokers and tobacco products should be repeatedly presented in unpopular images, through roleplays, pictures or posters at schools in order to create negative images about smoking and anti-smoking social-norm among pupils **(Social environmental reconstruction)**.

8.4.4 To reduce pupils' reflective motivations to initiate smoking

SBSPIs should stimulate pupils' reasoning and making a self-conscious decision not-to-smoke through:
1) persuading pupils about smoking consequences using mixture of the following persuasive, appealing memorable educational methods: real-life stories of smokers and non-smokers; field-visits to observe consequences on smokers; laboratory experiments to explain the physical consequences of smoking; photos/pictures, videos and school-plays, open discussions rather than lecturing; consider using social media in the future to guide pupils' online discussion around smoking **(persuasion)**.

2) Stimulating pupils' thinking of the pros and cons of smoking and non-smoking through open discussion and critical observations of smoking consequences on various aspects of the life of their relatives, parents and friends who smoke or never-smoked **(persuasion)**.

3) Continue obtinaing written commitments from pupils not to smoke or carry cigarettes in schools, witnessed and signed by parents, after informing pupils about the penalties applied if they do **(Education, restriction and coercion).** This should be accompanied by creating expectations of social punishments when pupils smoke through encouraging pupils' consideration of parents' disapproval of smoking and the social unacceptability of adolescents' smoking, especially by females **(Coercion).**

4) Building pupils' confidence in maintaining non-smoking behaviour, encouraging pupils who never smoked to be recognized among peers as no-smokers **(modelling**) plus linking smoking avoidance with achieving personal goals should be emphasized **(persuasion)**.

8.4.5 To reduce pupils' automatic motivations to initiate smoking

Pupils should be encouraged, trained and enabled to practice alternatives to smoking in releasing negative emotions and use of free time, such as practising hobbies and exercises **(Training and Enablement).**

The currently applied penalties in case of pupils caught smoking or carrying cigarettes inside schools **(coercion)** should be accompanied by rewarding, financially or socially, pupils who never-smoked and encouraged their peers to avoid smoking **(Incentivisation)** in order to enhance pupils' automatic motivation to avoid smoking initiation and support non-smoking among peers.

Table 26 summarizes the recommended strategies and actions needed to reduce physical and social opportunities for pupils to smoke and to enhance their psychological capability as well as reflective and automatic motivation to avoid smoking initiation in addition to the relevant interventions function to be used.

Table 26 Recommendations to improve the role of preparatory schools in Upper-Egypt in preventing adolescents from smoking initiation

The suggestion	Action required	The relevant intervention function	The impact in relation to COM-B Component
- Increase pupils' awareness of the religious prohibition of smoking and consequences caused by each form of smoking on various aspects of life; including consequences on appearance and beauty, physical fitness, sexual ability, income, social relationships, the environment and others as well as the addictive impact and consequences on health and emotions. - Integrate smoking-related educational and training activities in both curricular and extracurricular school activities and enhance pupils' discussion on smoking.	- Add more detailed information on smoking consequences to the current school curriculum, at least in the subjects of sciences, religion, behaviour and manners. - Integrate smoking-related educational and training activities in the annual plan of various extracurricular school activities such as health education, plays, assembly, and media activities. - Improve accessibility to information on smoking through appealing educational materials such as videos, lab. Experiments and attractive school-posters that are supported by pictures and photos.	**Education**	**Raising the psychological capability of pupils to avoid smoking**
- Build pupils' skills of refusing smoking offers, positive self-assertiveness, stress management, problem-solving, decision-making, goals' setting, monitoring and achievement as well as resisting peer-pressure to smoke.	- Train school staff who deal with pupils' behaviour by trusted experts on delivering attractive educational activities on smoking in order to maintain sustainability and improve accessibility. - Frequently deliver training courses for pupils on how to refuse smoking offers, resist peer-pressure to smoking without losing friendships, manage stress and emotion, solve problems, make decisions, as well as set, monitor and achieve personal goals - Use the freely available and Egypt-tailored training manuals that cover all these skills to deliver this training.	**Training**	

The suggestion	Action required	Intervention function	Impact (COM-B)
Enforce the current school policy that restrict pupils' smoking and carriage of tobacco product inside school premises.	- Continue restricting pupils' smoking and carriage of cigarettes and other tobacco products at schools. - Continue running frequent screening activities for cigarettes and smoking in hidden places inside school premises.	**Restriction**	**Reducing the physical opportunity of pupils to smoke**
	- Raise pupils' awareness of the existing anti-smoking school policies every year not only when pupils are first enrolled to schools.	**Education**	
Encourage schools to play a role in reducing pupils' accessibility to smoking in shops near schools.	- Explore, in further studies, opportunities and challenges of involving schools in providing social pressure to restrict selling tobacco products to adolescents, at least in shops closed to schools. - Then enable schools, through opening discussion, workshops and training, to play a role in encouraging community members to put social pressure, by signing petitions for example, to enforce the law that restrict selling tobacco products to adolescents and bans tobacco advertisements.	**Restriction**	
Minimize the exposure of pupils to smoking behaviour at school this includes smoking by staff, parents and visitors as well as pupils.	- Continue the current restriction of pupils smoking at school. - Revise the current school policy to, explicitly, include banning smoking by staff, parents and visitors inside school premises.	**Restriction**	**Reducing the social opportunities for pupils to initiate smoking.**
	- Revise the current school policy to include applying non-financial as well as more feasible financial punishments when staff smoke in schools - Publish and inform teachers and parents that smoking is not allowed inside school and explain the applied penalty on teachers if they smoke at school. - Enable schools to enforce the implementation of this policy by providing logistical, financial and political support.	**Coercion**	
	- Enable smoker staff to access quitting services by establishing a link between schools and the available quitting services close to schools, inform smoker staff about the availability of these services and facilitate refereeing them to these quitting services.	**Enablement**	
	- Educate smoker staff, through discussion and educational sessions at schools, on harms of active and passive smoking	**Education**	
	- Remind staff, through meetings and discussion, that they are role-models for pupils who might imitate them in smoking if they see them smoking	**Modelling**	

Create antismoking social norm	- Present examples of successful people inside and outside schools who never smoked, through curricular and extracurricular educational activities such as school assembly and open discussion, and encouraging pupils to imitate these examples. - Share experiences of pupils, teachers and stories of popular people on how they managed to avoid smoking, especially tolerating peer-pressure to smoke, through open discussion, stories, videos and roleplays. - Add never smoking to the criteria for selecting ideal pupils and teachers**.**	**Modelling**	**Reducing the social opportunities for pupils to initiate smoking.**
	- Represent smokers and tobacco products in unpopular images, through roleplays, pictures or posters at schools in order to create negative images about smoking.	**Social environmental reconstruction**	
Use the influence of peers to prevent smoking and create non-smoking social-norm.	- Encourage pupils to put pressure on their peers not to smoke and educate them, informally through open discussion using school posters, on the various consequences of smoking.	**Social environmental reconstruction**	
	- to enable pupils to do these activities schools should train nominated popular volunteers of pupils who never-smoked, probably members of schools smoking control groups, on communication, counselling and persuasion skills and allow them to practice these skills during the training and under close observations.	**Training**	
	- Encourage these trained pupils to provide peer-support for pupils who face peer-pressure to smoke in consultation with trained school staff. - Provide continuous support for these peer-educators , through frequent meetings and open discussion with trained staff, after the training and enable them to lead these peer-related activities	**Enablement**	

The suggestion	Action required	The relevant intervention function	The impact related to the COM-B
Stimulate pupils' reasoning and making a self-conscious decision not-to-smoke though using persuasive, appealing memorable educational methods.	- Persuading pupils about smoking consequences using mixture of the following persuasive, appealing memorable educational methods: real-life stories of smokers and non-smokers; field-visits to observe consequences on smokers; laboratory experiments to explain the physical consequences of smoking; photos/pictures, videos and school-plays, open discussions instead of lecturing. - Ensure that these activities are included in the annual plan of various committees that are responsible for the extra-curricular activities. - Provide fund and resources to schools to enable them delivering these activities. - Involve pupils and staff, though discussion and workshops, in designing these educational methods and consider pupils' opinion on the clarity, contents and designs of these methods and ways for improvement.	**Persuasion**	**Increasing the reflective motivation of pupils to avoid smoking though stimulating their reasoning and making a self-conscious decision not-to-smoke**
Stimulating pupils' thinking of the pros and cons of smoking and non-smoking	- Run formal and informal sessions to encourage open discussion and critical observations of various smoking consequences on relatives, parents and friends who smoke or never smoked.	**Persuasion**	
Create expectations of penalties in case pupils smoke or carry cigarettes at schools.	- Continue the currently implemented procedures of obtaining written commitments from pupils not to smoke or carry cigarettes in schools, witnessed and signed by parents. - Continue informing pupils and parents, on admissions, about the penalties applied if smoke or carry cigarettes at school. However, pupils should be also reminded on these penalties frequently, though assembly, school posters.	**Educations, restriction & coercion**	
Create expectations, among pupils, of social punishments when pupils smoke	- Encourage pupils, through extra-curricular activities such as open discussion, storytelling and assembly, to consider their parents' disapproval of smoking and the social unacceptability of adolescents' smoking, especially by females.	**Educations & coercion**	
Building pupils' confidence that maintaining non-smoking behaviour is good thing to do.	- Encourage pupils who never smoked to announce themselves and to be identified among peers as non-smokers, during the assembly, news and informal discussion at schools.	**Modelling**	

	- Emphasize the link between smoking avoidance and achieving personal goals through story-telling and open discussion with staff and peers inside and outside classrooms.	**Persuasion**	
- Encourage, train and enable pupils to practice alternatives to smoking in releasing negative emotions and use of free time, such as practising hobbies and exercises.	- Provide schools with equipment and resources for practicing hobbies and sports. Identify the opportunities for practicing hobbies and sports at the community level, inform pupils and families on these opportunities and facilitate their access to these services.	**Enablement**	**Enhancing pupils' automatic motivation to avoid smoking initiation and support other peers not to smoke.**
	- Train and encourage pupils to practice sports and hobbies, using the services inside or outside schools, to release their negative emotions and fill their free time properly	**Training**	
- Reward pupils (financially or socially) who never-smoked or those who encouraged their peers to avoid smoking.	- Based on consensus among classmates and teachers selection, identify pupils who either never smoked and those who actively participated in encouraging and supported other pupils to avoid smoking initiation, refuse smoking offers and resist peer-pressure to smoke. - Reward these pupils either financially or socially, at least by nominating their names in school news and assembly.	**Incentivisation**	

8.5 Implications for future research and areas for further research

A number of areas for further research were identified earlier; see sections 3.5.2, 4.5.9 and 8.3. This section summarises the key implications of the overall findings of this thesis for future research and area for further studies toward a better understanding of issues related to implementing school-based interventions to control adolescents' smoking in the Egyptian context, including some unclear issues around factors that influence smoking by Egyptian adolescents.

The thesis is concluded with proposed components and interventions functions of SBSPIs that could be implemented in preparatory schools of Upper-Egypt and within the available resources to enhance pupils' capability, opportunities and motivations to avoid smoking initiation in Upper Egypt, see Figure 17. These proposed components could be used to design SBSPIs in Upper-Egypt which then should be examined within a feasibility study, modified accordingly then implemented in a RCT to test its effectiveness in preventing smoking initiation by Egyptian adolescents. The effectiveness of the designed SBSPI should be tested in a high quality and long-term RCT for a better understanding of what strategies and intervention functions could enhance the effectiveness of SBSPI in the context of Egypt. Researchers should pay attention to measures that reduce selection and detection bias to avoid the selection biases that were common in RCTs of SBSPIs in Arabic and/or LMICs, as identified in study-2.

Based on the findings of this thesis, it is recommended that researchers and designers of SBSPIs should use standardized methods for defining, measuring, assessing and reporting changes in adolescents' smoking status before and after the interventions. This would allow, in future systematic reviews and meta-analysis, quantitative synthesis of the findings on the effectiveness of SBSPIs in Arabic and/or LMICs, including Egypt, and facilitate comparisons across these interventions. The definitions and methods of the GYTS are recommended to be used in this regard because they are designed to allow global and regional comparison of adolescents' smoking. For accurate assessment of the effectiveness of the designed intervention, it is recommended to measure biochemical markers, at least among a random sample of participants when resources are limited, to cross-validate the result of self-reporting of smoking (Mermelstein et al., 2002). This is to avoid over-reporting or under-reporting of participants' smoking status. As explained in section **Error! Reference source not found.**, misreporting of adolescents' smoking is influenced by their gender and culture (Valladolid-Lopez et al., 2015, Dietz et al., 2015, Patrick et al., 1994) and their attitude toward smoking (Ng et al., 2006, Mermelstein et al., 2002, Al-sheyab et al., 2016, Arora et al., 2011, Dolcini et al., 1996).

Although learning from the experience of other countries is an important step in designing SBSPIs, study-2 concluded that researchers should not only rely on reviewing the available evidence as many imported SBSPIs were ineffective in preventing adolescents in different contexts from smoking initiation even if these interventions were effective in the exported context. Therefore, researchers should ensure deep cultural-appropriateness of SBSPIs for the targeted context, which is more than linguistic and peripheral appropriateness of contents, as this was strongly associated with the effectiveness of SBSPIs in preventing adolescents from smoking initiation. Study-2 also concluded that the designed SBSPI should be theoretically-underpinned and the theoretical-underpinning should be clearly explained by indicating how the named theory was used in all interventions' stages; including clear explanations of how the theory and its constructs were used in selecting intervention activities and adapting the contents and delivery methods to suit the targeted context or population in addition to discussion of the

findings in relation to the applied theory as per the recommendation by (Michie and Prestwich, 2010).This is to facilitate explaining how theories influences the effectiveness of this intervention as well as allowing proper design, replication of effective SBSPIs in a similar context, as recommended by the MRC guidance on complex-interventions (Craig et al., 2008).

To enhance the utilization of the findings of RCTs that are used to test the effectiveness of SBSPIs in Egypt or other Arabic or LMICs, the following should be considered in designing and reporting these studies: **First,** better reporting of attrition rates, running attrition analysis and adjustment of findings are required for better explanations of interventions' outcomes and effectiveness (Hoffmann et al., 2014). **Second,** for a better understanding of how modelling and peer-led activities influence the effectiveness of the intervention more details should be reported on the type of peer-led activities, frequency, density and attendance of each activity plus the contents and extent of training peers. **Third,** particular attention should be paid to providing detailed information about the procedures involved for ensuring cultural-appropriateness of the interventions with clear explanations of what has been done or changed if the intervention was imported from another context, how, why and by whom these changes were made. Detailed information should be also provided about the contents, activities and delivery methods, quality of implementing the included interventions, what worked and did not work, why and how. The provision of these details would facilitate replicating the effective interventions and learning from mistakes in ineffective interventions. Publishing more details on interventions' contents and delivery methods or at least storing these details in a publicly accessible database would allow proper data extraction on the behaviour change techniques used in SBSPIs.

8.5.1 Areas for further research

Due to the time and resources limitations of this thesis, it was impossible to cover all the issues related to preventing smoking by adolescents through schools in the Egyptian context as well as the Arabic and LMICs. This section identified specific areas that need further exploration in further research in this field.

The thesis concluded that SBSPIs should include an explanation of the religious prohibition of smoking because this was strongly recommended by school staff and pupils in Upper Egypt and there is some evidence that the religious values influence smoking initiation by adolescents in the Egyptian context. However, the effectiveness of emphasising the religious prohibition of smoking on preventing adolescents from smoking initiation should be explored in relation to the context and religiosity of the targeted population, as there is a contradiction in the available evidence on this issue, which was strongly recommended, by school staff and pupils in upper-Egypt.

The thesis highlighted the importance of considering a balance between using coercion and incentives intervention functions while designing SBSPIs in the Egyptian context. While it is important to counties applying penalty on pupils who smoke inside school premises, it is also important to use, at least, non-financial incentives for pupils who do not smoke and those who support their peers not to smoke. However, further studies are needed to research the effectiveness, sustainability and applicability of using coercion intervention function in SBSPIs to prevent adolescents from smoking initiation in the Egyptian context, as well as Arabic and/or LMICs. Additional studies are also required to investigate what incentives, other than smoke-free class competition, could be effectively used in SBSPIs to prevent smoking uptake by adolescents in the context of LMICs, like Egypt, where resources are limited. These studies should also

explore the effectiveness, the dose-response relationships and cost-effectiveness and feasibility of using these incentives.

Study-1 identified the need for tracking changes of predictors of adolescents smoking across different regions of Egypt over the years in order to explain the reasons behind the changes in adolescents' smoking rates, shown in Figure 1, and inform behaviour change interventions. This could be facilitated by using consistent study designs and data collection tools, such as the GYTS, which could be adapted as needed.

The thesis identified the need for more research on girls' smoking in Egypt as limited evidence was identified on the prevalence and predictors of girls' smoking in Egypt due to the social unacceptability of smoking by females in the Egyptian context. Moreover, alternative approaches for dealing with girls' smoking inside schools, should be explored in further studies, may be outside Upper-Egypt where females' smoking is more obvious, because avoiding announcing girls' smoking might encourage some girls to initiate smoking as they feel protected from the social punishments when they smoke. More there is a need for further exploration of gender-specific SBSPIs and gender-specific factors that influence the effectiveness of SBSPIs across various contexts, particpally in Arabic and LMICs.

Study-2 identified that more RCTs are required to evaluate the impact of normative education in SBSPIs in preventing adolescents' smoking initiation in the Arabic and/or LMICs as well as the Egyptian context.

Study-3 highlighted that many Egyptian adolescents in Upper-Egypt smoke for self-assertiveness or to relieve stress. However, this issue was not researched in any of the included studies in study-1. In order to identify to what extent these factors influence adolescents' smoking in Egypt, these factors should be explored among a national representative sample of adolescents.

Further research is needed to explore opportunities for restricting pupils' accessibility to tobacco products in shops and cafes near to schools in the Egyptian context in order to reduce physical opportunities for pupils to smoke in their daily journeys from and to schools. Restricting pupils accessibility to smoking in shops around schools was used in effective SBSPIs in Arabic and/or LMICs although this issue did not emerge from study-3. There might be a need to explore this issue in studies in different parts of Egypt as the current study was limited to upper-Egypt. therfroe, future research should investigate how the Egyptian schools could contribute toward stimulating and implementing that.

Possible options for enhancing pupil's skills of problem-solving and decision making through schools need to be explored more in future studies. These studies should involve decision-makers in the educational authorities who decide how activities outside school curriculum could and should be delivered in schools. This was difficult to explore in the current study which only involved school staff who are not involved in this decision and not allowed by the educational authorities to deliver activities outside the school curriculum.

There is a need for implementing longitudinal studies to examine the potential influence of antismoking school policies on adolescents' smoking and explain this association over time in different contexts, including the Egyptian context, as there is some evidence that the impact of antismoking school policies on adolescents' smoking is changed over time, for example in the UK context (Moore et al., 2001, Hallingberg et al., 2016) as discussed in section 8.3.3.

This thesis identified that e-cigarette smoking was not well-researched in the Egyptian and Arabic context. There is a need to explore the attitude of the Arabic and Egyptian adolescents toward e-cigarettes as well as the influence of the e-cigarette smoking on the intention and susceptibility to smoke cigarettes by youths, as these topics are not well searched in in the Arabic and the Egyptian contexts as discussed in section 8.3.1. The thesis also identified very little research on shisha smoking and its role in dual shisha/cigarette smoking, including the gender dimensions, in the Arabic and Egyptian context. Additional studies are required to fill this gap and to investigate if specific intervention functions should be considered in SBSPIs to prevent adolescents from smoking shisha and e-cigarettes in the Arabic and Egyptian context and LMICs.

Study-1 identified that there is a need for conducting a qualitative study to explores in more depth how adolescents smoking is influenced, positively or negatively, by different factors over the years. Longitudinal studies are also needed to examine the potential influence of the identified factors on adolescents' smoking over time in the Egyptian context and explain changes in these association as some of the included studies were old. Study-1 also identified the need for further research to explore the confounding factors that are related to adolescents smoking in Egypt and mothers' occupation such as type of work, working hours, mothers' education, family income and expenditure; as these issues are not explained in the available evidence.

Although using the internet, smartphones and social media was not clearly emphasised in neither study-2 or study-3, and study-3 clearly identified poor accessibility to internet and technology at schools of Upper-Egypt, it might be worth exploring the feasibility of improving pupils' accessibility to the internet at schools. This is to enhance the use of advances technology in delivering attractive and innovative educational activities of SBSPIs in the near future as adolescents' utilization of these methods is increasing globally (Park and Calamaro, 2013, Savci and Aysan, 2017).

8.6 Limitations and strengths

The limitations and strengths of the evidence collected in study-1 and study-2 were discussed in sections 3.5.2 and 4.5.11 respectively. This section discusses the overall limitations and strengths of this thesis.

The use of the COM-B model of the BCW facilitated understanding factors that influence Egyptian adolescents' capability, opportunity and motivations to initiate smoking then identifying the components of effective SBSPIs that were implemented in Arabic and/or LMICs which are then compared with what preparatory schools in Upper-Egypt currently use to prevent pupils from smoking initiation and suggestions from pupils and staff to improve the role of schools in this regard. This systematic comparison is an important strength of this thesis.

Most of the identified studies about smoking in Egypt or LMICs rarely differentiate smoking by the type of smoked tobacco. This challenged focusing this thesis one type of the commonly smoked tobacco in Egypt (cigarettes or Shisha). However, study-3 explored different strategies that need to be considered to prevent adolescent from initiating smoking cigarettes as well as shisha smoking and highlighted the differences when applicable.

Conducting study-3 in three schools in Upper-Egypt limits the transferability of the findings to the rest of Egypt and schools within Upper-Egypt. However, the strengths of this qualitative study are including multiple sources of data, the large number of participants and documents reviewed, considering pupils' opinions, as well as using criteria in selecting the area of Upper-

Egypt and a school from each group of the mixed-gender, boys' and girls' schools, which increase the transferability of the findings, especially within Upper-Egypt.

All interviews and FGDs were conducted inside school premises, so participants, especially pupils, may have felt hesitant to express opinions about how smoking is and should be prevented schools. However, school staff and managers complied with the researcher's request not to attend interviews and FGDs unless invited, which were conducted in a room inside schools assuring privacy and confidentiality away from the observation and earshot of others.

Pupils and staff were recruited from schools through staff gatekeepers which may have introduced a certain bias because certain participants who were absent from schools or were not selected by the staff or may have been overlooked. To overcome this, the researcher explained clearly to the gatekeepers the aim of the research and the importance of interviewing a range of male and female staff at different educational level, experiences, smoking status, age, religion, relationships with pupils, and involvements in different curricular and extra-curricular activities as well as a range of boys and girls with different academic performance, social relationships, smoking status, exposure to smoking at home and by relatives, socioeconomic status and parents educational level and religious background. Encouragingly, the resulting sample included a range of participants across these criteria. Pupils' records were used for assessing their academic performance while the other criteria were assessed based on the gatekeepers' observation and knowledge about staff and pupils. Selecting socially-active gatekeepers whose work involves dealing with pupils' behaviour, performance at school, contacting parents was used to minimizing the selection bias.

Study-2 concluded that SBSPIs in Arabic and LMICs that targeted parents, relatives or community were effective in preventing adolescents from smoking initiation, however it was unclearly indicated that these interventions involved parents or relatives in designing the interventions. Some systematic reviews indicates that involving parents and family members may enhances the effectiveness of school-based behaviour change interventions in some contexts (de Kleijn et al., 2015, Brown et al., 2014, Langford et al., 2015). However, a systematic review explored the impact of parental involvement in school-based nutrition and physical activity interventions identified no conclusive evidence concerning the added value of parents involvement because of the scarcity of studies to test this hypothesis (Van Lippevelde et al., 2012). No similar review was identified in relation to school-based interventions that are aimed to prevent smoking. In this study, the researcher initially thought to explore the opinion of parents about the role of schools in preventing adolescents from smoking initiation in Egypt. However, during the field-visit, this seemed to be inappropriate for this study because of the following: 1) calling parents through schools to be interviewed about pupils' smoking would create the impression that their children smoke and therefore they were selected for this discussion, especially if their children were also selected to be interviewed. Many pupils, teachers and parents explained that this would have negative consequences on pupils' relationships with their parents and may expose them to physical and verbal harms as most parents don't accept smoking by their children at this age. 2) This would also influence pupils' responses in FGDs as they may tend to provide responses that satisfy their parents who may contribute to the same study. 3) Because of the punishments applied by schools in case of pupils smoke, the researcher recognized that there is exchanging blams between schools and parents on the role of each party to prevent pupils from smoking. While schools see smoking as an indicator of poor family care for children, parents emphasise that pupils learn to smoke at school. This relationships challenged conducting interviews with parents at school and may have resulted in collected biased data or creating conflicts between

parents and schools. In spite of all the above justifications, absence of parents' views remains one of the limitations of this study which could be explored in future research.

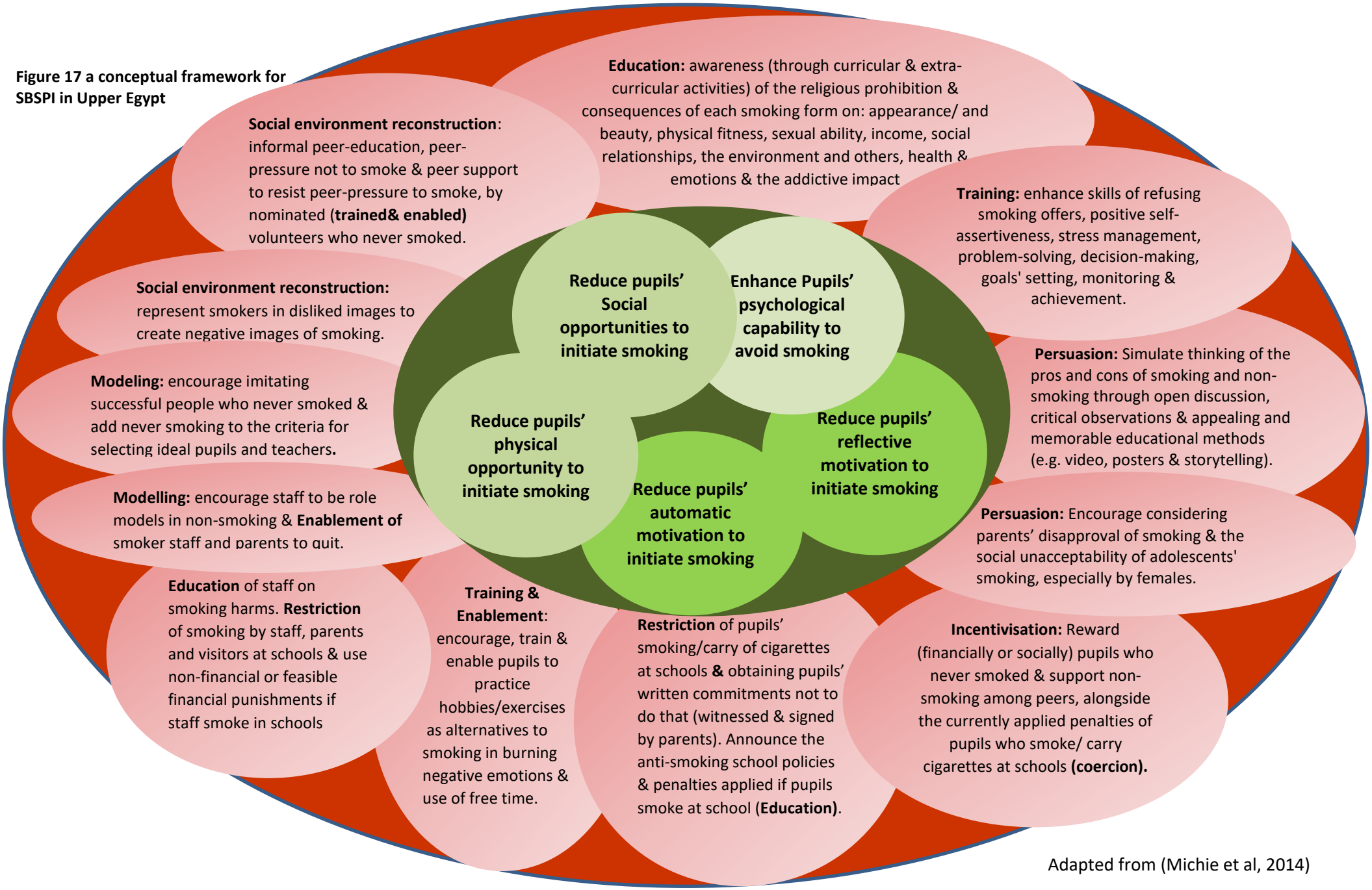
A further strength is that moving between schools and interviews and FGDs during the data collection period which allowed comparing opinions of staff, boys and girls across the three schools and identification of gender and context related issues that should be considered in SBSPIs. Involving an Egyptian academic, who has experience in school-based qualitative research in Upper-Egypt, in the process of data collection and analysis alongside the researcher who speaks the local language and understands the Egyptian context brought insight to the local culture and enabled understanding of the findings which are other strengths of this study. All these factors enhance the transferability of the findings within Upper-Egypt and should be considered when applying these findings to SBSPIs elsewhere in Egypt.

One of the limitations of this thesis is that study-3 did not explore in more depth the opportunities and challenges of enabling schools to play a social roll in restricting pupils' accessibility to tobacco products in the Egyptian context, which was successfully implemented in some effective SBSPIs in LMICs. There is a need to explore this issue in relation to the Egyptian context in more depth in further studies.

8.7 The conclusions

The thesis concluded that in order to achieve the desired outcome of SBSPIs, interventions contents, approaches and delivery methods should be based on effectiveness evidence and deeply adapted to the culture of the targeted population. To ensure deep cultural-appropriateness of SBSPIs for the Egyptian context, which is more than linguistic and peripheral appropriateness of contents, this thesis aimed to understand culturally relevant factors relating to smoking (though study-1) and its prevention through schools (through study-3) with the view of using this to adapt relevant interventions that were identified in study-2 to the Egyptian context. After identifying the predictors of adolescents' smoking initiation in Egypt, the thesis the thesis involved a top-down approach (through consulting the available evidence on was used in effective SBSPIs in similar contexts, Arabic and/or LMICs, to address similar predictors), as well as a bottom-up approach (through exploring the perspectives of staff and pupils on what is currently implemented and could be implemented in the preparatory schools in Upper-Egypt to prevent pupils from smoking initiation) in order to ensure to cultural-appropriateness of relevant intervention functions of SBSPIs in preventing pupils from smoking initiation to the Egyptian context. The thesis concluded that: A) there are several factors that influence smoking by Egyptian adolescents, summarized in Figure 11; B) these factors require different intervention functions to be addressed in SBSPIs, staff and pupils respondents in Study-3 suggested some of the interventions function that could be feasibly implemented through the current curricular and extracurricular activities delivered in preparatory schools of upper-Egypt and within the available schools resources. C) Study-2 concluded that there is no clear agreement on the minimum number and type of components required for enhancing the effectiveness of SBSPIs in Arabic and LMICs and effective intervention used more than intervention function to prevent adolescent from smoking initiation. The COM-B model was used to summarizes the findings across the three sub studies of this thesis, see Table 25, and Figure 17 summarizes the thesis conclusions on what should be implemented in SBSPIs to enhance pupils' capability, opportunities and motivations to avoid smoking initiation in Upper Egypt. I hope that the findings of this research will be used for preventing adolescents in Upper-Egypt from initiating smoking.

Figure 17 a conceptual framework for SBSPI in Upper Egypt



Adapted from (Michie et al, 2014)

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Appendices

Appendix A The literature mapping terms for the influencing factors of adolescents' smoking in Egypt (study-1)

Smoking	School-aged children	Egypt	Predictors
Tobacco uptake tobacco use Tobacco utilization/ utilisation Smoking Cigarette/cigar Nicotine Smokeless tobacco/ Chewing tobacco Snuff tobacco, oral tobacco, Water pipe /Shisha/ Argeela Adolescents behaviour or risky behaviour	Adolescents / Adolscen* youth Child /children Young people / Young person* Pupil* Student* Classmates / Minor* or juvenile* juvenile*	low middle income country or LMIC Developing country Arab or Arabic country Middle East Eastern Mediterranean Poor country	Predictor* Risk factor* Determin* Caus* Encourag* Erotolog* Enabl* Predispo* etiolog* Correlat*

Appendix B The Quality Assessment Form used in study-1 on the influencing factors of adolescents' smoking in Egypt

Methodological quality criteria	Responses	Comments
1. Are there clear research questions (or objectives*)?	☐Yes ☐No ☐Can't tell	
2. Do the collected data allow address the research question (objective)? E.g., consider whether the follow-up period is long enough for the outcome to occur (for longitudinal studies or study components).	☐Yes ☐No ☐Can't tell	
3. Is the sampling strategy relevant to address the research question (randomly selected)?	☐Yes ☐No ☐Can't tell	
4. Is the sample representative of the target population (in size, inclusion and exclusion criteria)?	☐Yes ☐No ☐Can't tell	
5. Are measurements appropriate (clear origin, or validity known, or standard instrument?	☐Yes ☐No ☐Can't tell	
6. Is the risk of nonresponse bias low?	☐Yes ☐No ☐Can't tell	
7. Is the statistical analysis appropriate to answer the research question?	☐Yes ☐No ☐Can't tell	

Appendix C: The literature mapping terms for SBSPIs in Arabic or/and LMICs (study-2)

Smoking (outcome)	School-aged children (participants)	School-based interventions (intervention)	Study type
		School or class based	
Tobacco uptake tobacco use Tobacco utilization/ utilisation Smoking Cigarette/cigar Nicotine Smokeless tobacco/ Chewing tobacco Snuff tobacco, oral tobacco, Water pipe /Shisha/ Argeela Adolescents behaviour or risky behaviour	Adolescents / adolscen* youth Child /children Young people Young person* Pupil* Student* Classmates Minor* or juvenile*	Primary Prevention or Control or restriction or ban Program* Intervention or strategy* Policy /policies health promotion or health education cessation or reduc* or abstain* or stop or quit anti-smoking Smoking free or freedom from smoking Class* Education or promotion /education or teach or training Behavior/ Behaviour change or modification	Randomised controlled trials Meta-analysis Systematic review

Appendix D The search strategy in the Medline, SBSPIs in Arabic or/and LMICs (Study-2)

#	Key words	No of hits	Notes updated on 18/12/2017
#1	exp "tobacco use"/ or exp smoking/ or Nicotine/		
#2	(Tobacco OR smok* OR cigar* OR Shisha OR water pipe OR Argeela OR nicotine).tw.		
#3	#1 OR #2		Tobacco use/ smoking
#4	(Health* adj2 (promot* OR educat* OR improvement)).tw		
#5	(prevent* OR Control OR program* OR interven* OR strateg* OR polic* OR technique* OR framework* OR Campaign* OR communicat* OR marketing OR advertis* OR media).tw		
#6	(educat* OR promot* OR teach* OR advise* OR counsel* OR encourage* OR train* OR behavio#ur change* OR campaign).tw		
#7	(anti smok* OR smok* free) OR (freedom adj3 smoking)		
#8	((Cessation OR reduc* OR abst?in* OR stop* OR quit* OR anti OR free* OR discourag* OR prevent*) adj3 (cigar* OR smok*)).tw		
#9	Psychotherapy, Group/ OR Counseling/		
#10	#4 OR #5 OR #6 OR #7 OR #8 OR #9		Behaviour change/prevention/promotion
#11	Child/ OR Adolescent/ OR Student/ OR pupil/ School OR Adolescent Behavior		
#12	(Adolescen* OR youth* OR child* OR young* OR Student* OR pupil* OR class* OR Minor* OR juvenile* OR teen* OR youth* OR girls OR boys OR school*).tw.		
#13	#11 OR #12		Adolescents
#14	#3 and #10 and #13	2,4214	**prevention OR control & Tobacco & adolescents/Adolescents**
#15	school*.tw OR class*.tw.		
#16	(school* adj3 based).tw. OR (class* adj3 based).tw.		
#17	#15 OR #16		School-based
#18	#15 and 17	7,433	**School-based prevention OR control & Tobacco & adolescents/Adolescents**
#19	randomized controlled trial.pt. OR controlled clinical trial.pt. OR randomized.ab. OR placebo.ab. OR drug therapy.fs. OR randomly.ab. OR trial.ab. OR groups.ab.		
#20	#19 Not exp animals/ not humans.sh.		RCT
#21	Meta-analysis OR Systematic review		
#22	#20 OR #21		RCT OR meta-analysis OR systematic review
#23	#18 and #22	1,840	RCT studies on **School-based prevention / control & Tobacco & adolescents/Adolescents**
#24	limit to humans	1,241	

Appendix E Eligibility checklist of SBSPI studies in Arabic and/or LMICs

Eligibility Form for scanning the abstract of Studies on SBSPI		
Study title: **First author:** **Year:**		
Assessment	**Answers**	**Comments**
Intervention		
Is the intervention/programs aim to prevent smoking among pupils?	☐Yes ☐Unclear	Go to the next question
	☐No	exclude
Is the intervention/programs School-based, With or without other activities outside school setting?	☐Yes ☐Unclear	Go to the next question
	☐No	exclude
Is the intervention focused on smoking prevention not only on cessation or alcohol or illicit drug?	☐Yes ☐Unclear	Go to the next question
	☐No	exclude
Is the intervention not pregnancy-related or clinical based?	☐Yes ☐Unclear	Go to the next question
	☐No	exclude
Population		
Are the participants pupils aged 10-17 years (at adolescent age), at any phase of the intervention?	☐Yes ☐Unclear	Go to the next question
	☐No	exclude
Was baseline smoking status measured before starting the intervention?	☐Yes ☐Unclear	Go to the next question
	☐No	exclude
Is the intervention/programs implemented in a Low or Middle income country (at the intervention time) or implemented in an Arabic country, regardless of the country income?	☐Yes ☐Unclear	Go to the next question
	☐No	exclude
Study design		
Is it RCT?	☐Yes ☐Unclear	Go to the next question
	☐No	exclude
Was the outcome measured at follow-up period of least six-months of after completion of the intervention?	☐Yes ☐Unclear	Go to the next question
	☐No	exclude
Outcome measured		
Did the study report the outcome on smoking status of pupils (never, ever, current smoking) **(WHAT has been changed)**	☐Yes ☐Unclear	Go to the next question
	☒No	exclude
Did the study report the outcome on smoking status of pupils (never, ever, current smoking) **(WHAT has been changed)**	☐Yes ☐Unclear	Include
	☐No	Explore more (other articles, contacting authors)
FINAL DECISION:		

NB: this Eligibility checklist was applied to all abstract emerged from data-bases search in order to identify studies that are included in the systematic review of SBSPI in Arabic and LICs; If the answer is yes or unclear, then the full-texts was reviewed.

Appendix F The generic topic guide for semi-structured interviews with staff

Welcome and thank you for making time for this interview.

Purpose and Format of the Interview:

As explained in the information sheet, I am conducting a study aims at understanding school's role in preventing adolescents in Assuit from smoking initiation. I would like to ask you some questions about that. I also request you to share your views, experiences suggestions regarding smoking prevention intervention in your school. I appreciate that you give me time for this discussion and would request as detailed responses and examples as possible.

General information on the respondents

1. Gender
2. Qualification
3. Age group
4. Year of experience in education / in adolescents' education/ in this school
5. Position at school /subjects to teach and involvement in informal school activities
6. Other relevant information : ----------

Current school's role in preventing adolescents' smoking

1. Do you think your school play a role in preventing pupils from smoking? If yes, how your school prevent pupils from smoking? Probe: what is done (activities and polices) by whom and when? The frequency and formality of the activities? Give examples?

❖ **The curriculum**

1. How are pupils at your school educated about smoking and its hazards? Probe for type of activities (formal/informal), examples from this or last year, done by whom, where, when and how frequent?
   - Probe: for any informal activities on smoking ran at or through school?
2. What information is included in the formal school curriculum about smoking?
   - Probe for the existence, amount and clarity of information, the targeted age and frequency, what subject, taught by whom and how?

❖ **Anti-smoking policy**

1. What happens if someone is seen smoking on school grounds?
   - Explain any differences if the smoker is a teacher, a pupil, a parent or a visitor?
2. Is there any policy exists at your school to prevent pupils from smoking?
   - If yes, could you tell me about this policy? Probe for the contents, clarity, explicitly of this policy, who developed it, where the policy documents are kept, who knows about it, how is it published, by whom? How is it ran and enforced? What challenges are faced by teachers/schools in running these policies?
   - If no, what do you think of having anti-smoking policy at your school and why? Probe: how could this policy be developed and enforced, by whom and the potential challenges?
3. Are you aware of any national policy to prevent smoking at schools? **If yes,** how did you know about this policy? What are the policy contents, how is it enforced at your school, and challenges?

❖ **General**

1. In your opinion, how different/similar your school from other schools in running smoking prevention activities and polices at schools?
2. How do you see the current contribution of your school in preventing adolescents' smoking? Why? What your school does well and what could be improved to prevent adolescents' smoking? What could be changed / added to the current: policies, curriculum, informal activities, allocated resources, time, teachers' skills and teaching methods?

Anticipated school's role in preventing adolescents' smoking

1. When we say school-based activities to prevent adolescents' smoking, what do you think this should include?
2. What school could do to enhance pupils' capability to remain non-smokers (probe for enhancing knowledge, skills of reasoning risk, setting personal plan/goal, self-regulation of behaviour, refusal skills)?
   - What school could do to reduce pupils' opportunity to smoke (probe for reducing accessibility and exposure to smoking behaviour at /around school, school regulations on smoking),
   - What school could do to motivate pupils not to smoke (probe for addressing beliefs and attitude; enhance religious values on smoking, using punishment or reward)?
3. How these activities could be done and when to take place?
4. Who should be involved in designing and running these smoking prevention intervention? Probe for:
   - Who should be excluded? Why?
   - What do you think of involving pupils in developing and running smoking prevention intervention? Why and how pupils could be involved? How could your opinion be different /similar from other teachers?
   - Whom permission needs to be obtained? What process should be followed?
5. How would you perceive taking part in preventing pupils at your school from smoking?
6. What teachers could do to prevent pupils from smoking? Why and how?
7. How, do you think, other teachers perceive taking role in preventing pupils from smoking?

❖ **The feasibility of specific strategies**

1. How pupils' ability to remember and apply what they learn in school could be enhanced?
2. What do you think of running smoking prevention activities led by pupils and why? Probe for:
   - The feasibility and acceptability of using activities led by pupils, alone or in combination with activities led by adults? Why and why not?
   - What smoking prevention activities could be led by pupils at your school, how it could be done and what needs to be considered
   - Which age group could lead these activities, any gender difference and why?
   - How could your opinion be different /similar from other teachers in school in this regard?
3. In your opinion, how could teachers be a role model in smoking prevention? Probe: How could your opinion be different /similar from other teachers in school and why?
4. How could smoke-free norm be created/run in your school, what needs to be done, by whom and why?
5. What do you think of running extra-curriculum activities in your school to prevent pupils from smoking and why? Probe for:
   - The perception on the importance, acceptance, and feasibility of running these activities, how these activities could be done, by whom, where (inside or outside the schools) and when (over the weekend, school holidays, or the regular class time)?
   - How could your opinion be different /similar from other teachers in the school?
6. How could school collaborate with parents to prevent pupils from smoking? Probe: the feasibility of training/educating parents on smoking hazard and how to prevent their children from smoking monitor their behaviour and enhance their skills on that?

Barriers and facilitators

1. In your opinion, how feasible is to run interventions/activities at your school to prevent pupils from smoking? Why?

2. What challenges faced or could be faced by your school in preventing pupils from smoking? In your opinion how similar/different these challenge in other school?
3. How ready your school to run anti-smoking training activities for pupils?
   Probe for: suitability of class size, teachers' skills, knowledge and capacity, infrastructure and school resources, availability of training materials?
4. What resources are required at your schools to run smoking prevention interventions?
5. What could facilitate running smoking prevention interventions at your school?
6. If any educational campaign was done before in schools, what lessons could be learnt from that? What worked what didn't?
7. What should be considered to sustain running smoking prevention interventions at your school?
8. What are your advices for those who will design school-based smoking preventing interventions in Egypt?

Others

1. Is there anything else you would like to say about how could school help in preventing adolescents from smoking?
2. Do you suggest anyone else that might be useful to interview regarding adolescents' smoking prevention at schools?
3. Do you know of any documents / reports relevant to smoking prevention in school? If so, where I can obtain these documents/reports from?

After clarifying anything I am unsure of, I will remind the interviewee that I will meet him/her again after designing the intervention to get his/her views on the intervention and its feasibility. Then I will end the interview by saying: "Thank you for your time today. This is the end of the discussion. I will now turn off the recorder."

Appendix G Documents Review Form

Category	Information
General information	
The name of school document	
Type of school document (policy, curriculum, poster, leaflets,….etc.)	
Author /reference	
To whom this school-document available?	
Date reviewed	
Where/whom it was obtained from? And how accessible this document is?	
Challenges in obtaining this school-document	
Reasons for any challenges in accessing this school-document	
Contents	
Brief summary of relevant information on smoking/tobacco prevention in this school-document NB: This section is to remind the researcher on the main content without having to revisit full text of the document	
In school policy and formal and informal school activities documents	
Policies /information on using communication methods against smoking (print, electronic, telephonic or broadcast media, or campaigns)	
Any Guideline on smoking prevention in schools (created documents that recommend or mandate non-smoking behaviour by pupils, teachers or visitors).	
Fiscal policy on smoking inside school (e.g. anything on financial punishment in case of smoking inside schools)	
Established regulation/rules on smoking inside school/by staff/visitor or pupils	
Legislations (any laws made or changed) regarding smoking at schools	
Environmental social planning i.e. Anything related to designing and controlling physical and social environment (such as smoking room)	
Anything indicates the presence of service provision related to smoking prevention for example social support to avoid smoking or improve resistance skills inside school, or work with parents to support pupils	
School curriculum	
Presence /absence of anti-smoking educational messages and brief summary of the identified messages	
All document	
Clarity /explicitly of relevant contents (anti-smoking policies or messages) in this school-document	
Any gap contents that is expected to be present in this school-document?	
Context	
How the contents of this school-document were developed	
Information and sources used in this school-document	
Who developed this school-document	
Explanation of how the contents of this school-document were chosen	
An explanation of why other contents of this school-document were excluded, if this is known / identified?	
When this school-document was developed	
Where this school-document is used	
Any bias in the contents of this school-document , explain	
Any link with other document, if yes ask for it	
Actors	
Who is the target of this school-document	
How this school-document published/circulated	
Any information on the implementation or utilization of this school-document	
Who can access this school-document	
Any other comments	

Appendix H Pupil Participants Information Sheet (in English)

Newsletter for Pupils in 1st and 2nd Preparatory Grades at Egyptian Schools

(Group Discussions in a study about preventing adolescents' smoking through their schools)

Would you like to take part in a study?

My name is Dr. Maryam Ba-Break and I am doing my PHD thesis on how school could help Egyptian adolescents to avoid smoking behaviour. Many Egyptians smoke at adolescent age and continue to smoke for the rest of their life which affect their health seriously. Because most Egyptian adolescents attend schools, it is better to inform them about smoking through their school.

I am interested to know the views of teachers and pupils in the 1st and 2nd preparatory grades on how school and teachers could empower pupils to avoid smoking behaviour. Your opinion, regardless if you smoke or not, is valuable and will enable me to inform Egyptian schools on the best way to protect pupils from smoking initiation.

What will you do in this study?

If you participate in this study, I will invited to group discussions with other classmates, to share opinions, experiences and suggestions about adolescents' smoking and how your school and teachers could pupils to avoid smoking initiation.

The group discussion will take place at [venue] at the school for a maximum of 2 hours but you will have few breaks during the discussion to relax. At least a day after group discussion, you will be asked to write short essay (for 30 minutes) on how school could prevent pupils from smoking. I am interested in your views, so you don't need to prepare for this essay and it will not be assessed. What you will write will not be seen by other students or teachers.

I will be with you to facilitate the group discussion and assist you with any questions or concerns you might have during the group discussion.

What's good about this Study?

This study is good because you can have your say on how schools could protect young people from taking up smoking. It is important that you know that this study may not help you now but what I learn from the study may help other pupils in the future to avoid smoking behaviour and protect them from smoking hazards.

What things may bother you about this study?

- You may feel tired and want to have a break or leave the group discussion earlier, just inform me and you will be allowed to do so at any time.
- You may be worry about making mistakes in expression, writing or spelling. Don't worry this is absolutely fine and I am only interested in your opinion regardless of any mistakes.
- You may be worry about missing important lessons. Be assured that your teacher will identify the best time for the group discussion and essay writing and you will not miss important lessons.
- You do not have to answer any question that you do not want to answer. However, your honest answer will help me a lot.

<u>I will audio-record the group discussion</u> to be able to remember your opinion and valuable suggestions. Nobody else will listen to your recorded answers and I will keep them in a safe place. I will delete all recording after the study finished. If you feel uncomfortable with recording what you say please do not sign the ok form.

- You will not be asked if you or your mum, dad or sibling smoke or not. You do not have to mention that or say something that could embarrass you or you do not want people to know it. If you regret saying something, please let me know and I will delete it from the recording. You and other participants **should not tell other people what everybody said during group discussion**.

- If you feel distressed because of the question, please let me know and we can ask your social worker for help.

WHAT WILL THE STUDY COST me?

You or your parents/guardians will not pay or receive any money for your participation in this study.

Who else will know about what I say or write?

I will only discuss what you said or written with my supervisors without telling them you name. Teachers and parents will not be allowed to attend the discussion and the room door will be closed so no one can hear the discussion. I will keep your answers and the recordings in a secured place and nobody else, even parents and teachers, will access them.

When I speak or write about this study I may include direct quotes from your responses to explain or the result, the quotes will not be attributed to you. Throughout the study, you will be identified by a number, not your name. Your name and school will be kept secret and you will not be identified or identifiable in anything written about this study.

If you said that you are at risk of something, *<u>I will consult the head-teacher to take action to protect you</u>* as your safety is more important than your privacy. So please think carefully before you answer questions and do not anything confidential.

Do you want to take part or not? – YOU DECIDE WITH YOUR PARENTS/GUARDIANS!

You do not have to take part in this study. You are free to say YES or NO. No one will be mad or upset if you do not want to. If you say YES you can change your mind later and STOP AT ANY TIME without giving any reason.

If you STOP BEFORE, DURING OR AFTER the group discussion or the essay writing, what you have already said or written will be used in this study without mentioning your name. If you changed your mind and you do not want me to use what you have written in this study, please let me know before 01/05/2018

Before deciding to help with this study?

Take as much time as you need to think. Ask as many questions as you wish. Talk about this study with your Mam, Dad or whoever looks after you before you say YES or No.

I will give you an envelope to give to your parents/guardians which includes information on this study, an ok form and an empty envelope.

What happened after deciding?

If you and your parents/guardians decided that you will participate in this study, at least one of your parents/guardians need to sign or stamp or thumbprint the ok form, put it in the empty envelope, close it and give it to you. You can give me the envelope or leave it with your teacher. Your parents can also arrange to meet me to ask questions and say the ok verbally.

If neither of your parents/guardians object that you to participate in this study and at least one of them signed/stamped/thumbprint the ok form, I will meet you again and ask you to sign your own ok form. You still can say NO even if your parents/guardians said yes. You will be only allowed to take part in this study if you and at least one of your parents/guardians signed the ok form.

By signing the ok form, you are allowing me to use your responses in this study.

Do you have any questions?
Ask as many questions as you like at any time, now or later. I am happy to answer any questions.
You or your parents/guardians can:

- Meet Dr. Maryam Ba-Break, at schools this week or the week after i.e. until [date].
  - at the beginning or the end of the school day,
  - or at other convenient time, just let her know
- Call her on ( )
- Email her: M.M.Ba-Break@leeds.ac.uk
  Ask her to call you or your parent and leave the contact details at school
- suggest other preferred ways to be contacted

You can also contact:
Dr Helen Elsey (the supervisor at UK) E-mail:
Dr. Doaa Mohamed (the supervisor in Egypt), Mobile:
E-mail:

The School of Medicine Research Ethics Committee (SoMREC project number MREC17-025) **has given the ok** for this study to be done .

Please keep this sheet in a safe place to contact me when you or your parent/guardians want to do so

For reading this newsletter

Appendix I Pupil Participants Consent Forms (in English)

Pupil's Consent Form: Group Discussion with Pupils in Preparatory Schools

School-Based Intervention to Prevent smoking initiation by Adolescents in Egypt

You are invited to take part in this study to share your views on adolescents' smoking and what kind of intervention could help prevent pupils at your school from taking up smoking, regardless if you smoke or not. Before you decide to take part of this study, it is important that you discuss your participation with your parents/ guardians and both of you are aware of why this study is being done and what participation in this study involves. Please read the information sheet of this study and feel free to ask the researcher if you or any of your parents/guardians have any questions, would like any further information or anything is unclear. If you and at least one of your parents/guardians agree on your participation in this study, you must read each point below and tick the boxes next to each one if you agree. Then, at the bottom of the form put your signature and the date. This means you agree to be part of the study and for the researcher to use the things you say and write in the analysis.

By signing this form, I confirm the following:

☐ I give permission for my responses to be maintained, used and shared as described in the information sheet [date 1/2/2018, version 3].

☐ I have received a copy of the information sheet and the consent form [date 1/2/2018, version], read them and have had time to think about whether or not I want to participate in the study.

☐ All my questions/enquires about the study or this form were answered and explained to my satisfaction.

☐ I voluntarily agree to take part in the study (by participating in group discussion and writing the study essay), to follow the study procedures and to provide necessary information to the researcher as requested.

☐ I may freely choose to stop being a part of the group discussion at any time without giving a reason. But that once the group discussion has started, my answers cannot be removed as they are needed to understand what everyone else said in the group. So my answers will be used in this study without mentioning my name.

☐ I may freely choose to stop being a part of the essay writing at any time without giving a reason. If I want my essay to be destroyed, I will tell the researcher before 01/05/2018

☐ I permit to audio-record the discussion.

☐ I have discussed my participation in this study with my parents/guardians and neither of them objects my participate in this study

☐ At least one of my parents/guardians voluntarily signed /stamped/thumb-printed the consent form of this study.

Signature of the participant	**Signature of the researcher**	**Signature of witness (if needed)**
_____	_____	_____
Participants name	**Researcher's name**	**Witness' name**
_____	_____	_____
Date _____	**Date**_____	**Date** _____

Name of Parent/guardian who signed the consent form _____

Appendix J The coding frame of the current SBSPI in preparatory schools, Upper-Egypt

Sub-themes	Emerging Themes	Meta themes (Intervention functions)	The COM_B components
- Brief and limited information on some smoking harms exist in few lessons, sometimes optional. - Cancelling some lessons on smoking harms, probably moved to primary school curriculum	Brief and limited curricular information on smoking harms	Insufficient knowledge are provided on smoking harms	Enhancing pupils' psychological capability to avoid smoking initiation
- limited, unplanned and voluntary extracurricular sessions on smoking harms are delivered by external experts - Few pupils are targeted, mainly smokers, due poor capacity - Experts deliver complex information in uninteresting lecturing style and limit pupils' discussion - Pupils dislike being selected as others believe only smokers are selected - Staff need knowledge and resources to deliver smoking-related educational sessions. - Voluntary opportunistic smoking-related discussion by teachers in classrooms, only when pupils were caught smoking in schools	Limited and opportunistic extracurricular educational sessions/lectures at schools on smoking consequences		
- Few old and unattractive school-posters on smoking harms exist but not always close to pupils - Hiding good posters on smoking to be used in schools competitions - Limited school resources hinder designing sustainable attractive school-posters	Few old unattractive anti-smoking school-posters		
- Smoking harms are rarely presented in school plays only in school competition - Plays on smoking are presented outside schools without inviting pupils to attend	Limited use of plays/drama in anti-smoking school education		
- Egypt-specific smoking prevention training manuals are designed - Range of skills needed for preventing pupils' smoking are covered by these manuals - Training manuals available online but unknown by school staff	Egypt-specific simplified training manuals on skills for smoking prevention exist	Providing the skills needed to avoid smoking initiation	
- Few pupils were trained on skills to avoid smoking using the Egypt-tailored smoking prevention training manuals.	Developing pupils' skills to avoid smoking		
- School policy bans smoking or carrying of cigarettes by pupils inside school - Pupils and places inside schools are randomly screened for smoking or cigarettes	Banning smoking or carrying of cigarettes by pupils inside school premises	Restricting pupils' smoking in schools	Reducing physical opportunities for pupils to smoke in school

- Restricting smoking by teachers, as role models for pupils of same-sex, mainly in pupils' presence not everywhere in schools - Visitors and parents are not restricted to smoke in schools due to cultural unacceptability of restricting guests' behaviour. - Lack of quitting services and adults' smoking areas hinder preventing adults' and teachers smoking in schools	Smoking by adults, as role models, inside school's premises	Creating anti-smoking social-norm at schools	Reduce social opportunities at schools that enhance pupils' smoking
- Smoking Control Group exist in schools but inactive - Discussion on smoking only targets members - The group in girls' school don't focus on smoking	Establishing school smoking control groups		
- Pupils are encouraged to report smoking - Some pupils put pressure on their friends not-to-smoke	Peer influence to avoid smoking		
- Avoid announcing girls' smoking to enhance the belief that it doesn't exist in Upper-Egypt and discouraging girls to smoke	Sustaining social norm of non-smoking girls		
- Informing pupils and their parents in advance about the penalty applied when pupils smoke or carry cigarettes inside schools. - Announcing names of boys who smoked in schools and their penalties to scare other pupils - Smoking by girls is secretly dealt to avoid stigmatizing girls and schools	Creating expectations of punishments in case pupils smoke	Persuasion and coercion toward decision making to avoid smoking	Reduce pupils' reflective motivation to smoke
- Requiting pupils to sign commitments not-to-smoke in schools witnessed and signed by parents	Requesting making written commitment / decision to avoid smoking		
- Suspending or expelling pupils who carry cigarettes or smoke inside schools	Punishments according to school policy	Feeling anticipated penalty when pupils smoke or carry cigarettes	Reduce pupils' automatic motivation to smoke
- Announcing names of smoker boys to punish them socially and discourage them to smoke again - Announcing punishments applied may lead to continue smoking - Girls' smoking never announced to avoid harsh social punishments on them	Social punishment by announcing names of smoker pupils		
- Social and light physical punishments applied by some popular teachers when pupils smoke outside schools or show intention to smoke to discourage smoking by pupils	Punishments outside school policy to discourage smoking by pupils		

Appendix K The coding frame of the anticipated SBSPI, preparatory schools, Upper-Egypt

Sub-themes	Emerging Themes	Meta-themes (Intervention functions)	The COM_B components
- Educating pupils about various smoking consequences; - Especially emphasizing the short-term consequences; - Emphasizing consequences on appearance, beauty, and physical fitness; - Explaining consequences on sexual ability - Explaining consequences on social relationships and income; - Explaining consequences on others and the environment; - Emphasizing the addictive impact of smoking; - Explaining the religious prohibition of smoking.	Educating pupils about various smoking consequences	Providing knowledge about smoking consequences.	Enhancing pupils' psychological capability to avoid smoking initiation
- Explaining contents of the regular, flavoured and electronic cigarettes and Water-pipe (Shisha); - Explaining harms of each tobacco product.	Specifying contents and consequences of each smoking form		
- Including more information on smoking consequences in the curriculum; - Opening frequent smoking-related extracurricular discussions with pupils by experts and staff; - Training staff by trusted experts to educate pupils; - Providing attractive, accessible school's posters that illustrate various smoking consequences.	Improving information accessibility		
- Enhancing pupils' refusal skills; - Enhancing pupils' skills of positive self-assertiveness, stress management, problem solving and decision-making.	Enhancing pupils' skills to avoid smoking uptake	Provide training on skills needed to avoid smoking	
Continue implementing the current ban of smoking or carrying of cigarettes by pupils inside schools		Banning smoking or carrying of cigarettes by pupils in schools	Reduce physical opportunities to smoke at schools .
- Disallow smoking by staff inside schools; - Considering non-financial and more feasible financial punishments when staff smoke in schools; - Educating staff on harms of active &passive smoking; - Reminding staff they are role-models; - Supporting smoker staff to quit.	Minimizing pupils' exposure to smoking by staff inside school premises	Creating smoke-free environment and anti-smoking social-norm at schools	Reduce social opportunities at schools that enhance pupils' smoking
- Encourage imitating examples of successful people inside and outside schools who never smoked; - Encourage sharing experiences of smoking avoidance; - Adding never smoking to the criteria for selecting ideal pupils and teachers.	Encourage modelling of non-smokers		

- Encouraging peer-pressure to avoid smoking; - Using informal peer-education; - Peer support for pupils facing peer-pressure to smoke.	Use the influence of peers to prevent smoking and create non-smoking social-norm		
- Using real-life stories of smokers and non-smokers - Field-visits to observe consequences on smokers; - Using laboratory experiments to explain the physical consequences of smoking; - Using photos/pictures, videos and school-plays to explain consequences; - Using open discussions rather than lecturing - Considering using social media and online resources in future.	Use persuasive and appealing methods to raise pupils' awareness of smoking consequences and correct pupils' false positive beliefs about smoking	Persuasion toward reasoning and making a self-conscious decision not to smoke	Enhancing pupils' reflective motivation to avoid smoking
- Opening discussion with pupils about the pros and cons of smoking and non-smoking; - Avoid focusing on explaining smoking consequences only. - Encouraging critical observation of the life of smokers and non-smokers in the surrounding environments	Stimulate thinking of the pros and cons of smoking and non-smoking		
- Encourage considering parents' disapproval of smoking; - Encourage considering social unacceptability of adolescents' smoking, especially females.	Creating expectations of social punishments when pupils smoke	Coercion to enhance pupils' decision to avoid smoking.	
- Rewarding never-smoked pupils, financially or socially; - Reward pupils who encourage never smoking among peers.	Rewarding pupils who never smoked or supported non-smoking	Feeling anticipated rewards associated with non-smoking	Enhancing pupils' automatic motivation to avoid smoking
- Encourage and facilitate practicing exercises	Encourage reducing negative emotions	Encouraging and facilitating alternatives to smoking behaviour	
- Encourage practicing hobbies and exercises	Encouraging good use of free time		