Paediatricians' Knowledge and Comments on Oral Health in Children

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Submitted in accordance with the requirement for the degree of Professional Doctorate of Paediatric Dentistry

The University of Leeds

Division of Child Dental Health

Leeds Dental Institute

February 2022

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

Dedication

This is dedicated to my beloved family

Acknowledgements

This thesis would not be possible without the direct support, both on a professional and emotional levels, of several individuals.

I would like to express my sincere gratitude to my supervisors Prof Bernadette Drummond, Dr Kate Kenny and Dr Susan Kindelan for their continuous guidance, help and advice during these years of my study.

I am delighted to extend my deepest thanks to my main supervisor, Prof Bernadette Drummond, for her endless support and encouragement particularly during the difficult unusual circumstances of Covid-19 pandemic. I would also like to thank my second supervisor, Dr Kate Kenny who provided the best advice and guidance of the qualitative part of this study and valuable appraisal of the theses. Last but not least, I am very grateful to my third supervisor, Dr Susan Kindelan who offered help, motivation and assistance specially whilst I was designing, conducting and arranging for recruiting participants for this study. I consider myself very lucky to have had the support of three fabulous supervisors.

In addition, I would like to take the opportunity to thank my friends and colleagues Maryam Alshezawi and Sana Alshahrani for their care, support and priceless memories we have had during my journey at Leeds.

A big thanks to the Kuwait Institute of Medical Specialisation (KIMS) for believing in me and allowing me to take on this opportunity.

Finally, I wish to acknowledge my warmest gratitude to my wonderful husband Mohammad, for joining me along the way, as well as my children Abdullaziz and Ali who were my source of joy during all difficult times.

Abstract

Background: Literature reveals that paediatricians' knowledge of child oral health is poor. Many children with significant medical or developmental conditions are under the care of a paediatrician. These children are considered to be at higher risk of developing dental caries and periodontal disease. Therefore, paediatricians, if they have appropriate knowledge and understanding, are well placed to identify oral health problems in these children and refer them for specialist dental care if required, in a timely manner.

Study Aims: To investigate if paediatricians including trainees in Yorkshire and the Humber consider oral health examination and advice in their general assessment of their patients and to explore their level of knowledge of children's oral health.

Study Design and Method: The study was designed as sequential quantitative and qualitative mixed methods of an identical sample of paediatricians working in Yorkshire and the Humber. Participants took part in answering the questionnaire over three separate study days with three different groups of trainee paediatricians. The study days were part of their child public health module in the paediatric specialty training programme in Yorkshire and the Humber region in England. The first group (original pilot group) included trainees from Levels 1 and 2(ST1-2); the second group involved trainees from Levels 4 and 5(ST4-5); and the last group were senior trainees from Levels 6 to 8 (SPR 6-8). A baseline questionnaire with questions linked to a power point presentation of some common oral conditions in children was completed by the participants to assess their knowledge on child oral health. They were given time to answer each question. Once the questionnaire was completed and collected from all participants, it was immediately followed up with the same power point presentation with additional information and discussion delivered by the principal investigator (SM). At the end of each meeting, all participants received another paper copy of the same questionnaire but with all answers and information. In addition to that, a recorded video of the same power point presentation was available via a link (https://www.youtube.com/watch?v=xQFXXLq4z04). This was provided in the

information handout for anyone to access for watching and/or sharing at a later time. This link is also uploaded on the YouTube channel of the University of Leeds School of Dentistry. Furthermore, some useful online resources of evidence-based knowledge and guidelines of preventive oral health care for children were provided in the information handout as well.

Data Analysis: A mixed method explanatory sequential design was conducted in this study. Firstly, quantitative analysis was utilised for all data elicited from the four sections of the questionnaires (simple descriptive statistics). Secondly, qualitative analysis was applied for data extracted from open ended questions in section III and section IV of the questionnaire (qualitative content analysis). The two phases of quantitative and qualitative analysis were performed independently.

Results: Almost 90% of participants self-assessed their level of knowledge on child oral health to be poor or fair (48.6% +40.50%). Although 70% admitted that they would refer their patients to a dentist when they identify an oral or dental problem, only 2.7% considered referral to a specialist paediatric dentist. The most common correctly identified oral condition identified by 85% of the trainees was dental caries. This was followed by dental trauma to the permanent upper central incisors with almost 69%, and gingivitis 67%. More than half of participants were able to provide an appropriate description of the following conditions: dental trauma to the upper left primary central incisor (60.8%), ectodermal dysplasia (54%) and anterior cross bite (51.3%). About one third of respondents (35%) were able to report the correct diagnosis of a dental abscess. Unexpectedly only 5% were able to identify primary herpetic gingivostomatitis. The second least accurate diagnosis was anterior open bite (6.76%) followed by dental erosion (10.8%). None of the participants were able to recognise enamel hypomineralisation. All 74 participants reported that they do provide some preventive oral health care advice for parents/carers to keep their childrens' teeth healthy. Some 97.3% reported that they do deliver some advice with regards to the use of fluoride toothpaste and 67.6% do provide advice about feeding bottles. The majority of trainees were aware of the main risk factors for dental decay in children (98.6%). Additionally,95.9% recognised that a child's first dental check-up should be undertaken as soon as the first tooth appears in the mouth and no later than one-year-old. Some 89.6% reported that it is difficult for their patients to find a dentist and 93.2% were highly motivated to increase their

knowledge of children's oral health. They proposed a range of suggestions through which they could receive education on child oral health.

Conclusion: Many of the paediatric trainees working in Yorkshire and The Humber region have no or very limited knowledge on child oral health and common oral conditions. They are providing children's parents/carers with preventive oral health care advice. However, some of this advice differs from the up-to-date guidance. Almost all paediatric trainees working in Yorkshire and The Humber region are highly motivated to learn about child oral health and include the significant relevance of such education to their practice to provide the best oral health guidance in children's best interest.

Table of Contents

List of Tables

List of Figures

List of Abbreviations

AAPD	American Academy of Paediatric Dentistry
BSPD	British Society of Paediatric Dentistry
DCby1	Dental Check by One
FTP	Fluoride Toothpaste
GDP	General Dental Practitioner
GP	General Practitioner
MDTs	Multi-Disciplinary Teams
MMR	Mixed Method Research
NHS	National Health Service
PG	Post-Graduate
PPM	Part-Per-Million
Qual	Qualitative
Quan	Quantitative
RCPCH	College of Paediatrics and Child Health
STEPP	Specialty Training Paediatric Programme
TDI	Traumatic Dental Injuries
UG	Under-Graduate
UK	United Kingdom
WHO	World Health Organisation

1. Background

Oral health is fundamental to overall health, wellbeing, and quality of life. A healthy mouth enables people to eat, speak and socialise without pain, discomfort or embarrassment (BritishDentalHealthFoundation1971-2016). The World Health Organisation (WHO) identified oral health as important for interprofessional within the primary health sector (WHO, 2017) .Atchison and Gift stated that oral health related quality of life measures include both general and oral wellbeing. Physical, social as well as psychological elements are independent but correlated components of overall health related quality of life (Gift and Atchison, 1995). Many life-threatening chronic diseases such as diabetes and cardiac conditions and their management are dramatically affected by the oral hygiene status (D'Aiuto et al., 2017) .Tremendous studies showed links between poor oral health and diabetes, strokes, heart and lung disease (D'Aiuto et al., 2017, BritishDentalHealthFoundation1971-2016). As health professionals, it is integral that patient's management should aim towards evaluating the patient as a whole. In other words, general and oral health as well as other aspects such as social status or habits should always be evaluated so the best health services can be delivered to our patients. This can be more challenging when dealing with paediatric patients since it is less easy to communicate with a child. Furthermore, teaching and educating children the best habits to maintain healthy general and oral health necessitates special behaviour management skills and knowledge which are considered to be the core material of all postgraduate paediatric medicine and dentistry programmes as well as some undergraduate medical and dental programmes. Comprehensive health care cannot be achieved unless oral health care is maintained (American Academy of Paediatric Dentistry, 2020) . Therefore, understanding basic oral health problems as well as common oral and dental conditions in children by paediatricians is imperative so they can provide a superior level of care for children and refer them to the appropriate dental care services as required.

2. Literature Review

2.1. Number of paediatricians in UK NHS

The National Health Service (NHS) is the name used for each public health service in the United Kingdom(UK). NHS England, NHS Scotland, NHS Wales and Health and Social Care in Northern Ireland. The NHS England is the largest governmental department funded national health care system in the UK (Fullfact, 2017). According to the NHS Workforce statistics-February 2018, there are 3220 consultant paediatricians (including directors of public health), 145 associate specialists, 388 speciality doctors and 3494 speciality registrars (NHS Workforce Statistics, 2018).

2.2. The Role of Paediatricians in UK NHS

In the UK babies will have a full health assessment in the first few days of their lives but will not be seen by a paediatric physician unless they have a specific medical condition. The General family Physician (GP) in primary health care is the first point of contact when parents or carers have any concerns about their child's general and oral health. According to the NHS referral system, all paediatric patients are seen by family general physician for routine primary health care and management. Children with specific medical comorbidities will be referred by their general physician to specialist paediatrician for further investigation and follow up care related to their medical issues. Patients' parents or carers also will have the right to choose which hospital in England to go to for the first outpatient appointment and which consultant led-team will be in charge of their child's treatment and to be treated by that consultant's team (NATIONALHEALTHSERVICE, 2016).

2.3. PG Paediatric Programmes Curriculum in the UK

Most developmental health conditions and syndromes are associated with different oral health manifestations. In the UK, the paediatric medical training postgraduate programme curriculum does not involve any specific material or teaching courses regarding oral health and common oral conditions (RCPCH, 2015) .This will subsequently lead to lack of education and knowledge in such field. And eventually, lack of confidence in implementing oral health advice within the overall child's health care assessment (Emmi DT, 2017, Sezer et al., 2013, Kalkani and Ashley, 2013, Rabiei et al., 2012, Prakash et al., 2006, Foster H, 2005).

2.4. Prevalence of Dental Caries in the UK

Evidence showed that dental caries and periodontal disease remain the most common chronic diseases among children in the UK. The prevalence of caries in the UK remain unacceptably high and varies geographically with the highest proportion in Northern Ireland 60% followed by Scotland 55%, Wales 51% and England 43% of 5-year-old children with dental caries experience respectively (Pitts and Evans, 1996) "High risk patients" were defined as all children with chronic disease, learning disabilities as well as children in intensive care. Children in areas with social deprivation were also involved (Foster H, 2005).

In England regular oral health surveys are undertaken and children aged 5 are the population surveyed most frequently. According to the most recent oral health survey 2019 reporting the regional variation in prevalence and severity of dental decay in 5 year old children in England, the highest proportions recorded were in North West and the Yorkshire and the Humber districts (shown in table 1) (PublicHealthEngland, 2019).

Table 1: Mean number of teeth with experience of dental decay in 5-year-olds in England, by region 2019 (PublicHealthEngland, 2019).

Region Name	Mean number of teeth with experience of dental decay in the whole sample (95% confidence intervals)	Mean number of teeth with experience of dental decay in those with decay experience (95% confidence intervals)
North East	0.8 (0.75-0.89)	3.5 (3.32-3.72)
North West	1.2 (1.14-1.25)	3.8 (3.65-3.89)
Yorkshire and the Humber	1.1 (1.02-1.14)	3.8 (3.62-3.90)
East Midlands	0.8 (0.80-0.88)	3.4 (3.26-3.49)
West Midlands	0.7 (0.70-0.75)	3.2 (3.11-3.29)
East of England	0.6 (0.60-0.67)	3.3 (3.21-3.48)
London	0.9 (0.88-0.97)	3.4 (3.30-3.53)
South East	0.6 (0.55-0.61)	3.3 (3.17-3.40)
South West	0.6 (0.59-0.70)	3.2 (2.99-3.34)
England	**0.8 (0.78-0.81)**	**3.4 (3.36-3.44)**

2.5. Paediatricians' Knowledge about Child Oral Health

Internationally, there is a growing target on the role of the non-dental workforce in improving oral health outcomes involving paediatricians, particularly for children. Recommendations for their role have included screening, preventive advice, and referral to dental services. Despite role identification, routine oral health screening and referral by paediatricians remains poor (Dickson-Swift et al., 2020).

In the UK, it was found that majority of PG paediatric specialty trainees in the Royal College of Paediatrics and Child Health (RCPCH) felt that it is a part of their responsibilities to be involved in the assessment of the child's oral health, but they don't have adequate training to implement this. They suggested the collaboration between the

British Society of Paediatric Dentistry (BSPD) and (RCPCH) to ensure that the curriculum includes information on children's oral health and preventive care (Kalkani and Ashley, 2013).

In addition, some suggestions were recommended in literature included joint training between dentist and other paediatric staff to enhance mutual understanding and referral pathways to ensure that all children receive the best and timely care (Olive et al., 2016). Paediatricians and paediatric dental services must always work together as integrated multidisciplinary team to raise the awareness, confidence and cooperation of children and parents which will ultimately improve the quality of life for such children (Foster H, 2005).

Most paediatricians across the world agreed that they play a key role in dental caries prevention. All are aware of the importance of providing their paediatric patients and their parents with the appropriate oral health care including prevention and diet advice.

However, they declare that they are not confident in their abilities to implement such care service to their patients. Those paediatric physicians referred their lack of confident to the insufficient training courses in oral health care. Majority of them stated that they have never received any undergraduate and postgraduate oral health education or training in their medical school and paediatric programmes (Niranjan et al., 2014, Sezer et al., 2013, Kalkani and Ashley, 2013, Rabiei et al., 2012, Prakash et al., 2006, Lewis et al., 2000).

Studies carried out in different states in US revealed that paediatric physicians do examine their patient's teeth as a part of their general health assessment, only few of those do apply fluoride varnish to their young patients as preventive dental care. Although they reported that they had received some oral health care training either in their medical school or during residency, this level of education about basic oral health knowledge is inadequate (Sezer et al., 2013, Lewis et al., 2009). Moreover, although quite number of paediatricians found to have proper knowledge about oral health with regards to the use of fluoride as a preventive oral health care measure in which include using child-age-appropriate amount of fluoride toothpaste (FTP) and regular application of topical fluoride for children, unfortunately , most of these information were outdated.

Therefore, the need to develop specific up to date oral health protocols for routine use by paediatricians was highly recommended (Emmi DT, 2017).

Further studies were conducted in several different countries in the world including Iran, Saudi Arabia, Italy, Canada and USA aiming to determine the level of oral health knowledge among general physicians working in primary health care centres. Again, inadequate education about oral heath during their medical studies was the main obstacle preventing those physicians to provide their patients with proper oral health prevention care and advice. These results provide valuable incentive for planning continuing education programs in the field of paediatric dentistry (Rabiei et al., 2012).

In addition, a number of suggestions were recommended in some studies in order to improve oral health care delivery to paediatric patients. These included involving the American Academy of Paediatric Dentistry (AAPD) oral health updated guidelines in the medical programmes and continuing education programmes,offering adequate training in oral health for paediatricians in all their studying levels by adding oral and dental care modules in their curriculum along with hands on skills. Furthermore, they recommended providing paediatricians with sufficient and up-to-date resources to ensure greater involvement in oral health related activities. Nevertheless, improving the communication between both fields could be achieved through including preventive dental articles in medical journals along with delivering up-to-date information about oral health promotion in brochures and posters(Niranjan et al., 2014, Sezer et al., 2013, Lewis et al., 2009, Prakash et al., 2006).

In conclusion, it is clear that family doctors' and paediatricians' knowledge on child oral health is variable and often poor. All show positive attitudes to learn more in this field (Dickson-Swift et al., 2020, Aburahima et al., 2020, Doshi et al., 2019, Alshunaiber et al., 2019, Olive et al., 2016, Sezer et al., 2013, Kalkani and Ashley, 2013). Consistently in the UK, literature reveals that there is lack of oral health knowledge which negatively impacts on all paediatricians to deliver optimal oral health care for their paediatric patients (Olive et al., 2016, Kalkani and Ashley, 2013). Children in Yorkshire and the Humber do not all have good access to the dentist as they do for a general health care professional. Many children with significant medical or developmental conditions will be under the care of a paediatrician. These children are considered to be at high risk of developing dental caries and gum disease (Foster H, 2005). Therefore, understanding

basic oral health problems as well as common oral and dental conditions in children by paediatricians is imperative so they can refer their patients to get the appropriate dental care when required.

2.6. Limitations of previous research

Almost all previous studies utilised anonymous web-based survey design which demonstrated very low response rate. Some of those internet-based surveys were also associated with non-response bias. Moreover, it was found that all questionnaire designs used in literature were very similar, they all included closed-ended type of questions which involved either yes/no and/or multiple-choice type of questions. Such type of questionnaires may prevent participants to provide their own perspectives. Furthermore, dichotomous type of questions may unintentionally lead participants to particular answers desired by the researcher which could subsequently raise the potential of surrogate information error. In addition, all previous studies had clearly founded that most paediatricians across the world as well as in the UK need more education and training on child oral health care. Those studies proposed various recommendations to improve paediatricians' knowledge on preventive oral health care in children, however, nothing had been implemented yet.

2.7. Three Major Research Paradigms (SAGE, 2020)

- Quantitative Research (Quan)
- Qualitative Research(Qual)
- Mixed Methods Research (MMR)

2.7.1. Quantitative and Qualitative Approaches to Research

Quantitative research has traditionally predominated much of healthcare research, particularly dentistry. However, qualitative approaches, which are common within social sciences, are also identified as equally important to health care inquiry (Stewart et al., 2008, Edmunds and Brown, 2012). Both approaches are important in health care research because they are capable of addressing different research questions in addition to their significant contribution to variable aspects of clinical practice (Stewart et al., 2008, Edmunds and Brown, 2012).

Quantitative research approaches are based on measurements and probabilities (Edmunds and Brown, 2012). They are commonly used to prove cause and effect relationships, test experimental hypothesis or determine the effectiveness of an intervention (Stewart et al., 2008). Moreover, they are a useful approach for determining the options, attitudes or practices of a large population. Randomised controlled trials, cross sectional studies and questionnaire-based surveys, are the most common quantitative research approaches which have been used with increasing frequency in evidence-based dentistry at the present time (Stewart et al., 2008).

Conversely, qualitative research does not seek to provide quantified answers to research questions and tends to be associated with more naturalistic types of research (Stewart et al., 2008). Such an approach often reveals insights which standard quantitative methods do not capture and is commonly used to explore, interpret, or obtain a deeper understanding of certain aspects of human beliefs, attitudes or behaviour, such as peoples' personal experiences and perspectives (Stewart et al., 2008, Edmunds and Brown, 2012). Neither qualitative nor quantitative research approaches are necessarily superior compared to each other. The chosen approach is considered appropriate according to its ability to address the research problem (Stewart et al., 2008).

2.7.2. Mixed Methods Research

Mixed methods research is a procedure for collecting, analysing both quantitative and qualitative in a single study or a series of studies for better understanding of a research problem (Creswell and Clark, 2011). This method of combining quantitative and qualitative approaches is getting more popular in various fields of social, behavioural, medical and oral health sciences (Creswell, 2021, Nicolau et al., 2017, Creswell and Clark, 2011).

Moreover, mixed method researches are increasingly being used in research studies on complex oral health issues (Nicolau et al., 2017). Combining quantitative and qualitative approaches has several advantages. Literature reveals that such an approach produces in-depth results at each level of the oral health care system including researchers, clinicians, and policy makers (Nicolau et al., 2017). Furthermore, complementing the two designs with each other by enhancing theoretical perceptions and permitting more in-depth exploration of certain findings, can subsequently increase the validity (Govindan, 2014, Creswell et al., 2011).

2.7.2.1. Types of Mixed Method Designs (Creswell and Clark, 2011)

- Sequential Explanatory Design
- Sequential Exploratory Design
- Sequential Transformative Design
- Concurrent Embedded Design
- Concurrent Transformative Design

2.7.2.2. Sampling and Sample Size in Mixed Methods Research (MMR)

Sampling is the process of selecting a portion of the population to represent the entire population. Sampling in Mixed Methods Research depends on the research designs chosen in the study (Kabir, 2016, Govindan, 2014). Generally, in quantitative research , the larger the sample, the more representative data is likely to be, tending to reduce the sample error.

Conversely, the guiding principle in qualitative is data saturation which means the larger the sample when there is maximum variation in the information and reaching a point where we don't get additional information (Govindan, 2014).

In Mixed Methods Researchers(MMR) sampling technique depends basically on two main factors. The first factor is time orientation of the study quantitative and qualitative phases occur ,in which could be undertaken either sequentially or concurrently. The second factor is the relationship of the qualitative and quantitative samples. According to this factor sample design could be either Identical, parallel, nested or multilevel. (Collins et al., 2007).

2.7.2.3. Challenges in conducting Mixed Method Research (MMR) (Creswell et al., 2011)

• Resources and Time: mixed methods research requires extensive time and resources to carry out the multiple steps involved such approach, including the time required for data collection and analysis.

• Sample size: choosing samples and estimating reasonable sample sizes for both phases and interpreting results from both phases.

• For sequential design, it can be difficult to decide when to proceed from one phase to the other or what results from the first phase to use in the follow-up phase.

• Analytic and interpretive issues: for sequential design with one phase following the other.

It might be challenging for the researcher to choose the significant findings from the first phase to be a focus of attention for the follow up data collection and analysis in the second phase.

2.8. Qualitative research in dentistry

Qualitative methods are gaining popularity in dental research (Bradbury-Jones et al., 2013, Rodd et al., 2010). There has been growing recognition for the important and powerful role played by qualitative research in dentistry (Erlingsson and Brysiewicz, 2017, Edmunds and Brown, 2012). The methods used in qualitative research include direct observation, open ended questions in questionnaires, interviews, electronic discussions, analysis of texts or documents and analysis of recorded speech or behaviour using audio or videotapes (Erlingsson and Brysiewicz, 2017, Edmunds and Brown, 2012) .

Qualitative approaches can offer dentistry a unique insight into peoples' personal perspectives, providing a more comprehensive understanding of their beliefs, knowledge and attitude as well as offering greater depth and methodological flexibility than quantitative research methods (Edmunds and Brown, 2012, Stewart et al., 2008) . They are appropriate for exploring the complexities of health and well-being and can help in creating an in-depth understanding of the patient experience (Smith and Firth, 2011).

Furthermore, qualitative methods can be used to explore the meaning of existing quantitative data in more detail. Also, it may be useful in the evaluation of perceptions of programmes (eg oral health initiatives), services, products or treatments (Stewart et al., 2008).

2.9. Qualitative Data Analysis

2.9.1. Content analysis and Thematic analysis

Content analysis and Thematic analysis are two analysis approaches in qualitative descriptive research (Vaismoradi et al., 2013). They facilitate rigorous and transparent data management such that all stages involved in the 'analytical hierarchy' can be systematically conducted (Ritchie et al., 2013). Content analysis is a method of analysing written, verbal or visual communication text and Its use has shown considerable growth over the last few decades (Erlingsson and Brysiewicz, 2017, Vaismoradi et al., 2013). Today, content analysis has widely spread history of use in communication, journalism, sociology, psychology, business, nursing and public health studies (Erlingsson and Brysiewicz, 2017).

Thematic analysis is an independent qualitative descriptive approach which mainly described as "a method for identifying, analysing and reporting patterns (themes) within data". It has also been introduced as qualitative descriptive method that provides core skills to researchers for conducting many other forms of qualitative analysis (Vaismoradi et al., 2013).

It should be noted that both approaches allow for a qualitative analysis of data. Content analysis and thematic analysis share the same aim of analytically examining narrative materials from life stories by breaking the text into relatively small units of content and submitting them to descriptive treatment. However, content analysis uses a descriptive approach in both coding of the data and its interpretation of quantitative counts of the codes. This means that it allows to quantify the data while analysing it qualitatively. On the other hand, thematic analysis provides a purely qualitative, detailed and nuanced account of data (Vaismoradi et al., 2013).

2.9.2. Content analysis

Qualitative content analysis has been recognised as a very useful method in open ended questionnaires, interviews, focus groups, electronic discussions, observation of practical procedures, presentations and analysis of written documents. An increasing number of dental education researchers are using these methods as a powerful research tool (Erlingsson and Brysiewicz, 2017, Hsieh and Shannon, 2005). The aim of using content analysis is to build a model to describe the phenomenon in a conceptual form (Elo and Kyngäs, 2008).

Inductive analysis is the most frequently approach used to analyse qualitative data (Burnard et al., 2008, Elo and Kyngäs, 2008). The concepts are derived from the data in inductive content analysis. The inductive approach uses the actual data itself to derive the structure of analysis. Such methods involve analysing data with little or no predetermined theory, structure or framework. Therefore, it is considered to be comprehensive, time consuming and most suitable where little or nothing is known about the study phenomenon.

Conversely, deductive approaches involve using a structure or predetermined framework to analyse data. Essentially, the researcher imposes their own structure or theories on the data and then uses these to analyse the interview transcripts. This approach is useful in studies where researchers are already aware of probable participant responses. However, while this approach is relatively quick and easy, it is inflexible and can potentially biased the whole analysis process as the coding framework has been decided in advance. And this can severely limit theme and theory development (Burnard et al., 2008, Elo and Kyngäs, 2008).

2.9.2.1. Advantages of Content Analysis

Content analysis methodology is gaining popularity in many fields because of its systematic and explicit way of applying the principles of undertaking qualitative analysis to a series of interconnected stages that guide the process (Erlingsson and Brysiewicz, 2017, Elo and & Kyngäs, 2008). For the novice researcher, using content analysis approach to guide the stages of the data analysis has the potential to assist in developing the skills required to undertake

robust qualitative data analysis. Content analysis approach aims to attain a condensed and broad description of the phenomenon (Erlingsson and Brysiewicz, 2017, Elo and & Kyngäs, 2008).

Content analysis as a research method offer researcher several major benefits (Elo and Kyngäs, 2008) :

- It is a systematic and objective means of describing and quantifying a phenomenon.
- It is flexible in terms of research design and is known as a method of analysing documents.
- It is concerned with meanings, intentions, consequences and context, with the purpose of providing knowledge, new insights, a representation of facts and a practical guide to action.

2.9.2.2. Three approaches to qualitative content analysis

Content analyses show three distinct approaches: conventional, directed, or summative. All three approaches are used to interpret meaning from the content of text data, hence, obtained by the naturalistic pattern. The essential difference among the approaches depends on the way of coding schemes, origins of codes, and threats to trust worthiness (Hsieh and Shannon, 2005).

“In conventional content analysis, coding categories are derived directly from the text data. With a directed approach, analysis starts with a theory or relevant research findings as guidance for initial codes. A summative content analysis involves counting and comparisons, usually of keywords or content, followed by the interpretation of the underlying context” (Hsieh and Shannon, 2005).

2.9.2.3. Steps of content analysis process (Erlingsson and Brysiewicz, 2017)

(a) Familiarising oneself with the data and the hermeneutic spiral	Initially, start to read and re-read the transcribed interview/ text content while keeping your aim in focus. Make a clear picture of your initial impression. Then start breaking down the whole text into small 'parts'. Compare the parts to the whole to determine whether impression of the whole demonstrate the analysis of the parts. In all phases of analysis, each part should reflect the whole and the whole should be reflected in each part. This is known as "hermeneutic spiral or hermeneutic cycle**"**.
(b) Dividing of the text into meaning units and condensing meaning units	Following that, split up the text into meaning units. Located meaning units are then compressed further while keeping the main meaning robust. The condensation should be a shortened version of the same text that still deliver the fundamental message of the meaning unit.
(c) Formulating codes	The next step is to develop codes. Codes should represent a descriptive label for the condensed meaning units. Additionally, they considered as tools to help researchers reflect on the data in new ways. Codes help to identify links between meaning units. At this stage of analysis, you are still keeping very close to your data with very limited interpretation of content. You may adjust and re-code until you achieve the most reasonable choices.
(d) Developing categories and themes	Eventually, the researcher needs to sort codes into categories that answer the questions who, what, when or where? This is chieved by collecting codes that express similar meanings, thereby, forming a category. In other words, establish a category which consists of codes that appear to deal with the same issue.

3. Research Question

3.1. This study was anticipated to answer the following questions:

- Do paediatricians including trainees in Yorkshire and the Humber consider an oral and dental health assessment to be an integral part of their general health care for their patients?
- What is their level of knowledge regarding oral health and common oral conditions in children?
- What is their attitude towards receiving more education in this field and how would they prefer to receive it?

4. Aims and Objectives

4.1. Aims of the study

- Assess the level of knowledge of Yorkshire and The Humber paediatricians and trainees in relation to child oral health and common oral conditions.
- Explore if they need education in this field and the best preferred ways to implement this in the future.
- To investigate if the impact of the chief investigator's intervention in delivering education on child oral health was useful and appreciated by the paediatricians and trainees.

4.2. Objectives of the study

- Objectives of the quantitative phase of the study(questionnaire with power point presentation and information handout):
    1. To provide paediatricians and trainees in Yorkshire and the Humber with knowledge on oral health and common oral conditions in children in order to increase their awareness and help them to provide their paediatric patients with the appropriate preventive oral health care in a timely manner.

- Objectives of the qualitative phase of the study(focus group interviews):
    1. To explore in depth about paediatricians' experience of diagnosing and managing oral health problems in their patients and find out if this has been changed after their attendance the quantitative phase of this study.
    2. Probe in more details to discover the barriers preventing them to implement oral health care and investigate what other information could be more relevant to their clinical practice to encourage the multidisciplinary work between paediatricians and paediatric dentists for child's best interest.

5. Methodology

5.1. Study Design

The study was designed as sequential quantitative and qualitative mixed methods of an identical sample of paediatricians including trainees working in Yorkshire and the Humber. The study was designed in three phases:

- Phase one: pilot study.
- Phase two: questionnaire with power point presentation and information handout of child oral health (quantitative part).
- Phase three: focus group interviews (qualitative part).

5.2. Ethics

The study was reviewed by the University of Leeds Dental Research Ethics Committee (DREC). A research protocol in addition to participant information sheet, questionnaire with power point presentation and information handout (Appendix 1, 4,7 and 5) as well as the participant information sheet, consent form and topic guid for focus group interviews (Appendix 2, 3 and 6) were provided to DREC who reviewed them and approved the three phases of this study project (Appendix 8),(DREC ref: 030719/SM/278).

According to NHS Health Research Authority Approval , NHS Research Ethics Committee (REC) approval was not necessary in order to conduct the study because it did not involve NHS service users or their relatives/carers (NHS, 2021). This research involved NHS staff recruited as research participants by virtue of their professional role only.

5.3. Sample Size

No sample size calculation was required as the study aimed to look at the level of knowledge, comments and opinions of paediatricians with regards to orofacial health in children. It was not measuring statistical differences of their knowledge. The study aimed to target as many paediatricians as possible including trainees, specialists and consultants working in Yorkshire and the Humber.

5.4. Study Phases

5.4.1. Phase one: Pilot study

Initially, while ethical approval was being sought, an agreement was gained from the Head of Paediatric Dentistry to contact postgraduate students in paediatric dentistry to pilot the participant information sheet, questionnaire with power point presentation and information handout (Appendix 1, 4,7 and 5) in order to ensure that the language and photographs used were clear. The questionnaire and the power point presentation were piloted in the Paediatric Dentistry Department at the University of Leeds with ten postgraduate paediatric dental students in September 2019. Following their feedback and with the recommendation of the Dental Research Ethics Committee (DREC), the questionnaire and the power point presentation were piloted again within the targeted population who were to be recruited into the study(paediatricians). The second pilot of the questionnaire with the power point presentation was undertaken with a group of 38 paediatric trainees and one paediatric consultant. This was carried out during a study day in their Child Public Health module at level 8 Worsley Building at Leeds Medical School in October 2019. Participants were asked to answer the questions within the allotted time and give feedback on the clarity of the images of oral conditions and dental terminology used in the questionnaire. Very minor modifications made following this pilot. A comment by several participants, 12 out of 38(31.5%), was with regards to the question to self-score their level of knowledge of child oral health (question number1 in section IV). They said that there was a need to include the option Poor, as their knowledge level was less than Fair. This was the only modification performed in the original questionnaire and it was used in the actual study as no further adjustments were required either to the language or the images used.

5.4.2. Phase two: Questionnaire with power point presentation and information handout

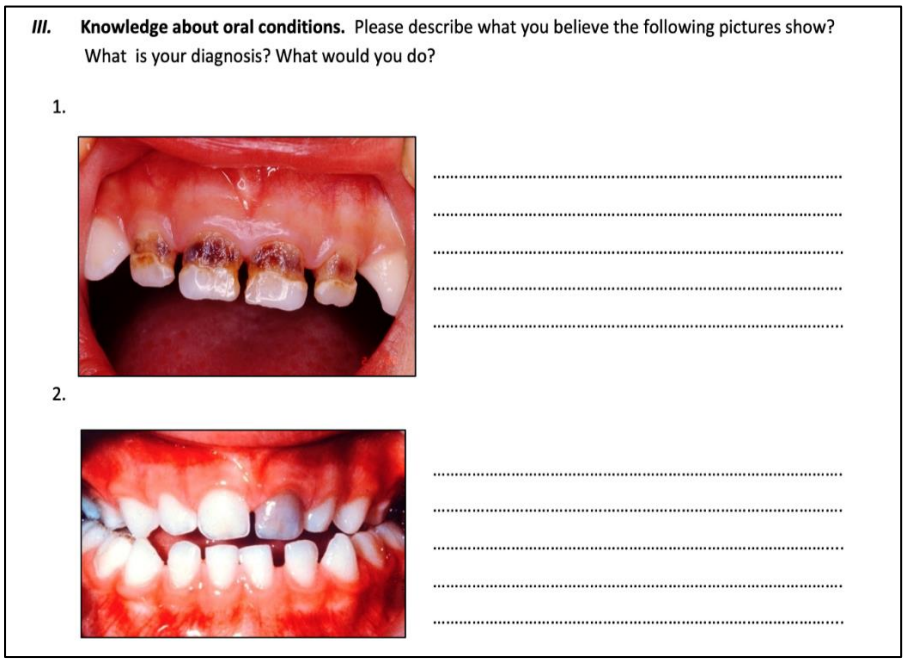
All paediatric leads who are responsible for paediatrics and paediatric specialty training in Yorkshire and the Humber were contacted. This was performed by sending an email where the lead researcher (SM) introduced herself, the research project aims and objectives and information about the study. After Ethics Approval from (DREC) and agreement from the paediatric leads, suitable meetings to attend were arranged with time allocated to provide a baseline questionnaire(Appendix 4) with power point presentation (Appendix 7) and information handout on child oral health (Appendix 5).These scheduled meetings included three groups of paediatric trainees and one group of paediatric consultants.

The base line questionnaire (Appendix 4) with the power point presentation (Appendix 7) together with an information hand out on child oral health (Appendix 5) were delivered in three separate meetings with three separate groups of paediatric trainees at different levels of their paediatric training programme (STEPP). This was provided at study days within their Child Public Health module and took place on Level 8 of the University of Leeds Worsley Building for the first and second trainee groups, and at a meeting room in Jubilee Wing at Leeds General Infirmary for the third trainee group. At those three meetings, two paediatric consultants who were the trainee leads also participated in the study. The meeting with the consultant paediatric group was scheduled in March 2020 and unfortunately could not be carried out as planned due to the impact of Covid 19 pandemic. This issue was discussed with the research team and a decision made to focus on paediatric trainee participants as the target population for this study as it was not known when it would be possible to meet with the Consultant group.

Each meeting started with a brief oral explanation by the research lead (SM). This was supported by providing all attendees with a participant information sheet (Appendix1) which clarified the study aim, objectives and methodology in more detail. The participant information sheet (Appendix1) was delivered accompanied by a paper copy of the baseline questionnaire (Appendix 4) in which included coloured photographs of some common oral conditions in children to assess the trainee paediatricians' knowledge of child oral health (Figure 1). As was noted in the participant information sheet, their participation to complete

the questionnaire was entirely voluntary and by accepting to fill in the questionnaire, this was considered as implied consent.

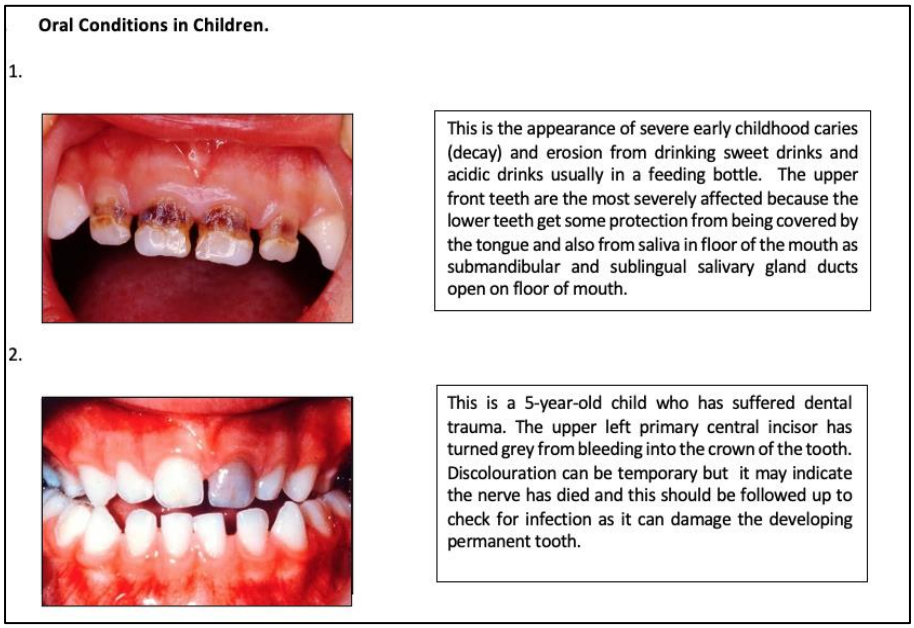
Figure 1:Example of section III of the questionnaire.



Concurrently, with the paper questionnaire, the questions and pictures were displayed in a power point presentation on a screen. Participants were asked to follow the power point presentation while answering their paper copy questionnaire with an allocated time for each section of the questionnaire. The last section of the questionnaire included an invitation to participate in another phase of the study which was a focus group interview. Those interested in taking part were asked to include their email addresses on a detachable paper slip contacted to the questionnaire. This was so that their personal information could be removed immediately from the questionnaire and not linked to the answers they had given. The focus group interviews intended to explore more about the participants' knowledge of child oral health and their suggestions for how this might be integrated into their training and ongoing study. Once the questionnaire (Appendix 4) was completed and collected from all participants, it was immediately followed up with the same power point presentation with

information about the conditions (Appendix 7) and discussion of the information. At the end of each meeting, all participants received a copy of the questionnaire with the answers to the questions and additional information (Appendix 5) (Figure 2).

Figure 2 : Example of section III of the information handout

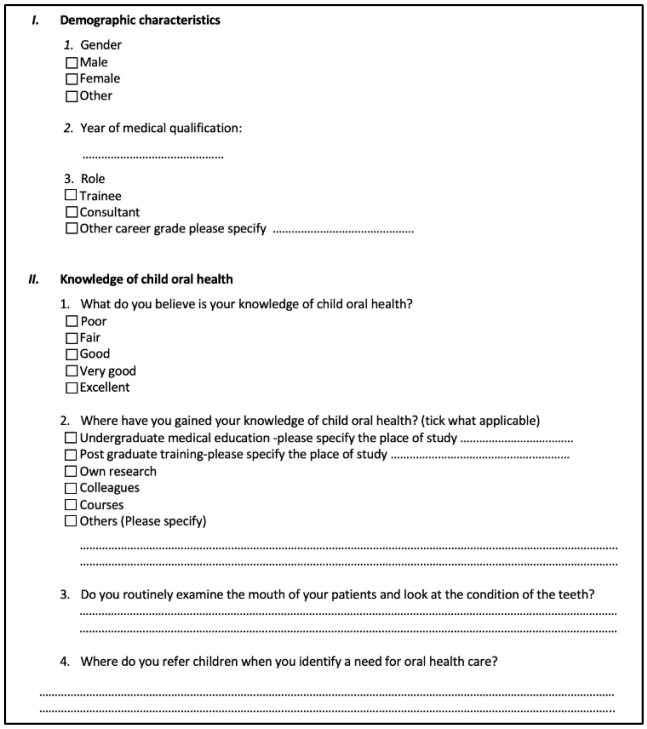


In addition to that, a recorded video of the same power point presentation was made available via a link: (https://www.youtube.com/watch?v=xQFXXLq4z04) with details provided in the information handout (Appendix 5) for anyone to access for watching and/or sharing at later time. This link is also uploaded on the YouTube channel of the University of Leeds School of Dentistry. Furthermore, some useful online resources of evidence-based knowledge and guidelines of preventive oral health care for children were provided in the information handout as well (Appendix 5).

5.4.2.1. Questionnaire Design

The questionnaire was designed by the lead researcher (SM) to ascertain paediatricians' baseline knowledge of oral health and common oral conditions in children. As mentioned earlier, it was delivered as a paper copy with a power point presentation. The questionnaire consisted of four sections: The first section included demographic questions about gender, year of general medical qualification, years of paediatric training/experience and current professional role (Figure 3). The second section included four questions with multiple choice and yes/no questions about child oral health knowledge (Figure 3). In this section participants had the opportunity to leave extra comments in addition to their answers if they wished.

Figure 3 :Section I and section II layout of the questionnaire



I. **Demographic characteristics**

1. Gender
☐Male
☐Female
☐Other

2. Year of medical qualification:
.....

3. Role
☐ Trainee
☐Consultant
☐Other career grade please specify .....

II. **Knowledge of child oral health**

1. What do you believe is your knowledge of child oral health?
☐ Poor
☐Fair
☐Good
☐Very good
☐Excellent

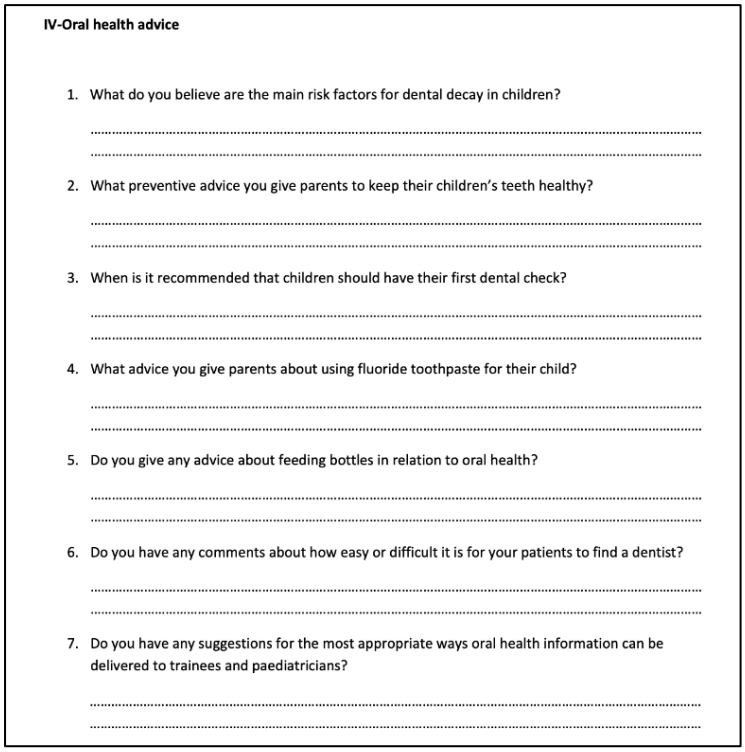
2. Where have you gained your knowledge of child oral health? (tick what applicable)
☐ Undergraduate medical education -please specify the place of study .....
☐ Post graduate training-please specify the place of study .....
☐ Own research
☐ Colleagues
☐ Courses
☐ Others (Please specify)
.....
.....

3. Do you routinely examine the mouth of your patients and look at the condition of the teeth?
.....
.....

4. Where do you refer children when you identify a need for oral health care?
.....
.....

The third section investigated participants' knowledge about oral conditions. This section of the questionnaire involved 11 coloured images of some of the most common oral conditions in children. Each image was displayed in a single slide on the power point screen for one minute. All participants were asked to identify each condition and its appropriate management in their paper copy questionnaire which included the same displayed image. An example of this section layout is illustrated in Figure 1. The fourth section included some general questions about oral health advice (Figure 4). In the last question of this section, paediatricians were asked to propose suggestions for their preferred methods to receive up-to-date information on child oral health in the future if they were interested.

Figure 4: Section IV layout of the questionnaire



IV-Oral health advice

1. What do you believe are the main risk factors for dental decay in children?

   .....
   .....

2. What preventive advice you give parents to keep their children's teeth healthy?

   .....
   .....

3. When is it recommended that children should have their first dental check?

   .....
   .....

4. What advice you give parents about using fluoride toothpaste for their child?

   .....
   .....

5. Do you give any advice about feeding bottles in relation to oral health?

   .....
   .....

6. Do you have any comments about how easy or difficult it is for your patients to find a dentist?

   .....
   .....

7. Do you have any suggestions for the most appropriate ways oral health information can be delivered to trainees and paediatricians?

   .....
   .....

5.4.3. Phase Three (Focus group interviews)

A few weeks after the questionnaire was completed, it was planned to conduct qualitative focus group interviews. The aim was to have two focus groups: one for trainees and one for consultants. This was to be guided by a topic guide (Appendix 6) which had been developed by literature review and through discussion with the lead researcher's team. The purpose of this stage of the study was to explore paediatricians' experiences of diagnosing and managing oral health conditions in their child patients in depth and if this had changed after they completed the questionnaire (Appendix 4), attended the power point presentation (Appendix 7) and received the information handout (Appendix5). Moreover, the lead researcher (SM) wished to discover whether the presentation and information sheet they received had helped in their clinical practice. Furthermore, she wished to probe in more detail what are the barriers that prevent paediatricians from implementing oral health care and preventive advice for their paediatric patients.

The recruitment of participants in this stage of the study was planned to be undertaken via emailing all paediatricians who had shown their willingness to participate in focus group interviews. Another email was to be sent with a participant information sheet and consent form for phase three of the study (Appendix 2 and 3). A copy of the signed consent form was to be returned to each participant. The focus groups were planned to be face-to-face but the Covid 19 pandemic arrived in March 2020 when the focus groups were planned. Following the initial lockdown, it was considered to hold the focus groups by Zoom or Teams meetings. This was delayed until 2021.

In September 2021, two emails were sent to the identified participants two weeks apart. Unfortunately, no one responded. This was totally understandable due to the workload the COVID-19 pandemic had created and a further crisis of an increase in Rotavirus infections in children with high numbers of hospitalisations. This was discussed with the research team and the decision was made to abandon the focus group interviews.

5.5. Data confidentiality and anonymity

5.5.1. Phase one (Pilot) & Phase two (Questionnaire with power point presentation)

All manually collected data was anonymised. A unique coding number was assigned to each participant who took place in the first trainee group which was also the pilot group. This allowed data from the pilot group to be analysed separately. The paper slip from the questionnaire which included participants' email addresses for those interested to be contacted for later focus group interviews was detached immediately from each questionnaire after each meeting. This was to maintain their anonymisation and not to link their personal information to their answers. The paper slips and all manual data were locked away in a secured office on the 6th floor of the Worsley Building to ensure it cannot be accessed by unauthorised individuals.

Electronic data was linked to the manual data by the coding numbers to make it easy to refer to it whenever needed and this was kept in encrypted formats with passwords to ensure that it is not accessible by unauthorised individuals. Only the lead researcher and supervisors had access to the information. Any electronic transfer of anonymised transcripts, between members of the research team working for different organisations were kept encrypted.

5.5.2. Phase Three (Focus group interviews)

Although this phase was dropped off the study. This paragraph explains how it was originally planned. All interviews were planned to be conducted by a digital sound recorder and no participant identifiable information was to be recorded in any associated paperwork. All quotations used in reports and publications were to be anonymised. All recordings were to be discarded once data analysis was completed and the lead researcher's thesis completed. Data from the project was offered to the

University of Leeds Research Data Repository (Research Data Leeds), in order to ensure the data can be shared, reused, and cited beyond the end of the project. Research Data Leeds holds deposited data for a minimum of 10 years and datasets are associated with digital object identifiers (DOIs).

5.6. Data Analysis

5.6.1. Introduction

The lead researcher (SM) initially planned to complete data collection from all arranged meetings with trainee groups as well as a consultant group and analyse data of this phase of the study (questionnaire with power point presentation) quantitatively. Then she planned to apply qualitative analysis for data which was to be collected later from the focus group phase. However, due to the Covid-19 pandemic and the Rotovirus outbreak which overwhelmed paediatricians at that time, the lead researcher (SM) was not able to carry out the questionnaire with the consultant paediatric group. The focus group phase was also abandoned from the study. Despite that, it was thought that a degree of further information regarding paediatricians' knowledge, opinions and comments on child oral health could still be obtained from the original questionnaire, particularly from the comments collected from section III and section IV. Those sections of the questionnaire involved open-ended type questions and contained a range of free text answers which could be analysed qualitatively for further exploration of participants' insights with regards to their knowledge about child oral health. In light of this, and after discussion with the research team, the decision was made do a separate extent qualitative analysis of the original questionnaire from the information collected in section III and section IV.

5.6.2. Data Analysis Design

A mixed methods explanatory sequential design was conducted in this study. Firstly, quantitative analysis was utilised for all data elicited from the four sections of the questionnaires (simple descriptive statistics). Secondly, qualitative analysis was applied for data extracted from open ended questions in section III and section IV of the questionnaire (content analysis). The two phases of quantitative and qualitative analysis were performed independently.

5.6.3. Data Analysis phases

5.6.3.1. Pilot Data Analysis phase

Initially, data from the paediatric trainee pilot group was analysed separately. It was found that the data information from the pilot group was very similar to the data obtained from the main study groups. The questionnaire had had minimal changes after piloting it and therefore, a decision was made to pool all the data for the analysis.

5.6.3.2. Quantitative Data Analysis Phase

A sample size calculation was not required. It was aimed to target as many paediatricians as possible (consultants, specialists and trainees) who worked in Yorkshire and the Humber. Data was gathered from all questionnaires then analysed using simple descriptive statistics. Regarding the open-ended questions in section III and section IV of the questionnaire, each answer was defined as either acceptable = 1 mark or not acceptable = 0 mark. This was performed by comparing each answer with a standard correct answer

developed and agreed by the research lead (SM) and her team beforehand (Appendix 5). The anonymised data was entered on an Excel spread sheet by the lead researcher (SM) and proportions of participants' answers were reported for all four sections of the questionnaire using Excel tools:

Section I: Demographics

- Gender
- Year of medical qualification
- Role/professional title

Section II: Knowledge of child oral health

- What do you believe your level of knowledge of child oral health?
- Where have you gained your knowledge of child oral health?
- Do you routinely examine the mouth of your patients and look for the condition of the teeth?
- Where do you refer children when you identify I need for oral health care?

Section III: Knowledge about oral conditions

Participants answers included their diagnosis and management of 11 images of some common oral conditions.

Section IV: Oral health advice and suggestions

5.6.3.3. Qualitative Data Analysis Phase

The free text data extracted from participants' comments in the open-ended questions in section III and section IV of the questionnaire were analysed qualitatively. Content analysis was carried out by identifying variable codes and categories of the data provided to analyse its content (Grbich et al, 2013). There are three approaches to qualitative content analysis, which are conventional, directed, or summative (Hsieh et al, 2005). Conventional content analysis was undertaken in this study.

Conventional content analysis was used to analyse the qualitative data extracted from participants' answers to open-ended questions from both section III and section IV of the questionnaire. In conventional content analysis coding and categories are derived directly from participants' responses (Hsieh et al, 2005). The elements identified in this conventional content analysis were the codes and categories running through the paediatricians' text data in the open-ended questions of section III and section IV of the questionnaire.

5.6.4. Qualitative Analysis Process

Qualitative data was extracted from participants' responses to the open-ended questions in both section III and section IV of the questionnaire. These responses were analysed using conventional content analysis. Codes and categories were identified directly using participants' own words. This process was performed manually by collecting all participants' answers in a Word spread sheet. Initially, codes were developed, and the frequency of the same codes presented in the text was considered to show the significance of such codes. Similar codes were grouped together under broader meaning to form categories. There was no coding process applied for the two consultant paediatricians who were trainees' mentors and took place in this project. However, their responses were summarised and the findings are described in the results.

Examples of the codes and categories developed for the conventional content analysis are shown in Tables 6, 7, 8, 9, 10, 11, 12 and 13. As coding progressed, spider diagramms for

key findings were established to help in organising categories. Examples of spider diagramms set up for the key information from sections III and IV of the questionnaires are shown in Figures 16, 17, 18, 19, 20, 21 and 22.

5.6.5. Rigour, Reliability and Validity in Qualitative Research

The analysis of qualitative data is in general, more subjective than the process associated with quantitative data analysis (Burnard et al., 2008). However, for the research findings to have some meaning, it is imperative that processes are undertaken throughout the research project to ensure the findings are true and valid. Reliability is the degree of consistency or dependability with which an instrument measures the attribute it was designed to measure (Long and Johnson, 2000). Although efforts may be made to enhance a qualitative study's reliability, in most cases the nature of the data and the sample make this difficult at best and qualitative researchers may have to accept that reliability is unlikely to be a strength of their work (Long and Johnson, 2000). The reliability of the analysis of qualitative data can be enhanced by organising an independent assessment of transcripts by additional skilled qualitative researchers and then, comparing agreement between the raters (Mays and Pope, 1995). However, there is no definitive answer to the issue of validity in qualitative analysis. The process of analysis should be systematic and rigorous and researchers should provide a detailed explanation of how data was collected and analysed (Burnard et al., 2008).

5.6.5.1. Internal Validity/Reliability

Intercoder reliability (ICR) is achieved by inviting an independent coder to analyse the same text using the same coding process and reach the same decisions in order to increase the reliability of the results (O'Connor, 2020). Moreover, such procedures are vital to reduce research bias, and in particular the confirmation bias. Confirmation bias is reached when researchers tend to interpret data in a way that supports their hypothesis. Therefore, getting an independent person to check the work during the study is fundamental to achieve rigorous valuable results (EnagoAcademy, 2021, Mays and Pope, 1995). An intra-coder approach is

another measure to evaluate the reliability. This can be done by re-coding the same data at different periods of time by the same person (a single coder) to ensure the consistency of the coding scheme (Given, 2008). Both intercoder and intra-coder approaches were utilised in this study to ensure the consistency of the coding and categorisation process.

Initially, codes were created by the researcher (SM) and one of the research team (KK) independently. Then, codes were discussed and agreed through a virtual meeting. The same procedure was repeated in the categorisation process. After that, the researcher (SM) re-coded a sub-set of the sample to assure consistency of the finding

6. Results

As described in the Methodology, of the overall 74 participants, data from the 38 paediatric trainees pilot group was analysed initially. Then data from the next 36 questionnaires of paediatric trainee groups were analysed. It was found that data from both groups was almost the same. The questionnaire set up had only minimal alteration after the pilot group was completed. This involved only one question in section II of the questionnaire with regards to self-assessment of paediatrician's knowledge level of child oral health. An extra option called (Poor) was added to the answers to this question. This was the only modification applied to the questionnaire and was based on 31.5% of the participants' requests from the pilot study. With this minor change the original questionnaire was used in the actual study as no further adjustments were required either to the language or the images used.

6.1. Quantitative Results

6.1.1. Section I-Demographic characteristics

Seventy-four paediatric trainees participated in this study comprising 55 females, 18 males and one with no gender revealed. Participants took part in the questionnaire on three separate study days with three different groups of trainee paediatricians. The study days were part of their child public health module in the paediatric specialty training programme in Yorkshire and the Humber region in England. The first group (original pilot group) included trainees from Levels 1and 2(ST1-2), the second group involved trainees from Levels 4 and 5(ST4-5) and the last group were senior trainees from Levels 6 to 8 (SPR 6-8). Of the 74 participants, 16 (21%) did not answer the question regarding year of medical qualification.

Two consultant paediatricians also completed the questionnaires on the study days. They were the trainee' supervisors at the study sessions. Their responses were not involved in the main analysis. However, the research team agreed that their responses would be summarised and described at the end of the Results Chapter to allow some comparison with the trainees.

Table 2: Participant Demographic Characteristics

Characteristic Gender	N	%
Male	18	24.30%
Female	55	74.30%
Others	1	1.40%
	74	100 %
Year of medical qualification		
Blank	16	21.62%
2003	1	1.35%
2004	1	1.35%
2005	1	1.35%
2006	1	1.35%
2008	7	9.46%
2009	2	2.70%
2010	13	17.57%
2011	7	9.46%
2012	10	13.51%
2013	6	8.11%
2014	8	10.81%
2015	1	1.35%
	74	100%

6.1.2. Section II-Knowledge of Child Oral Health

Four questions were asked regarding oral health knowledge. A summary of the results for each question is presented in Table 3.

Almost 90% of participants, felt their knowledge of child oral health was fair or poor. Eight participants recorded that they felt they have good (9.5%) and very good (1.4%) understanding of child oral health.

Regarding the source of their knowledge of child oral health, participants were asked from where they gained knowledge of child oral health. Thirty-one respondents (41%) stated that they gained such information from their undergraduate (UG) medical studies, in different medical schools in the UK and from schools in overseas countries. Of those 31 trainees, 18 specified the name of their medical schools which included Birmingham, Nottingham, Leeds, Sheffield, Manchester, Brighton, Southampton, Kings College, Leicester, and Barts and the London. Five respondents had their undergraduate medical degrees from overseas countries, including India and Greece. Only six trainees (8%) noted that they acquired their knowledge on child oral health, either during a post graduate (PG) diploma, post graduate (PG) training programme or from studying for the Royal College of Paediatrics and Child Health (RCPCH) examination. Two of these six trainees specified that they gained some knowledge on child oral health during their PG diploma at a specific day on oral health in children which was provided at the University of Leeds. Twenty participants (27%) said that they collected information from their own reading and nine trainees (12.1%) stated that their knowledge was gained from chatting with colleagues. Moreover, eight respondents (10.8%) reported a further range of sources from where they obtained information on child oral health. These included from personal experience as stated by two participants, Google searching by another two, textbooks by one and one had gained information from their family dentist or family members. Three trainees commented that they never had any formal teaching or training on child oral health.

With respect to routine oral health and teeth examination provided by trainee paediatricians for their paediatric patients, although, 46 respondents (62%) stated that they did examine their patient's mouths as part of their assessment, none mentioned that they looked at the oral cavity soft tissues or teeth specifically. Nineteen declared that they looked at the mouth as

part of an ear nose and throat examination or while checking a patient's tonsils. In addition, six reported that they considered examining the mouth only if they thought it was relevant to the patient's medical condition, and four admitted that they thought it was their responsibility to implement this for all patients, but they provided such oral care "*only sometimes when time allows*". Another three participants noted that they do perform mouth examinations as part of safeguarding reviews. Only one considered an oral examination when patients were being admitted to hospital. Twenty-eight respondents (37.8%) reported that they didn't routinely perform any mouth or teeth examination with one trainee commenting that such an examination is not usually provided unless a patient is complaining of pain from mouth and/or teeth.

The next question asked about the most appropriate place where paediatricians would refer their patients who required oral health care. The majority of participants (70%) would refer patients to a dentist when they identified an oral or dental problem. However, only two trainees (2.7%) considered referral to a specialist paediatric dentist. Eight respondents (10%) reported they would refer to a maxillofacial surgery department and four (5%) stated that they would advise their patients' parents/carers to see their registered family dentist and would signpost to the NHS website if they were not already registered. Three trainees (4%) recommended to see a family general practitioner (GP) for advice. One respondent (1.4%) noted that they would refer to the safeguarding team if they were concerned about child neglect. A further participant (1.4%) participant reported they would refer to the cleft lip and palate clinic. One participant left this question with no answer.

Table 3: Child oral health knowledge questions

(1) What do you believe is your knowledge of child oral health?	**%**	**N**
Poor	48.60%	36
Faire	40.50%	30
Good	9.50%	7
Very good	1.40%	1
Excellent	0%	0
(2) Where have you gained your knowledge of child oral health?		
UG	41.89%	31
PG	8.11%	6
Own reading	27.03%	20
Colleagues	12.1%	9
Others (google, textbooks, personal experience, family members/dentist)	10.8%	8
Courses	0%	0
Never had formal teaching or training	25%	3
(3) Do you routinely examine the mouth of your patients and look at the condition of the teeth?		
No	37.80%	28
Yes	62.20%	46
(4) Where do you refer children when you identify a need for oral health care?		
Dentist	70.2%	52
Maxillo-facial department	10.8%	8
Paediatric dentist	2.7%	2
Advice to see their own dentist and signpost to NHS website if not registered with a dentist.	5.40%	4
GP	4.05%	3
Cleft lip and palate clinic	1.40%	1
Safeguard department if signs of neglect concerned	1.40%	1
Blank	1.40%	1

6.1.3. Section III-Oral conditions

This section included 11 pictures of common oral conditions that are found in children. Participants were asked to provide the most appropriate diagnosis and management for each image provided.

6.1.3.1. Image 1: Early Childhood Caries and Erosion

The majority of participants (85.1%) were able to correctly identify the condition as dental caries. However, none acknowledged that there was also dental erosion evident in the photograph. Thirty-six trainees (48.6%) noted that they would refer a patient with this condition for dental care. This included either a referral to a dentist, for emergency dental care or to a maxillofacial surgery department. Four respondents would recommend seeing a dentist for advice. Five said they would provide oral health advice. Such advice included to reduce sugar intake and to maintain regular toothbrushing. Seven respondents (9.5%) misdiagnosed this condition. The most common incorrect diagnoses reported by six of the seven were gum disease and plaque buildup. This was followed by dental staining reported by one. Four participants did not answer this question.

Figure 5:Caries and Erosion

6.1.3.2. Image 2: Dental Trauma of upper left primary central incisor

More than half of the participants (60.8%) correctly identified that this child had an injury to his top left front tooth. The majority 30 out of 45 (66.7%) referred to it as a dead tooth: nine (20%) called it loss of blood supply and five (11.1%) diagnosed it as a necrotic tooth. One explained that this occurred due to bleeding in the tooth following trauma. Twenty-four would refer the patient to a dentist and six noted they would advise the parents of the need to see a dentist. A quarter of respondents (25.7%) were unable to diagnose the condition. Nineteen trainees incorrectly diagnosed the trauma with eight calling it dental decay or tooth discoloration and three calling it an inflamed gum. Ten participants did not answer this question.

Figure 6: Trauma to primary central incisor

6.1.3.3. Image 3: Intra-oral view of Ectodermal Dysplasia

Forty of the trainees (54%) were able to correctly recognise that the image showed abnormal teeth development. Of those, 15 described the condition as peg shaped teeth, 10 accurately diagnosed the condition as ectodermal dysplasia, eight labelled the condition as abnormal developed teeth and seven participants explained that such abnormal poorly developed teeth shown in this case was related to a congenital defect or a syndrome. From all 74 participants, only 16 said they would refer the patient for dental care including to a dentist, maxillofacial surgery department, or a specialist paediatric dentist. Seventeen trainees (23%) were unable to identify the correct condition. Four of the 17 incorrectly diagnosed the condition as large gaps between teeth suspected to be related either to bony pathology, thumb sucking habit or following teeth extractions. Another four accurately labelled the condition as teeth loss and

three of the 17 trainees inappropriately described this condition as either delayed teeth eruption or gum pathology. Two thought that this condition could be related to different syndromes and one wrongly described the case as tooth discolouration. Seventeen participants did not answer this question.

Figure 7: Ectodermal Dysplasia

6.1.3.4. Image 4: Gingivitis

Fifty of the participants (67.6%) correctly diagnosed this oral condition and 20 of the 50 accurately called the condition 'gingivitis'. Thirteen respondents described it as poor oral and gum health with plaque buildup, 10 labelled it as gum disease and 7 called it inflammation of the gums. Eleven of the trainees recommended that such a patient should see a dentist or dental hygienist, while another 10 thought of referring the patient to a dentist. Eight participants considered they would provide oral health advice regarding regular teeth brushing. Sixteen trainees (21.6%) provided incorrect diagnoses with six of the 16 saying this was stains and enamel discolorations. Caries and erosion were documented by three: two inappropriately described the condition to be lack of fluoride or fluorosis and one participant called the condition either gingivostomatitis, overcrowding or a smoking related case. There were eight participants who left this question with no answer.

Figure 8: Gingivitis

6.1.3.5. Image 5: Primary Herpetic Gingivostomatitis in mixed dentition

Unexpectedly, only a small number of participants – four (5.4%) were able to correctly identify this as gingivostomatitis and a herpes simplex virus (HSV) related condition. All reported their primary management to be: perform blood tests, check iron levels and provide proper diet advice. Fourteen participants left the condition unanswered. Three quarters of the respondents - 56 (75%) incorrectly diagnosed this condition. A range of incorrect diagnoses were documented. The most common one was gingivitis and inflamed gums reported by 29; this was followed by oral ulcerations documented by 13 and six of the 56 who gave a diagnosis mistakenly identifying the condition to be teeth grinding. Three participants thought this oral problem was due to a medical condition such as Scurvy/Vit C deficiency or Williams Syndrome. A few more incorrect descriptions of this image were reported including gum bleeding, teeth staining, tongue bite habit and smoking. Twelve considered the need of oral health care for this case, with six thinking of referring the patient to a dentist, while the other six recommended to see a dentist or dental hygienist for advice.

Figure 9: Primary Herpetic Gingivostomatitis

6.1.3.6. Image 6: Fracture of both upper permanent central incisors

The second highest level of correct diagnoses following the 85% recorded for dental caries, was reported for this image. Fifty-one participants (68.9%) described broken teeth (27 out of 51), chipped teeth (13 out of 51) and trauma (11 out of 51). Twenty-eight reported that they would refer the patient to a dentist or maxillofacial surgery department and a further three would recommend the patient see a dentist for advice. However, 13 (17.6%) of the participants were unable to make the correct diagnosis, the majority of whom (8) thought that the shape of the upper front teeth was related to prolonged use of bottle feeding. A further five of the 13 incorrectly diagnosed the condition to be enamel loss (3 of 13) or dental decay (2 of 13). Ten participants did not answer this question.

Figure 10: Fracture of both upper permanent central incisors

6.1.3.7. Image 7: Dental Abscess

More than one third of respondents 26 out of 74 (35%) were able to identify the right condition. Twenty-four of the 26 noted it was a dental abscess and two named it as an infection. The first line of management reported was to refer the patient either to a dentist or maxillofacial surgeon (26 out of 74 participants). Six respondents out of 74 suggested to see a dentist for advice. Thirty-three doctors (44.6%) were unable to describe this condition correctly. A range of incorrect diagnoses were reported, with the most common being tooth malalignment/malposition reported by 12 of the 33, followed by overcrowding by

10. Three of the 33 with incorrect answers thought it was an eruption cyst and three a retained milk tooth. A further two incorrectly assumed that it was a mucocele and one labelled it as either discoloured tooth, underdeveloped tooth or impacted tooth. Fifteen of the 74 doctors left this question blank.

Figure 11: Dental Abscess

6.1.3.8. Image 8: Hypomineralisation

This condition was the least commonly known by the participants. Eleven of the 74 did not answer this question. None of the remaining 63 (85 %) participants who provided answers were aware of the correct diagnosis. However, 23 were able to recognise that there is a change in teeth colour. None knew that this change in colour was because of a developmental defect of the enamel. Eighteen of 23 who acknowledged discolouration of the teeth described the condition as teeth staining. The remaining five called it either teeth discolouration (4 out of 23) or pigmentation (1 out of 23). On the other hand, 40 of 74(40.1%) incorrectly diagnosed this condition with 12 describing it as dental decay, and one respondent diagnosed the condition as gum disease. A number of trainees identified teeth discolouration, but they incorrectly described the change in colour to be due to several inappropriate reasons including poor oral hygiene (8 out of 40), medication related (7 out of 40) or food stains (6 out of 40). Two misdiagnosed this change of teeth colour as due to nicotine and one to fluoride. Fourteen participants considered dental referral for this case, while only five recommended a dental visit for advice.

Figure 12: Hypomineralisation

6.1.3.9. Image 9: Anterior Cross-bite

Thirty eight of the 74 (51%) diagnosed this condition correctly with several descriptions reported. The most common diagnosis was teeth malalignment documented by 30 participants out of 38, followed by malocclusion reported by only four of the 38. In addition, one each reported: cross bite, poor bite, poor tooth position or displaced tooth. Seventeen (23%) were unable to recognise the right condition, 21 of whom suggested a referral to dentist and three recommended seeing a dentist for advice. Eight of the 17 incorrectly thought that patient has overbite; six labelled it as overcrowding; two reported bifid tooth and one wrote teeth staining with enamel loss. Nineteen out of 74 did not answer this question.

Figure 13: Anterior Cross-bite

6.1.3.10. Image 10: Dental Erosion

Only eight participants out of 74 (10.8%) were aware of this condition, with three correctly diagnosing dental erosion. Another three called it wearing-away of teeth with exposed roots and two of the eight accurately identifying it as teeth wear from acids. Of all 74 participants, 12 considered to generate a referral and only three recommended a dental visit for advice. More than half the participants 45 (60.8%) mistakenly diagnosed this oral condition, with 15 recommending a dental referral. A range of incorrect diagnoses was reported by 45 of the respondents. These included: dental decay (16), teeth grinding secondary to anxiety (10), underdeveloped teeth (8), and short /small teeth (4). Additionally, three either called the condition gum disease or malocclusion as a part of syndrome. This condition had the highest number of blank answers - 21 out of 74.

Figure 14: Dental Erosion

6.1.3.11. Image 11: Anterior Open bite

Only five out of 74 (6.8%) were able to correctly recognise that this child has an incorrect bite. They explained the cause of such an abnormal bite to be either due to dummy use reported by three of the 5 or due to a thumb sucking habit noted by two. Forty-nine 74 (66.2%) were unable to identify the oral problem in this photo. However, nine considered referring such patient to a dentist and six suggested a dental visit for advice. Incorrect diagnoses including overcrowding, underdeveloped

bottom teeth and incomplete eruption of adult teeth were reported by nine participants for each diagnosis. Almost a quarter of respondents,12 out of 49 described the condition as retained upper primary incisors/upper milk teeth, four labelled it as dental decay. Three described it as yellow small bottom front teeth and two enlarged maxilla. Surprisingly, five out of 49 did not acknowledge any abnormality and described it as normal growing of adult teeth. Twenty out of 74 did not answer this question.

Figure 15: Anterior Open Bite

6.1.3.12. Summary of the findings of all Oral conditions

The most common correctly identified oral condition identified by 85% of the trainees was dental caries. This was followed by dental trauma to the permanent upper central incisors with almost 69%, and gingivitis 67%. More than half of participants were able to provide an appropriate description of the following conditions: dental trauma to the upper left primary central incisor (60.8%), ectodermal dysplasia (54%) and anterior cross bite (51.3%). More than one third of respondents (35%) were able to report the correct diagnosis of a dental abscess. The second least accurate diagnosis was dental erosion (10.8%) followed by anterior open bite (96.7%). Unexpectedly only 5% were able to identify primary herpetic gingivostomatitis. None of the participants were able to recognise hypomineralisation.

Table 4: Summary of Oral condition questions

Oral Condition	Blank		Correct		Incorrect		Partially Correct	
	%	N	%	N	%	N	%	N
(1)Caries and erosion	5.41%	4	85.14%	63	9.46%	7		
(2)Trauma upper primary central incisor	13.51%	10	60.81%	45	25.68%	19		
(3)Ectodermal dysplasia	22.97%	17	54.05%	40	22.97%	17		
(4)Gingivitis	10.81%	8	67.57%	50	21.62%	16		
(5)Primary herpetic gingivostomatitis	18.92%	14	5.41%	4	75.68%	56		
(6)Trauma UR1 and UL1	13.51%	10	68.92%	51	17.57%	13		
(7)Dental abscess	20.27%	15	35.14%	26	44.59%	33		
(8)Hypomineralisation	14.86%	11	0.00%	0	54.05%	40	31.08%	23
(9)Anterior cross bite	25.68%	19	51.35%	38	22.97%	17		
(10)Dental erosion	28.38%	21	10.80%	8	60.81%	45		
(11)Anterior open bite	27.03%	20	6.76%	5	66.22%	49		

6.1.4. Section IV-Oral health advice and suggestions

This section included seven questions, five of which were questions with regards to oral health advice for children. One question investigated the difficulty of accessing dentists in Yorkshire and the Humber and one question explored the respondents' willingness to receive up-to-date education and knowledge on child oral health and how they would like this knowledge to be delivered.

6.1.4.1. Question One: What are the main risk factors for dental decay in children?

Almost all participants provided some appropriate answers for this question - 73 out of 74 (98.6%). Only one participant left this question with no answer. More than one third, 25 out of 73 (34.2%) reported that a diet high in sugar, fizzy drinks and poor oral hygiene with poor tooth brushing are the main risk factors for dental decay. Twenty out of 73 (27.4 %) were more comprehensive as they added low socioeconomic status and deprivation as other risk factors along with the factors above. Thirteen (17.8%) and 12 (16.4%) out of 73 focused either on poor dietary habits including: high sugary food, fizzy drinks or prolonged bottle feeding. A minority of three (4.1%) reported that child neglect, medical/ developmental disabilities, as well as lack dental care access would be some of the contributing factors for dental caries, in addition to poor oral hygiene and a high sugary/acidic diet. Nothing was documented with regards to the frequency of having sugary and acidic snacks.

6.1.4.2. Question Two: What preventive advice to give parents/carers to keep their children's teeth healthy?

All of the 74 participants reported that they do provide some preventive oral health care advice for parents/carers to keep their children's teeth healthy. A range of appropriate advice

was reported including the following: 21 (28.4%) recommended to reduce sugar intake, brush teeth twice daily using fluoridated tooth paste and maintain regular dental visits;19 (25.7%) advised to decrease the amount of sugary food and maintain regular tooth brushing twice daily using FTP; 14 (18.9%) emphasised the habits of regular tooth brushing using fluoridated toothpaste and frequent dental follow up visits; 12 (16.2%) considered that all children need to maintain tooth brushing twice daily using FTP. Additionally, several other recommendations were suggested by two participants each (2.7%). Those involved: avoiding fizzy drinks, reducing sugar intake along with maintaining constant tooth brushing and stopping bottle feeding after age one year, lessening the sugar in diet together with regular tooth brushing twice daily and ensure that it is performed 30 minutes after eating, reduc ing sugar intake and keep up regular tooth brushing with emphasising the use of F- containing toothpaste instead of F- free ones for pre-school age children.

6.1.4.3. Question Three: When to recommend child's first dental visit?

The majority of trainees, 71 out of 74 (95.9%), answered this question appropriately. More than half, 38 out of 71 (53.5%) were aware that the first dental check visit should start as soon as the first tooth appears in child's mouth and six (8.5%) suggested this first dental review to be undertaken at age 6 months. Seventeen out of 71 (23.9%) stated that the first dental visit should take place when the child is 12 months old. On the other hand, five (7.0%) recommended that children can start seeing their dentist when they are a bit older. They thought that the best time for such visit would be when the child is 2 or 3 years of age. Three participants did not answer this question.

6.1.4.4. Question Four: What advice to give parents/carers regarding the use of fluoride toothpaste for their child?

The vast majority of participants 72 out of 74 (97.3%) reported that they provide some advice with regards to use of fluoride toothpaste and two declared that they don't give any advice on this matter. A large number 64 out of 74 (88.9%) said that they encourage parents/carers to use fluoridated toothpaste for their children without any further instructions. While two

recommended to use fluoridated toothpaste in a small amount (pea size) taking into consideration to choose child age-appropriate toothpaste and also to ensure that the child should spit without rinsing afterward with care not to swallow. Some trainees provide inaccurate advice of avoiding the use of fluoridated tooth paste for pre-school aged children and two (2.8%) discouraged the use of fluoride toothpaste before the age of one year. Another two (2.8%) advised to avoid fluoride toothpaste before age three years and one if the child is less than two years of age. One reported inappropriate answer was to use fluoride toothpaste only in areas with no fluoridated water supply.

6.1.4.5. Question Five: What advice to give parents/carers about feeding bottles in relation to oral health?

More than half the participants 50 out of 74 (67.6%) reported that they deliver some advice about bottle feeding. However, 20 out of 74(27%) stated that they do not provide any advice about feeding bottles. Four participants left this question with no answer. The most common advice documented by 24 out of 50 (48%) was to stop bottle feeding at the age of one year as well as to encourage the use of a free flow cup from the age of 6 months. Two out of 50 (4%), provided even more comprehensive advice to stop bottle feeding at age one along with avoiding the bottle at bed-time and avoiding sugary drinks in the bottle. A further six of 50 trainees (12%) recorded the following advice: do not add sugary drinks or juices to a feeding bottle; avoid bottle feeding during sleep time and clean your child's oral cavity with a wet cloth after each episode of bottle feeding. Four (8%) said that they provide advice with regards to bottle hygiene and sterilisation and two (4%) recommended that bottle feeding should be stopped at the age of two years.

6.1.4.6. Question Six: Comments about the difficulty to find a dentist

Over half of participants answered this question- 48 out of 74(64.9%). Forty three of the 48 (89.6%) reported that it is difficult for their patients to find a dentist. Three (6.3%) stated that when families are not yet registered and ask for help, they are signposted to the NHS website. Only two participants (4.2%) assumed that it is easy; but almost one third 22 out of all the 74

participants (29.7%) said that they have no idea whether it is easy or difficult for their patients to find a dentist. However, two said that they never ask about dentists due to time limitations and four left this question unanswered.

6.1.4.7. Question Seven: Suggestions for the most preferable ways to receive oral health information

The majority of participants 69 (93.2%) seemed highly motivated to increase their knowledge of children's oral health. They proposed a range of suggestions through which they could receive education on child oral health. The most common approach noted by 30 participants out of 69 who answered the question (43.5%) was to have regular teaching including: lectures, teaching days and sessions during their postgraduate paediatric training. They also commented that the best place to include oral health teaching was for it to be included in the Specialty Training Paediatric Programme (STEPP). More than quarter of the participants (27.5%) recommended that oral health education should be included in both undergraduate (Medical School) and postgraduate (STEPP & Diploma) teaching. Furthermore, four (5.8%) suggested to have regional training in the STEPP programme and four suggested initiating online resources including websites, applications and/or YouTube videos which provide oral health teaching with photos. Three (4.3%) thought that providing leaflets with oral health information in assessment units would be helpful and two suggested having observation sessions at a paediatric dental clinic as part of their paediatric training programme as well as having grand round teaching sessions on child oral health during their training programmes in local hospitals. Two also suggested to have an electronic learning module on oral health with lectures including photos and videos. The following suggestions were made by one participant in each case: to include such education in the undergraduate curriculum along with general practice (GP) training programmes and to have regular group discussions. One participant thought that it is the responsibility of the general practitioner to provide families with oral health care advice. One trainee did not propose a specific suggestion in particular but said, "*anything better than nothing*". Four did not make any suggestions.

Table 5: Oral health advice questions

(1)What do you believe are the main risk factors for dental decay in children	**%**	**N**
Blank	1.4%	1
Not answered	0.0%	0
Answered	98.6%	73
Diet high sugar +fizzy drinks/ poor OH &TB.	34.2%	25
Diet high sugar and fizzy drinks/ Low socioeconomic status including lack of education& deprivation / poor OH&TB.	27.4%	20
Poor diet habits; high sugary diet and fizzy drinks.	17.8%	13
High sugary diet & prolonged bottle feeding	16.4%	12
Poor oral hygiene/ high sugar in diet and fizzy drinks/ no access to dental care/ neglect/developmental conditions and disabilities.	4.1%	3
(2) What preventive advice you give parents to keep their childrens' teeth healthy?		
Blank	0.0%	0
Not answered	0.0%	0
Answered	100%	74
Reduce sugar intake, TB twice use FTP, maintain regular dental visit	28.4%	21
FTB twice daily	16.2%	12
Reduce sugar intake/regular TB/Never use F- free TP for pre-school age Children.	2.7%	2
Reduce sugar intake/regular TB/TB undertaken 30 min after you eat.	2.7%	2

Regular FTB & maintain regular dental visit.	18.9%	14
Avoid fizzy drinks	2.7%	2
Reduce sugar intake/regular TB/no bottle feeding after age 1 yr.	2.7%	2
Reduce sugar intake/regular TB twice daily using FTP.	25.7%	19
(3) When is it recommended that children should have their first dental check?		
Blank	4.1%	3
Not answered	0.0%	0
Answered	95.9%	31
ASA 1st tooth appear /come through	53.5%	38
Age6 m	8.5%	6
Age12 m	23.9%	17
Age2 yrs	7.0%	5
Age3 yrs	7.0%	5
(4) What advice you give parents about using FTP for their child ?		
Blank	0.0%	0
I don’t provide any advice	2.7%	2
Answered	97.3%	72
Advice to use FTP	88.9%	64
To be used in small amount (pea sized) spit not rinse and not swallow/use child age appropriate FTP.	2.8%	2
Avoid using before age1	2.8%	2
Avoid using before age3	2.8%	2
Avoid using before age2	1.4%	1
Use only in area with no F water	1.4%	1

(5) Do you give any advice about feeding bottles in relation to oral health?		
Blank	5.4%	4
No, I don't provide any advice	27.0%	20
Yes	67.6%	50
Stop use at age1yr / no added sugar / not to use at sleep time.	4.0%	2
No added sugar/juice	12.0%	6
Stop at age 2	4.0%	2
No sugar & No during sleep	12.0%	6
Stop age 1 or ASA &encourage use free flow cup from 6m.	48.0%	24
Clean mouth/teeth with wet cloth after eating.	12.0%	6
Bottle hygiene/sterilise and clean properly	8.0%	4
(6) Do you have any comments about how easy or difficult it is for your patients to find a dentist?		
Blank	5.4%	4
No	29.7%	22
Yes	64.9%	48
Difficult	89.6%	43
when family ask for help; signpost to NHS website.	6.3%	3
Easy	4.2%	2
(7) Do you have any suggestions for the most appropriate ways OH information can be delivered to trainees and paediatricians?		
Blank	5.4%	4
No	1.4%	1
Yes	93.2%	69

Regular Lectures, teaching days, sessions during PG/STEPP training like today very useful.	43.5%	30
Both UG (Med Sch) +PG (STEPP & Diploma with teaching & training on OH).	27.5%	19
Grand Round teaching sessions during training program in local hospitals.	2.9%	2
Regional training in STEPP Program.	5.8%	4
UG (medical school).	1.4%	1
Leaflets available in assessment units.	4.3%	3
Electronic learning module on O.H with lectures including photos and videos.	2.9%	2
Online teaching on O.H including photos and videos (websites/Applications/ YouTube).	5.8%	4
Observe at paediatric dental clinic as part of training.	2.9%	2
Group discussion.	1.4%	1
GP should provide families with O.H care advice.	1.4%	1

6.1.5. Summary of the findings from the two consultants

As described earlier, two consultant paediatricians also answered this questionnaire. After analysing their answers separately, it was found that their answers were very similar to data collected from the trainees. Despite the longer professional experience, both self- assessed their level of knowledge on child oral health to be fair or poor. Moreover, both participants admitted that oral examination is not provided routinely to all their paediatric patients. Trauma to a primary tooth (Figure 2) and anterior cross bite (Figure 9) were correctly identified by both consultants, and both acknowledged the unusual peg shaped teeth in Figure 3. However, neither were able to diagnose any of the medical conditions shown in Figure 3 (ectodermal dysplasia) or Figure 5 (primary herpetic gingivostomatitis). Although most oral conditions were incorrectly diagnosed by both consultants, they did consider referral to either a dental hospital or the community dental service in all cases. With regards to the oral health advice questions, they demonstrated quite good knowledge with regards to preventive oral health care advice and bottle feeding in relation to oral health. One consultant was not aware about the best time for a child's first dental attendance. Both agreed that it is hard to find an NHS dentist. Both consultants thought there should be oral health education in both the undergraduate and postgraduate curriculum and they would advocate to implement this in the postgraduate Diploma and the Specialty Training Paediatric Programme (STEPP). There was no qualitative analysis preformed for consultant paediatricians' responses as they were only two participants with limited data.

6.2. Qualitative Results

6.2.1. Coding Process of Conventional Content Analysis

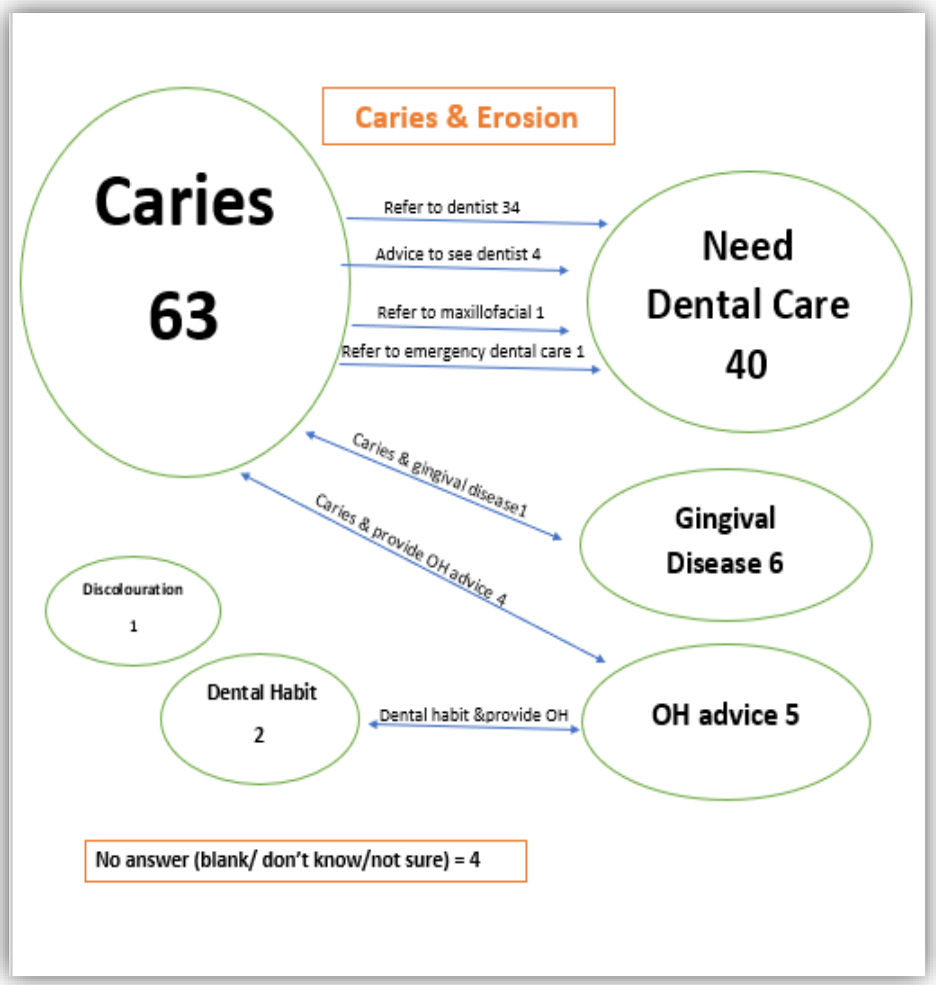
The elements identified in this Conventional Content Analysis were the codes and categories running throughout trainees' responses . These codes were developed based on trainees' responses to the open-ended questions in section III and section IV of the questionnaire. As coding progressed, the key results of the analysis of trainees' responses of section III and IV organised in a spider diagram. Each spider diagram demonstrates the main categories of each question. A number shown underneath each category illustrates the frequency of each category occurred for each question. All elicited types of information were linked together.

The qualitative results highlight the most significant information that were apparent from the participant responses. Examples of codes and categories process that was used for the conventional content analysis are shown in Table 6,7,8,9,10,11,12 and 13. Spider diagrams that were developed for those key information are shown in Figure 16,17.18.19,20,21and 22.

Table 6 :Example of Coding and Categories of the first question of section III of the questionnaire (Early Childhood Caries and Erosion).

Number of participants	Meaning units condensation (Participants' answers)	Codes	Categories
	Oral Condition1 (caries and erosion)		
P1	decay in all 4 incisors/poor gum health/the top 2 layers; enamel& dentine appear to be completely gone	• Caries	• Caries
P2	dental caries possible due to sugar intake/ref to D	• Caries • Referral	• Caries • Need dental care
P3	dental caries /should ask about pain, sleep &last dental visit	• Caries • Ask for associated symptoms	• Caries
P4	dental caries /ref to D or Advice to see D	• Caries • Referral	• Caries • Need dental care
P5	severe caries/Analgesics if needed/Ref to D	• Severe caries • Referral	• Caries • Need dental care
P6	dental caries /Ref to D	• Caries • Referral	• Caries • Need dental care
P7	dental caries /Ref to D	• Caries • Referral	• Caries • Need dental care
P8	gum disease, plaque, small teeth	• Gum disease	• Gingival disease

Figure 16: Spider Diagram of the first question of section III of the questionnaire (Early Childhood Caries and Erosion).

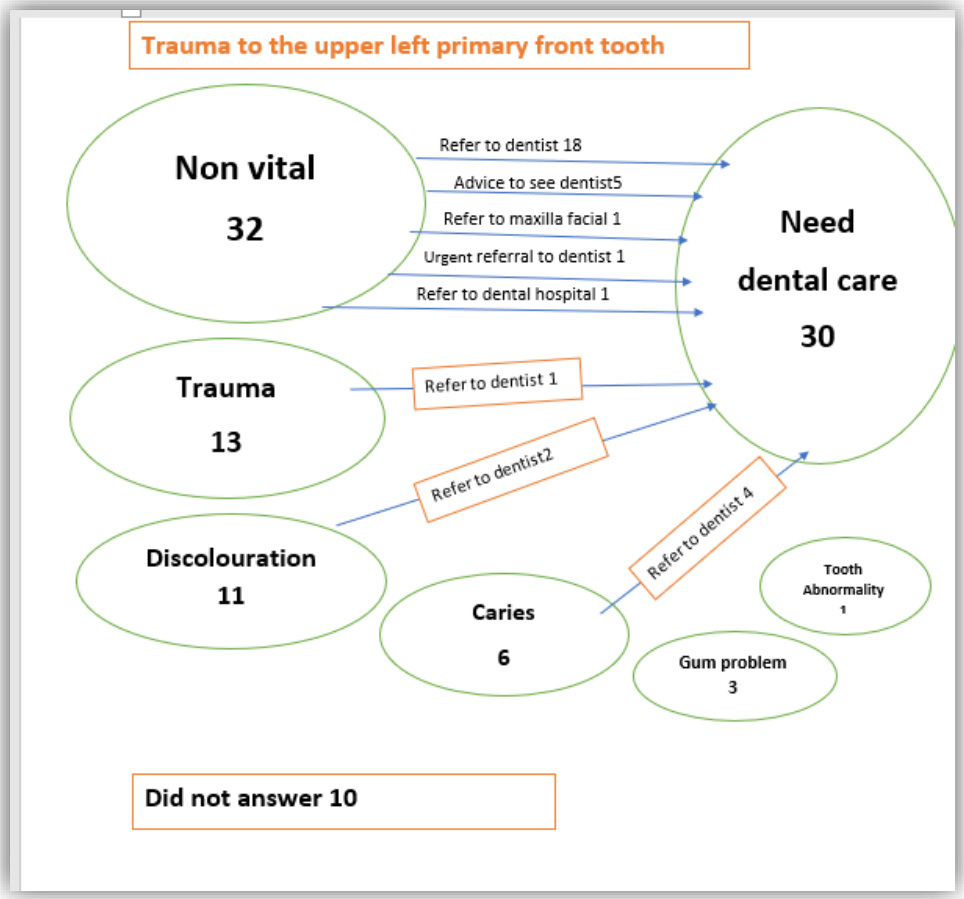


As was shown by the quantitative results, the majority of participants did recognise that this child has dental caries. And more than half would refer the child to a dental care service.

Table 7: Example of Coding and Categories of the second question of section III of the questionnaire (Trauma of the upper left primary central incisor).

Number of participants	Meaning units (Participants' answers)	Codes	Categories
	Condition 2 (trauma primary front tooth)		
P1	following injury that affected the blood supply of upper left incisor	• Trauma	• Trauma
P2	injury to milk tooth/ref to D/ as pt less than 7 yrs ; reassurance when permanent tooth grows will be normal	• Trauma &refer	• Trauma • Need Dental Care
P3	staining -black discoloured tooth /should ask about pain, sleep &last dental visit	• Discoloured tooth &seek other symptoms	• Discolouration
P4	tooth necrosis/Advice to see D	• Non vital& recommend dental advice	• Non vital • Need Dental Care
P5	Dead tooth, nothing needs to be done as baby tooth (unless pain)	• Non vital	• Non vital
P6	problem in tooth root no blood supply, dead tooth/Ref to Maxillo-facial	• Non vital& refer	• Non vital • Need Dental Care
P7	dead tooth/Ref to D	• Non vital& refer	• Non vital • Need Dental Care

Figure 17: Spider Diagram of the second question of section III of the questionnaire (Trauma of the upper left primary central incisor).

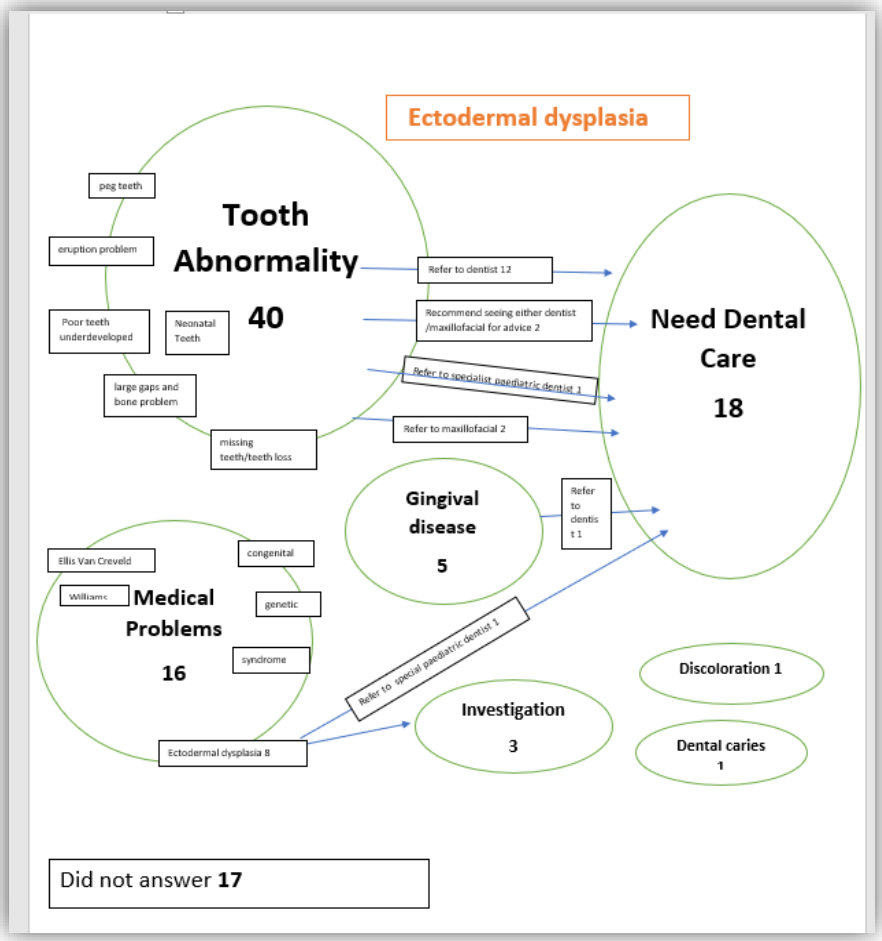


This Spider Diagram clearly highlights that a quite number of the participant recognised that this child has dental trauma and needs dental care. However, It also shows that not all of the participants would refer to the most appropriate place.

Table 8: Example of Coding and Categories of the third question of section III of the questionnaire (Ectodermal Dysplasia).

Number of participants	Meaning units (Participants' answers)	Codes	Categories
	Condition 3 (ectodermal dysplasia)		
P1	Abnormal teeth development/growth pattern possible as part of a syndrome	• Abnormal teeth development& ? syndrome	• Tooth Abnormality • Medical Problem
P2	Gaps between teeth &also teeth are not fully developed, abnormal teeth development/Ref to D or Max fax team	• Abnormal teeth development& refer	• Tooth Abnormality • Need Dental Care
P3	New-born, neonatal teeth/ask about feeding, cough	• Neonatal teeth& seek other symptoms	• Tooth Abnormality
P4	Don't know/Advice to see D	• Don't know & recommend dental advice	• Need Dental Care
P5	Poorly developed teeth and missing teeth/Ref to D	• Abnormal teeth development + missing teeth &refer	• Tooth Abnormality • Need Dental Care
P6	Unsure		
P7	peg shaped teeth possible syndrome or congenital	• Abnormal tooth shape & ?syndrome or Congenital problem	• Tooth Abnormality • Medical Problem

Figure 18: Spider Diagram of third question of section III of the questionnaire (Ectodermal Dysplasia).

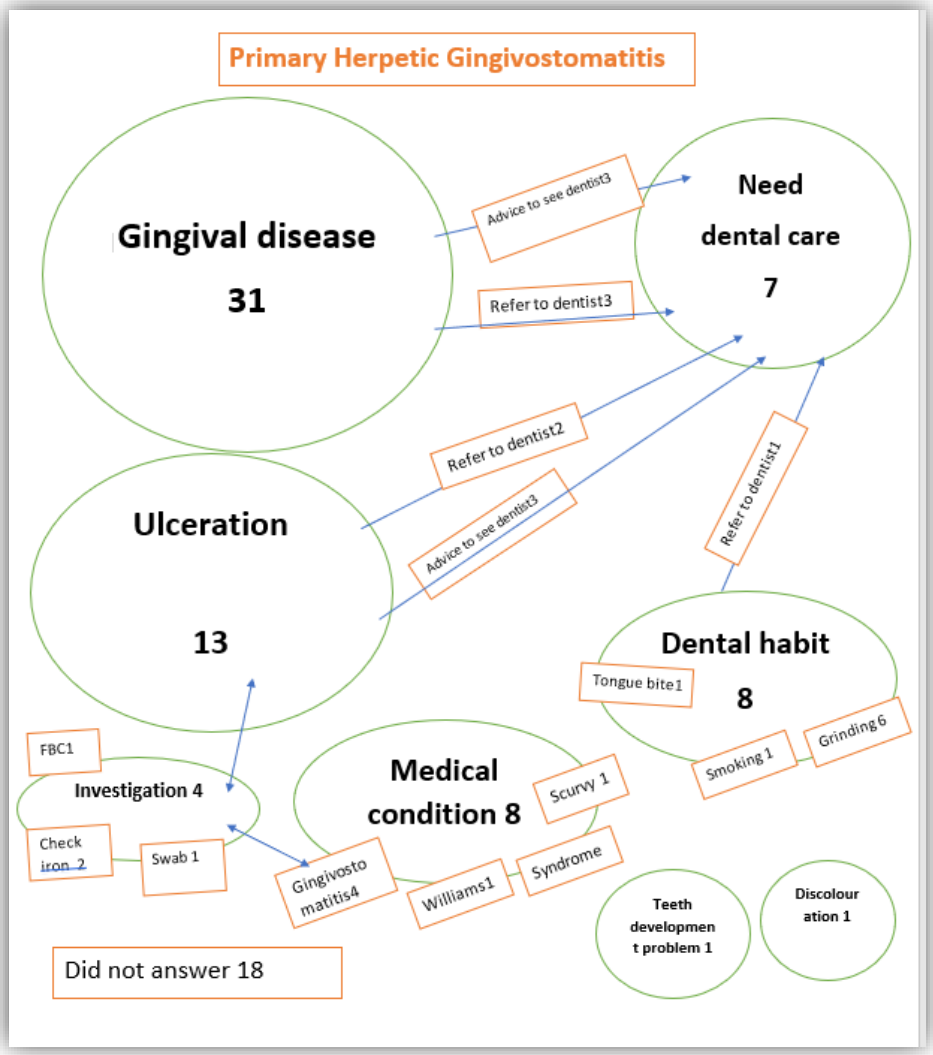


The Spider Diagram shows that although over half of the trainees recognised that this child has abnormal tooth development, non considered referral for appropriate multidisciplinary care as required.

Table 9: Coding and categories of the fifth question of section III of the questionnaire (Primary Herpetic Gingivostomatitis).

Number of participants	Meaning units (Participants' answers)	Codes	Categories
	Condition5 (primary herpetic gingivostomatitis/ HSV)		
P1	Severe gingivitis, evidence of tongue bite, teeth look small teeth	• Gingivitis, • Tongue biting • Abnormal tooth size	• Gingival disease • Dental habit • Teeth development problem
P2	Gum swelling/advice to use vit C /Ref to D	• Gum problem • Supplement advice (vit C) & refer	• Gingival disease • Need dental care
P3	Part of syndrome, staining	• Syndrome • Staining of teeth	• Discolouration • Medical condition
P4	Gum disease due to poor OH/Advice to see D	• Gingivitis & advise to see dentist	• Gingival disease • Need dental care
P5	Gum hypertrophy	• Gum problem	• Gingival disease
P6	Unsure		
P7	Gingival hyperplasia	• Gum problem	• Gingival disease

Figure 19: Spider Diagram of the fifth question of section III of the questionnaire (Primary Herpetic Gingivostomatitis).

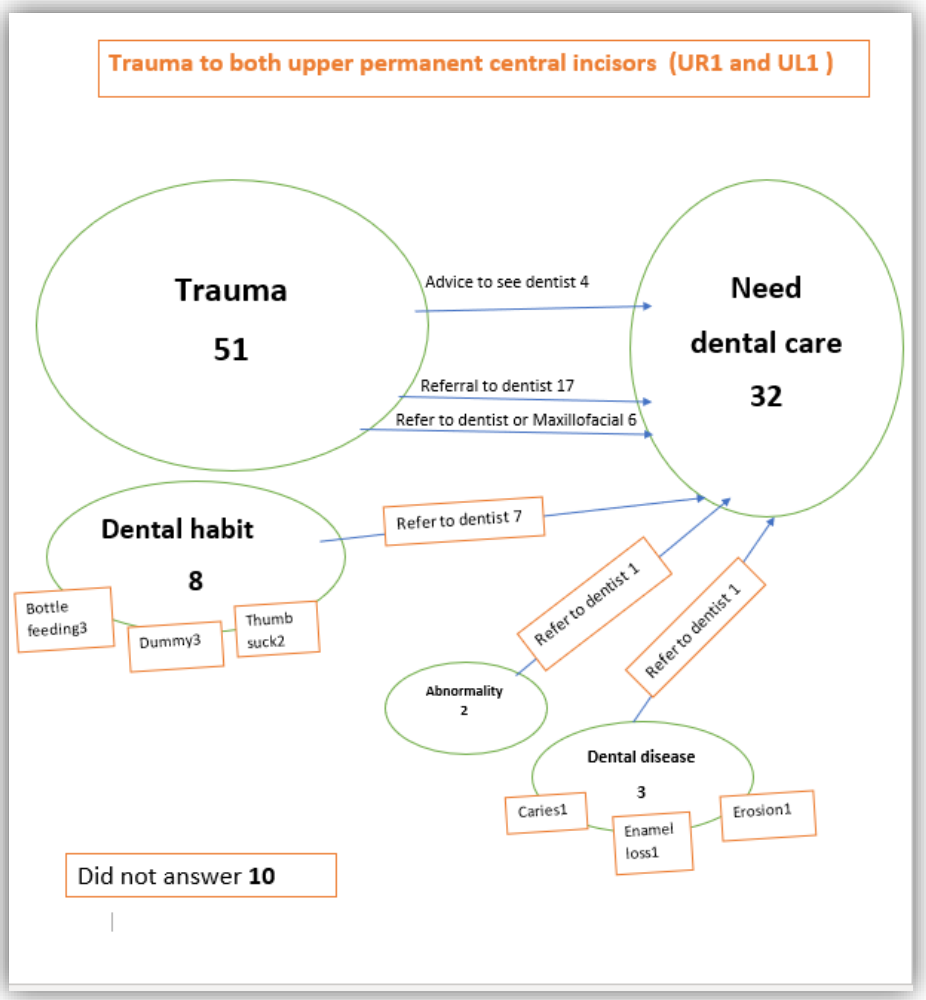


As was shown in quantitative results, this Spider Diagram highlights more clearly that this oral condition was misdiagnosed by the majority of the participants.

Table 10: Coding and categories of the sixth question of section III of the questionnaire (Trauma of upper permanent central incisors).

Number of participants	Meaning units (Participants' answers)	Codes	Categories
	Condition 6(trauma permanent /fractured UR1&UL1)		
P1	Broken teeth	• Broken tooth	• Dental Trauma
P2	Broken teeth/ref to cosmetic D	• Broken tooth • Refer to cosmetic dentist	• Dental Trauma • Need Dental Care
P3	2ry to dummy or bottle feeding/ Ref to D	• Dummy/bottle use • Refer to dentist	• Dental Habit • Need Dental Care
P4	Prolonged bottle use/Advice to see D	• Prolonged bottle use • Advise to see dentist	• Dental Habit • Need Dental Care
P5	Teeth erosion 2ry to dummy use	• Tooth erosion (dummy use)	• Dental Habit
P6	Chipped teeth	• Broken tooth	• Dental Trauma
P7	Chipped teeth 2ry to trauma/Advice to see dentist	• Broken tooth (trauma) • Advise see dentist	• Dental Trauma • Need Dental Care
P8	Areas of whiteness and unusual shape of front teeth	• Abnormal tooth shape • Abnormal tooth colour	• Abnormality

Figure 20: Spider Diagram of the sixth question of section III of the questionnaire (Trauma of upper permanent central incisors).



The Spider Diagram illustrates that despite the fact that a large number of participants identified dental trauma , not all thought of the significance of this and the urgent need of dental intervention.

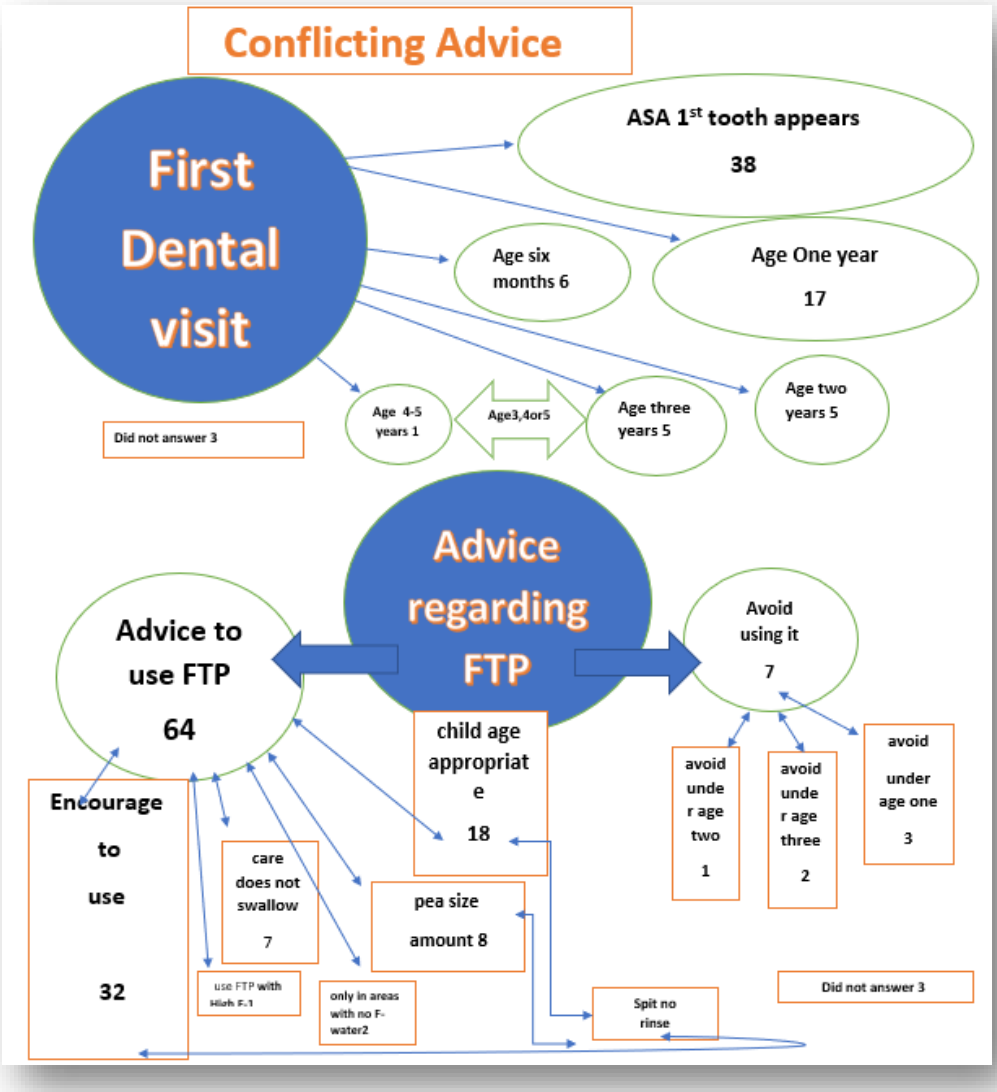
Table 11: Coding and categories of the third question of section IV of the questionnaire (When is it recommended for the child to have the first dental visit).

Number of participants	Meaning units (Participants' answers)	Codes	Categories
	When is it recommend that children should have their first dental check?		
P1	ASA 1st tooth appears	• Once 1st tooth appears	• ASA1st tooth appear
P2	ASA 1st tooth appears	• Once 1st tooth appears	• ASA1st tooth appear
P3	ASA 1st tooth appears	• Once 1st tooth appears	• ASA1st tooth appear
P4	6 months	• 6 m	• Age 6 m
P5	once 1st tooth erupts	• Once 1st tooth appears	• ASA1st tooth appear
P6	Once 1st tooth erupts	• Once 1st tooth appears	• ASA1st tooth appear
P7	unsure		
P8	Once 1st tooth erupts	• Once 1st tooth appears	• ASA1st tooth appear

Table 12: Coding and categories of the fourth question of section IV of the questionnaire (Advice regarding the use of fluoridated toothpaste).

Number of participants	Meaning units (Participants' answers)	Codes	Categories
	What advice you give parents about using FTP for their child?		
P1	use pea size amount of normal adult TP /spit not rinse	• Pea size adult TP & spit not rinse	• Advice to use it
P2	Encourage use FTP	• Encourage use FTP	• Advice to use it
P3	To buy child age-appropriate Fluoridated TP	• Child age-appropriate FTP	• Advice to use it
P4	choose child age-appropriate TP	• Child age-appropriate TP	• Advice to use it
P5	follow instruction on TP tube/don't swallow TP	• Use with care not swallow	• Advice to use it
P6	Don't swallow it, if unable use no/or low FTP	• Use with care not swallow	• Advice to use it
P7	I will advise them to read the label on tube (age appropriate) or speak to their dentist	• Child age-appropriate FTP& Advice to check with their dentist.	• Advice to use it

Figure 21: Spider Diagram of the third and fourth questions of section IV of the questionnaire (Conflicting Advice/Messages).

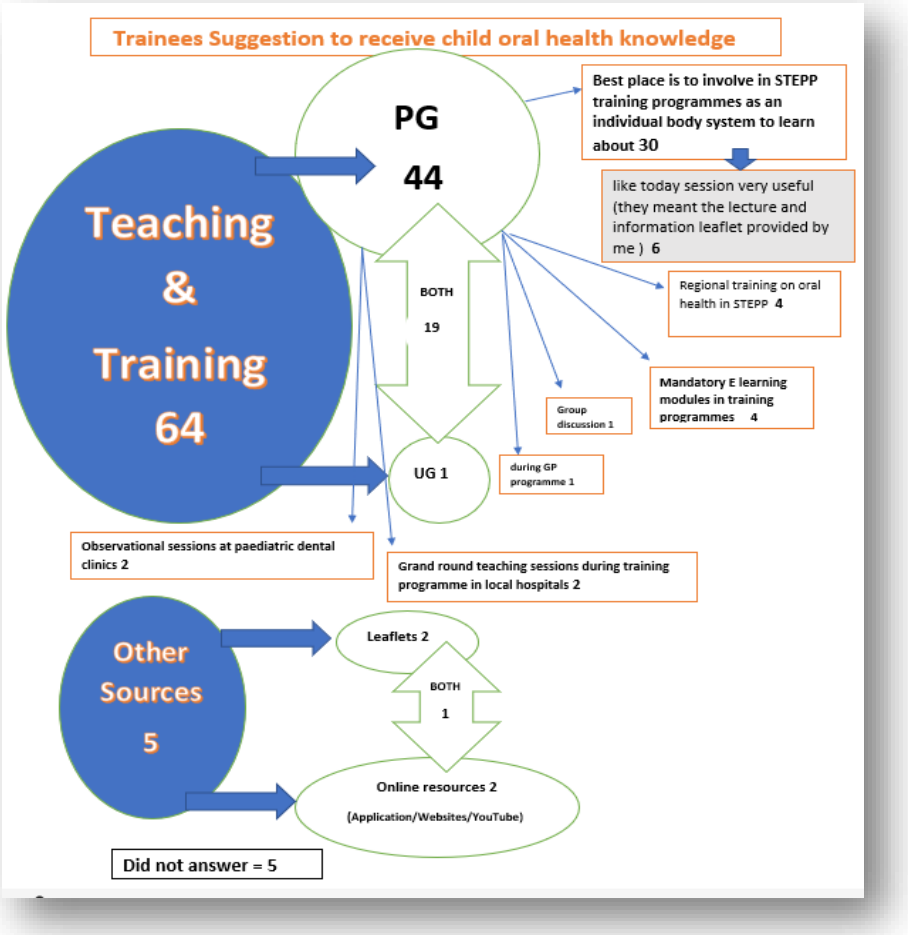


The two Spider Diagrams clearly illustrate the inconsistent preventive oral health advice suggested by trainees to child's parents/carers.

Table 13: Coding and Categories of the last question of section IV of the questionnaire (Trainees Suggestions).

Number of participants	Meaning units (Participants' answers)	Codes	Categories
	Do have any suggestions for the most appropriate ways OH information can be delivered to trainees & paediatricians?		
P1	Make it part of teaching in medical school & PG training programmes especially peads +GP training	• Include OH teaching& training in UG (Med Sch)+PG (STEPP) + GP training programmes	• Teaching and Training
P2	Should be included in Paeds training programme STEPP 1-5 levels/ Provide regular updates teaching sessions on dental health information	• Include up to date DH teaching in all (STEPP) programme levels	• Teaching and Training
P3	included in Paeds training programme STEPP /Part of induction/Department teaching in community paediatrics/Teaching sessions every 6 months in acute paeds department as we rotate 6/12	• Include OH teaching sessions in (STEPP) programme and in Acute Paeds Department	• Teaching and Training
P4	Included in STEPP training program ST1-3 Levels as expected to examine teeth for children	• Include OH teaching in (STEPP Level 1,2,3) programme	• Teaching and Training

Figure 22: Spider Diagram of the last question of section IV of the questionnaire (Trainees Suggestions).



The Spider Diagram clearly reflects how the majority of participants are highly motivated to learn about child oral health. It also highlites the different prefered options proposed by them to receive knowledge about child oral health.

6.2.2. Summary of the qualitative findings

The results of this study revealed that participants knowledge about common oral conditions in children and their appropriate management need improvement.

Large number of respondents were unable to identify some of the oral problems:

"Don't know" , "Not sure", "Unsure"

Moreover, few participants were not aware of the potential risk associated to some oral conditions as shown in Figure 6 (Trauma of primary front tooth) :

"Nothing Need to be done as baby tooth"

"Leave it as it is a milk tooth"

"Patient is less than 7-year-oldvso reassurance when permanent tooth grows will be normal"

In addition, a quite number of respondents identified the correct diagnosis, but, referred it to other irrelevant medical conditions as shown in Figure 7 (ectodermal dysplasia) :

"peg shaped teeth possible as part of syndrome"

"genetic malformation check family history"

"congenital abnormality"

"peg shaped teeth as part of syndrome (Williams)"

"gum pathology as part of a syndrome"

"syndromic peg shaped poor developed teeth"

"peg shaped teeth as part of syndrome Ellis Van Creveld"

Unexpectedly, only two trainees acknowledged the primary herpetic gingivostomatitis (Figure 9). Most participants identified the ulceration and inflammation associated with this condition, however, they incorrectly linked it to one of many gingival diseases :

"bleeding gums 2ry vit C deficiency", "gum hypertrophy", "ulcer/blister", "gingivitis" "gingival hyperplasia" , "gum inflammation"

or referred it to other medical conditions as : *"Scurvy"* or part of a syndrome :*" William's syndrome"*

Furthermore, few referred it to several dental habits like smoking, teeth grinding and tongue biting:

"Abnormal tooth size due to tongue biting" , "Smoker" , "Ulcer and teeth grinding"

In addition to this, some participants did not acknowledge any abnormality as in the case of anterior open bite (Figure15) and described it as normal growing of adult teeth:

"Adult teeth growing" , "Eruption of adult teeth" , "New teeth growing"

Also, a quiet number of participants reported that they lack education and training on child oral health :

"Please don't underestimate how little we know about oral health-we know very little"

"I don't have very much knowledge at oral health"

"Don't think I have had formal teaching on child oral health"

"No formal teaching"

"Never had any training"

"I don't think I have ever had any training"

This research highlighted lack of time as a contributing factor preventing trainees to implement oral health care and advice at their practice. Some participants reported that they don't give any oral health advice in relation to feeding bottles, of which, two explained that this was due to lack of time :

"No I don't as we don't have time"

"No I don't as we don't have time for all this in our consultation visit"

The same comment was made by another couple respondents in the question about accessing NHS dentist by their patients' parents/carers:

"No idea, never asked due to lack of time"

"Never asked due to lack of time"

In addition, there were several verbal comments during the questionnaire and power point presentation complaining of time pressure during the child assessment visit. They expressed their willingness to check children's mouths by lifting the upper lip and looking at the teeth as part of child general assessment and discuss with families,if time allowed.

Moreover, trainees' knowledge regarding oral health questions in section IV of the questionnaire was variable. Some respondents reported oral health advice that differ from what is recommended by the up-to-date evidence-based guidance. These involved advice about child first dental visit :

"At age two" , "At age three" , "At school age in reception year", "At school age4-5"

And advice about the use of fluoride toothpaste for children :

"Avoid under age 1" , "Avoid under age 2" , "Avoid under age 3" , "Avoid it "

Nevertheless, results of this research showed that the vast majority of participants were highly motivated to learn about child oral health. It also highlited the different prefered options proposed by them to receive knowledge about child oral health in future :

"Make it part of teaching in medical school& PG training programmes specially paeds+GPtraining"

"Application & websites"

"E lectures"

"Online modules&lectures"

"Include in STEPP programme ST1-3 levels as expected to examine teeth for children"

"Incorporate in normal teaching methods"

"Integrated part of STEPP days& PG diploma"

"Teaching sessions with appropriate training on oral health assessment"

"Any way better than noway"

"Small groups teaching as part of sructured training programme"

"To have regular teaching lectures at least once a year"

"Mandatory teaching in medical school"

"Leaflets,Websites,Youtube"

"Leaflets available at assessment units"

"E- lectures with photos and videos"

"E- learning modules"

"To do local training in hospitals"

"teaching sessions as part of grand round teaching"

"Opprtunity to visit & observe at paeds dental clinics"

In addition to this, some trainees expreseed their appreciation for the information about child oral health provided in this research project and recommended the same approach to deliver oral health education in future :

"*Teaching sessions in paediatric training programme like today*"

"*To have teaching sessions like this is useful* "

"*Good to have regular teaching like that*"

"*Teaching days Like this session in STEPP/PG Diploma*"

"*Like this very useful (lecture and presentation)"*

"*To do like what you did today*"

7. Discussion

7.1. Discussion and Critique the Methodology

7.1.1. Questionnaire Design

The questionnaire design of this study is novel and aimed to serve more than one purpose. As mentioned earlier in the methodology chapter, it was not only a baseline questionnaire to assess paediatricians' knowledge on child oral health, but also was designed to act as an education opportunity at the same time. Participants had 3 opportunities to look at the selected oral conditions of children (Appendix 4,5 and 7) with two of the opportunities giving them all the appropriate information related to child oral health and common oral conditions in children (Appendix 5 and 7). It evident in the literature that for understanding information it is essential how such information is administered (Gao et al., 2018) . In addition, the approach of delivering information can help to transform such information into permanent knowledge (Gao et al., 2018) . Gaining, understanding and remembering knowledge require several opportunities to see the information presented in different ways(Gao et al., 2018).

The unique approach of the present study allowed for representation, storing and sharing information about child oral health which are the major key stages for knowledge management process (Gao et al., 2018). As explained in the methodology chapter, participants had the opportunity to ask questions and discuss answers they had provided in

the questionnaire(Appendix4) and while the follow up power point presentation was provided (Appendix 7).This was presented immediately after they had completed their questionnaire (Appendix4) and at the same time thy received a copy of the questionnaire/presentation (Appendix 5) which involved the appropriate answers to the questions on the child oral conditions. This contributed in enhancing the interaction and communication with participants while the presentation (Appendix 7) was carried out. Moreover, the information handout(Appendix 5) involved

a link https://www.youtube.com/watch?v=xQFXXLq4z04 to a recorded video of the same power point presentation(Appendix7). This link can be accessed for watching and /or sharing by participants and/or their colleagues if they are interested in improving their knowledge on child oral health (Mohammad.S, 2020).Furthermore, the information handout (Appendix5) also contained some useful up-to-date online resources of child preventive oral health care and advice. The present study findings revealed that this study approach was preferred by the participants for implementation in future (question 7 ,sec IV of the questionnaire), where they were asked to propose suggestions of preferable ways to receive information on child oral health in the future.

7.1.2. Bias in Questionnaire

As it is evident in the literature, surveys results are typically subjected to some errors/biases (Kabir, 2016).This is particularly accompanied with internet-based survey designs (Kabir, 2016). However, the special approach of delivering the questionnaire in this study played a crucial role in reducing the non-response bias (failure to obtain complete data from all selected individuals) which subsequently enhances the robustness and strength of the study. Furthermore, this questionnaire was piloted twice , one of which was with the same targeted sample recruited in this study. This step was performed to ensure that the questionnaire language and the pictures of child oral conditions which included within the questionnaire were clear and understandable by participants. Such process contributed to minimise the measurement error ,which occur when respondents misunderstand a question, or find it difficult to answer due to lack clearness (Kabir, 2016). Moreover, this study was different to many other questionnaire

designs found in the literature which include dichotomous type of questions (yes/no - agree/disagree types) which is likely to raise the potential of surrogate information error by unintentionally leading participants to particular answers desired by the researcher (Kabir, 2016). The present study questionnaire design included open ended questions which gave participants the opportunity to provide more realistic responses and to show their own perspectives on the topics. This is believed to have improved the possibilities of having more reliable results.

7.1.3. Follow up Questionnaire

Although, it was planned to have a follow up qualitative focus group interviews with paediatricians to explore if their experiences of diagnosing and managing oral health conditions in their child patients had changed after they completed the baseline questionnaire (Appendix 4), attended the power point presentation (Appendix 7) and received the information hand out on child oral health (Appendix 5), It would have been useful if the lead researcher (SM) considered to provide participants with a follow up quantitative questionnaire at the end of each meeting. This can ask participants how useful and relevant to their daily practice this teaching session had been (Appendix4,5and 7) and what the most useful learning points were. This could also contribute to modify the previously developed topic guide (Appendix 6) planned to be utilised at the focus group phase of this study. However, this needed more time, and the lead researcher (SM) was allowed to have an allocated time of only 45 minutes in each meeting to deliver the baseline questionnaire (Appendix 4),with power point presentation (Appendix 7) and information hand out (Appendix 5).

7.1.4. Study Design and Data Analysis

An explanatory sequential mixed- methods design with identical sample were utilised in this research project. Each phase of quantitative and qualitative data collection and analysis

was undertaken independently. This form of study design was applied because evidence shows that quantitative and qualitative research approaches, in combination, provide a better understanding of the research issue than either research approach alone (Creswell, 2021, Creswell and Clark, 2011). Indeed, this purpose was achieved in the present study. However, focus group involving the lead researcher(SM) and paediatric trainees may have been helpful to probe in more detail to ascertain what are the barriers that prevent paediatricians from implementing oral health care and preventive advice for their paediatric patients. Moreover, it would have assisted to discover whether the presentation and information sheet they received had helped in their clinical practice. This may have led to obtain more rich data and would have raised the qualitative content analysis process to a higher level of main concepts, which subsequently would have increased the validity of the results.

7.1.5. Study Sample

In Mixed Methods Research(MMR) Collins and Onwuegbuzie have provided a useful framework which helps to identify rigorous sampling designs (Collins et al., 2007). This framework incorporates a two-dimensional mixed methods sampling model. This specifically included; the time orientation of the study quantitative and qualitative phases occur ;sequentially or concurrently, and, the relationship of the qualitative and quantitative samples (Collins et al., 2007). According to Collins and Onwuegbuzie (2007), the relationship of the qualitative and quantitative samples either can be identical, parallel, nested, or multilevel.

Identical sampling	The same participants participate in QUAL and QUANT study phases
Parallel sampling	Different samples for QUAL and QUANT study phases but participants drawn from same population
Nested sampling	A subset of the entire sample participate in an additional study
Multilevel sampling	Two or more samples recruited from different levels of the population of interest.

In this study, both quantitative and qualitative samples have been drawn from the same population, therefore, identical sampling strategy found to be the most appropriate sample design for this research. This sampling design used very frequently in mixed method studies and reported in the literature to be one of the most prevalent designs used in mixed methods researches (Collins et al., 2007).

7.2. Discussion and Critique the Results

7.2.1. Section II- Knowledge of child oral health

7.2.1.1. What do you believe your knowledge of child oral health? and where have you gained your knowledge on child oral health?

Although half of participants (50%) reported that they gain some oral health knowledge during their university education with most of them stating such education was through their undergraduate medical studies in and out the UK, the majority of trainees 66 out of 74 (89%) rated their level of knowledge on child oral health and oral conditions below average. This supports what has been found in literature among paediatricians worldwide (Aburahima et al., 2020, Alshunaiber et al., 2019, Sezer et al., 2013, Rabiei et al., 2012, Lewis et al., 2009, Prakash et al., 2006, Lewis et al., 2000) as well as in the UK (Olive et al., 2016, Kalkani and Ashley, 2013).

In the UK studies have revealed that many medical schools include no oral health teaching in their curriculum and when teaching is provided, there is wide variation in the time dedicated and methods used with regards to oral health materials compared to other subjects (McCann et al., 2005, Bater et al., 2005). In addition to this, most of the trainees in the studies agreed on lack oral health education and training in their post-graduate training programmes. Later studies of Oliver et al. and Kalkani et al. reported similar results in the UK suggesting there

had not been any improvements in the preceding decade (Olive et al., 2016, Kalkani and Ashley, 2013). Nevertheless, according to the General Medical Council (GMC), there has been no specific material or teaching courses regarding oral health and common oral conditions included in the paediatric medical training postgraduate programme curriculum (RCPCH, 2015). It appears from previous studies and our study that oral health teaching and training is limited or non-existent in medicine both at UG and PG levels in the UK.

7.2.1.2. Do you routinely examine the mouth of the patient and look at the condition of the teeth?

As demonstrated in this study from twenty-eight respondents (37.8%), oral examination of child's mouth and teeth is not regularly performed for paediatric patients in Yorkshire and The Humber region. The latest Child Dental Health Survey for England showed 12% of children aged 3 as well as 23.4% of children aged 5 have visible tooth decay. Moreover, tooth extraction because of tooth decay is reported as the most common reason for hospital admission. Almost 9 out of 10 hospital tooth extractions among children aged 0 to 5 years are due to preventable tooth decay, and tooth extraction remains the major hospital procedure in 6 to 10 year olds, which costs approximately £50 million (PublicHeallthEngland, 2019). Even with this knowledge that so many children in England have dental caries, it is of significant concern that this is not being picked up by many paediatricians who we would hope would be able to help in the early diagnosis of dental caries and support early intervention.

7.2.1.3. Where do you refer your child when you identify a need for oral health care?

Concerning the question regarding the best place for paediatricians to refer their patients who need oral health care, more than half the participants suggested referrals to the general dentist (GDP) when they identify oral or dental problems. On the other hand, only a few recommended referral to a special paediatric dentist who will be sometimes the most relevant place to refer. Our study indicates that there is a need to improve communication between paediatricians and paediatric dentists to help children get more timely referrals for complex

dental problems. This is supported by the knowledge that many children who have been looked after by paediatricians are children with specific medicalconditions and/or comorbidities (NATIONALHEALTHSERVICE, 2016). In many cases specialist paediatric consultants and dentists would provide the best dental management and care when they suffer oral problems.

The specialty of paediatric dentistry provides specialist oral healthcare for children from birth to adolescence whose needs cannot be managed by their GDP (General dental practitioner). Those include children and young people with significant oral disease, as well as patients whose oral health care is complicated by intellectual, medical, physical, social, psychological and/or emotional factors/disability. In addition, specialist care is available for children with developmental disorders of the teeth and mouth who are either too anxious or too young to accept routine dental treatment. The age range covered by the specialty is normally regarded as 0-16 years. Furthermore, paediatric dentists may also play a role in care for 'looked after children', and those for whom the local authority and their partner commissioning bodies must make arrangements for their healthcare. This may include vulnerable children with special educational needs or a disability (CommissioningStandardforDentalSpecialist, 2018). It is clear from the present study that most paediatric trainees and perhaps paediatricians are unaware of the scope of paediatric dentistry and of the improvement that children can get from early intervention for dental problems. An aspect that was not investigated in the present study is if the local area services and facilities play a role in guiding referrals. This would be important to investigate in a national study.

7.2.2. Section III Knowledge about oral conditions

In recent years there has been increased awareness that poor oral health is linked to several systemic health conditions (Dietrich et al., 2017, BritishDentalHealthFoundation1971-2016). Many systemic diseases have oral manifestations and an ability to recognise these will help with general medical diagnosis as well as management (Porter et al., 2017). Children who are medically compromised are at increased risk of developing systemic complications from dental infections, which may prove fatal (Foster H, 2005). Furthermore, some medical interventions require an oral assessment before commencement (Ryan et al., 2015).

Therefore, there is a crucial need for doctors and paediatricians to know how to identify and manage oral conditions among their patients, and also to be aware on how and where to refer to local dental services as described earlier.

7.2.2.1. Early Childhood Caries and Erosion (Figure5)

The majority of trainees identified dental caries shown in this image. However, there was no precise answer related to dental erosion which was associated with the caries. This shows the general knowledge about caries but not erosion and this will not enable them to provide appropriate oral health related advice for erosion. Some respondents provided oral health advice including toothbrushing and diet, but, with regards to diet, it was recommended by trainees to reduce the amount of sugar intake, yet not the frequency of sugar intake. This was similar to what was reported by (Hong et al., 2018). In addition to this, none of the respondents reported good information with regards to bottle feeding habits including sugary and/or acidic drinks which is more critical for helping prevent early childhood dental caries as reported by (Anil and Anand, 2017). The lack of knowledge among the trainees explains their advice which, though valuable, may not respond completely to the critical conditions of the teeth of their patients. The image of dental caries and erosion in the questionnaire showed caries in the advanced stage and a visit to the dentist very soon is highly recommended. However, none of our respondents considered urgent referral to dental care. This revealed that there is a need for more education on an up-to-date evidence-based child preventive oral health care and advice in the training programme for paediatricians.

7.2.2.2. Dental Trauma (Figures 6 and 10)

Traumatic dental injuries (TDIs) occur frequently in children and young adults comprising 5% of all injuries. A recent meta-analysis on TDIs reveals a world prevalence of 22.7% affecting the primary teeth with high frequently of repeated TDIs seen in children. Some adults 33 % experience TDIs to their permanent dentition (Peter F. Day, 2020, Liran Levin, 2020). Proper diagnosis, treatment planning and follow up care by a specialist dentist in some cases is crucial to assure a favourable outcome (Peter F. Day, 2020, Liran Levin, 2020).

Despite the fact that a large number of participants were able to identify the appropriate diagnoses in both trauma pictures (Figures 2 and 6), less than half the participants thought of dental care and advice and none considered referral to specialist paediatric dentist who can provide the appropriate management of such traumatic injuries. The low number of participants who thought of the significance of dental trauma conditions in both primary and permanent dentitions affecting the long-term survival of teeth, reflects their poor knowledge of the potential long-term consequences of traumatic dental injuries.

As already discussed, dental trauma is another area which needs to be addressed in training programmes for paediatricians.

7.2.2.3. Ectodermal Dysplasia and Primary Herpetic Gingivostomatitis (Figures 7 and 9)

Ectodermal Dysplasia and Primary Herpetic Gingivostomatitis, are systemic diseases which both have significant oral impacts. Surprisingly, quite a large number of paediatricians were unable to recognise them as possible diagnoses. Primary Herpetic Gingivostomatitis is by far more common than Ectodermal Dysplasia. However, both health conditions are associated with some oral manifestations which usually require a multidisciplinary care approach for the best outcome. The key of success for management of children with any medical condition is early diagnosis and, in some conditions such as Ectodermal Dysplasia planning for prosthetic options by multidisciplinary dental teams (MDTs) including paediatric dentistry, orthodontics and restorative dentistry together with sometimes maxillofacial/oral surgery and oral medicine (CommissioningStandardforDentalSpecialist, 2018, Chokshi A, 2015). Furthermore, dental management of children with complicated medical problems needs close links with medical paediatric specialties who should be fully aware of dentally- related issues associated with these medical conditions particularly in the hospital setting for children where dental disease either presents an increased risk to a child's general health and/or where the management of dental disease might involve specialist medical support (CommissioningStandardforDentalSpecialist, 2018). In many situations, specialist paediatric dentists where they are available play key roles in the early successful management because they have further training in child psychology and behavioural management to help them provide care for children (Shojaeipour R, 2019).

Although respondents did recognise the abnormal conditions in the mouth, it was clear that oral signs alone may not be useful for them to diagnose a condition. It is important to remember that in normal examination, they would have more information and signs and symptoms to help them diagnose these conditions.

7.2.2.4. Active/Passive Referrals by paediatricians to dental care services

Regarding the question about oral health conditions, in section III of the questionnaire, participants were also asked to write what they would do if they had a child complaining of any of these oral conditions at their clinic. The study results showed that a quite number of participants considered the need for dental care. Some reported to see dentist (passive referral). While others said to refer the patient for dental care service (active referral). When these responses were analysed,it was not very clear if participants who reported "*see dentist*" meant an active referral to be initiated by themselves or just to provide advice for child's parent/carer to see their own GDP and left the decision to be made by them (passive referral). The reason for that is the limited answers were in the open-ended questionnaire. Those answers needed further probing by a focus group for better understanding of participants' intentions. However, the focus group phase of this study was not possible to be undertaken as planned because of the pandemic circumstances of COVID-19.

It is a medical practitioner's responsibility to ensure that individuals can access the appropriate health care service whenever they are in need. Moreover, safe and efficient patient care requires effective, timely and appropriate transfer of the patient through the healthcare system. by their health care professional. Evidence reveals that there is a need to enhance a consistent approach to referral pathways for patients between healthcare professionals in England and involvement of dentistry in these pathways would improve the integrated care for children requiring dentistry in the NHS (Willcocks and Willcocks, 2019, NHS.ENGLAND, 2015).

7.2.3. Section IV Oral Health Advice

Concerning the first and second questions of this section of the questionnaire (What are the main risk factors for dental decay in children? and, What preventive advice to provide parents/carers to keep their children's teeth healthy?), the present study results highlighted that the majority of trainees are knowledgeable about the importance of tooth brushing, regular dental visits and the negative role of sugary as well as acidic foods and drinks on development of tooth decay as recommended by 'Delivering Better Oral Health' toolkit for caries prevention, which are mandatory advices to achieve or maintain good oral health (PHE, 2021). Added to this, they understand the increased risk of dental caries in children of low socioeconomic backgrounds, which supports what has been reported in the Child Dental Health Survey of Children in England (PublicHeallthEngland, 2019). Nevertheless, a large number of trainees were aware of that amount and concentration of fluoridated toothpaste for children varies according to child age and caries risk level as recommended by the 'Delivering Better Oral Health' toolkit for caries prevention guidelines (PHE, 2021).

7.2.3.1. Conflicting Advice/Mixed messages

Giving incorrect advice to parents may unintentionally contribute to poor oral health in young children. Furthermore, receiving different information from different health carers may confuse parents. In addition, mixed information may lead to conflict between patients, parents and health professionals, and this can have long-lasting impact on relationships between a treating team and the family of a child or young person. In rare cases it may result in serious breakdowns in communication between families and health professionals (Iacobucci, 2021, Sukinik, 2017, Barclay, 2016). Our study did not detect any significant errors in advice that was recommended but it did detect that children may not get the most appropriate and timely referrals to allow appropriate and timely intervention for their dental problems.

With regards to the question about the best time for children to have their first dental check, most trainees were knowledgeable about the appropriate child first dental visit to be undertaken once child's the first tooth appears and/or no later than child's first birthday.

However, it was concerning that a number of participants thought children should have their first dental check-up visit at later age than what is recommended. Suggestions were:

"*At age two" , At age three ", "At school age in reception year* " one suggested " *at school age 4-5* " .

Some trainees admitted that they either didn't know, were unsure , or didn't provide any advice regarding the best time for children to start seeing a dentist. This is a key challenge to ensure that all health care professionals are capable to provide their paediatric patients parents/carers with appropriate advice and promote early dental attendance. Early dental attendance allows evidence-based preventive advice to be provided before oral disease has occurred and is a significant area for change, as encouraged by the 'Dental Check by One' (DCby1) initiative (BSPD, 2019) and the current NHS England initiative of 'Starting Well' (NHS.England, 2019).

Considering our results with regards to the question about what advice to provide parents/carers about using FTP for their children, some participants recommended not to use fluoride toothpaste for very young children, including children under three years-of-age. This was an earlier recommendation. Sezer et al.(2001) reported that 72% of paediatricians believed that fluoridated toothpaste should not be used in children less than three years based on several studies that reported toothpaste swallowing as a risk factor for dental fluorosis (Sezer et al., 2013). However, this does not match the up-to-date recommendations by Delivering Better Oral Health guidelines for caries prevention. It is recommended by Delivering Better Oral Health that a smear of toothpaste including no less than 1,000 ppm fluoride should be used for children under three years-of-age to provide effective caries prevention. They report that this advice has been developed while considering the development risk of fluorosis (PHE, 2021). This was a finding that suggested current information in the UK is not reaching paediatricians and trainees appropriately.

7.2.3.2. Lack of time

Previous reports have suggested that lack of knowledge and training on oral health together with low confidence to implement this, are the main barriers reported by paediatricians for not implementing routine oral health assessment (Niranjan et al., 2014, Sezer et al., 2013,

Kalkani and Ashley, 2013, Rabiei et al., 2012, Lewis et al., 2009, Prakash et al., 2006). Our study has highlighted an additional reason preventing paediatricians to provide such care to their patients which was not reported in previous research. Lack of time was frequently reported to support their answers to some questions. It was interesting that several said however that it is not possible to implement this as most young children show lack compliance and this procedure requires extra time. It is surprising that they saw mouth examination as so difficult when they are working with children all the time and have to conduct many more complex medical examinations. This was an important finding in this research project which requires further investigation in future research. It also suggests that when providing teaching for trainees, paediatric dentists should offer some tips on how to look in the mouth successfully.

Several recent studies have described a deterioration in physical examination skills among modern physicians. Poor physical examination skills could be a noteworthy threat to patient safety as they can lead to incorrect as well as missed diagnoses, causing delays in timely implementation of life saving treatments (Asif et al., 2017). Furthermore, evidence showed that under time pressure, adherence to guidelines concerning history taking and advice giving is compromised (Tsiga E, 2013). The present study did not detect that children would suffer significant consequences from the missed diagnoses but it is clear that many children would have delayed diagnoses and referrals may be delayed when children are referred to their general dentists rather than directly to a specialist.

7.2.3.3. Participants' suggestions regarding future education on child oral health

One very important and promising finding of the present study is the enthusiasm and positive response from sixty nine of the paediatric trainees (93.2%) which indicates their genuine interest and motivation to have particular education and training on child oral health. Similar results were reported by Al-Shunairber et al. and Aburahima et al. (Aburahima et al., 2020, Alshunaiber et al., 2019). It is encouraging that despite the fact of how busy their curriculum in paediatric training is, fifty seven trainees (77%) suggested to include oral health teaching/education as an integral part within the STEPP module. In addition to that, some participants expressed their appreciation for the material provided by the researcher (SM) and recommended the same approach of delivering oral health education in future.

The rest of the participants proposed other educational tools and resources. These included child oral health information leaflets, online resources and E learning packages as more flexible approaches to ensure the maximum reach of oral health education to all medical practitioners. Nevertheless, quite a few suggested there be mandatory oral health education in both UG and PG education. Our results support that paediatricians are willing to have oral health learning as an integral part of their general medical education which also reflects the findings from a similar study conducted previously in the UK by Kalkani and Ashley (Kalkani and Ashley, 2013).

7.3. Conclusions

- Many of paediatric trainees working in Yorkshire and The Humber region have limited knowledge on child oral health and common oral conditions. In addition to this, some are providing children's parents/carers with preventive oral health care advice that differs from the up-to-date issued guidance.

- Almost all paediatric trainees working in Yorkshire and The Humber region are highly motivated and enthusiastic to learn about child oral health and use this education in their practice to provide good oral health care and advice for the children in their care.

7.4. Limitations

- Even though this study's recruited paediatric trainees were from variable stages within their paediatric training programmes (juniors ST1-5 and seniors ST6-8), this questionnaire was of a relatively small sample and from one region only.

- Some participants' responses in sections III and IV of the questionnaire were very limited with only one or two words. This made it more challenging to fit each code under a specific category. Those answers needed more probing for better

understanding of participants' intentions for more reliable results. Furthermore, due to the fact that data from sections III and IV of the questionnaire was not rich enough (only one or two words), the qualitative content analysis process was stopped at the Categories level and it was not possible to lift it to the highest level of abstraction which develops main Concepts/Themes. We believe if we had the opportunity to proceed with the focus group interviews as planned originally, the results of the study would be more rich and reliable.

7.5. Recommendations for further research

A number of recommendations for areas of further research can be made from the results and conclusions of this study:

1. The study should be repeated on a larger scale with wider target groups including paediatric specialists and consultants across the UK. It should be followed up with focus group interviews to explore if the present study approach of identifying conditions that respondents should be able to recognise and then immediately delivering information on child health and common oral conditions was useful. Moreover, it would be important to assess if years of experience has any impact on the level of knowledge among paediatricians at different career stages (trainees, specialists, consultants).

2. There is a clear need for introduction of further oral health education in the curriculum of paediatric training programme in the UK.

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9. Appendices

Appendix 1: Participant Information Sheet (Phase One and Two)

UNIVERSITY OF LEEDS

University of Leeds School of Dentistry
Tel. +44 (0) 113 343 7497

Study title: Paediatricians' and Trainees' knowledge and comments on oral health in children

We would like to invite you to take part in a research project. Before you decide to take part, it is important for you to understand why the research is being carried out and what it would involve for you. Please take the time to read the following information carefully. Ask us if there is anything that is not clear or if you would like more information. This sheet tells you about the purpose of this project and what will happen if you take part.

What is the purpose of this research?

We would like to invite you to take part in this study which aims to explore the level of knowledge about oral and dental health among paediatricians and trainees in Yorkshire and the Humber.

Who is doing the research?

The study is being undertaken by Sara Mohammad a postgraduate student in paediatric dentistry at the University of Leeds, School of Dentistry. Sarah is conducting this study as part of her specialist training and Professional Doctorate in Paediatric Dentistry.

Why have you been asked to participate?

You have been chosen because you are a paediatrician or trainee and we wish to be able to use your knowledge and comments to provide appropriate oral health information to you and your colleagues in the future.

Do you have to take part?

The study is entirely voluntary.

What will happen if you agree to take part?

If you agree to take part, you will be asked to complete a questionnaire which includes questions on common oral and dental conditions. The conditions will be shown on screen in a Power Point presentation. This will take approximately 30 minutes. When the questionnaire is complete you will be given another copy with written information about each of the conditions. This will also be available via a link as a lecture or if there is time available, this lecture can also be delivered immediately (30 minutes).

The questionnaire will also ask participants to write down their email address if they would be willing to take part in a focus group further exploring how to improve oral health education and teaching for trainees and paediatricians.

What are the benefits/disadvantages of taking part?

The questionnaire will test your knowledge but will be directly followed up with information so that you can check how accurate your knowledge is. Every effort will be made to deliver this efficiently and minimise the inconvenience and ensure your comfort. This work will explore the paediatricians' and trainees' knowledge about child oral health and subsequently work towards further supporting multidisciplinary care for children between paediatricians and paediatric dentists.

Can you withdraw from the study at any time?

If you do take part and then change your mind afterwards you can withdraw from the study any time up until the data has been analysed.

Will the information obtained in the study be kept confidential?

All the information that we collect will be kept strictly confidential. You will not be able to be identified in any reports or publications. Data collected may be shared in an anonymised form to allow for further use by the research team. The anonymised data will not allow any individuals to be identified or identifiable. Only members of the research team will have access to the data which will be stored securely at the University of Leeds and handled in strict accordance with the 1998 Data Protection Act.

What will happen to the findings of the study?

At the end of the study we will publish our findings in professional and academic journals, and you will not be identified in any report or publication. Dr Mohammad will publish the findings in her doctoral thesis. If you would like a copy of any publication arising from this research to read for yourself, please contact us.

What if there is a problem?

If you have any concerns about this study, please contact a member of the research team in the first instance. If you are unhappy about any part of this project or any activity of a member of the research team and wish to complain formally, you can do this by contacting Prof Bernadette Drummond on B.K.Drummond@leeds.ac.uk or Dr Kate Kenny on K.Counihan@leeds.ac.uk or Dr Susan Kindelan on susan.kindelan@nhs.net

Who has reviewed this study?

This study has been reviewed by the Dental Research Ethics Committee, School of Dentistry who have asked for the study to be piloted with paediatricians and paediatric trainees before final approval.

What happens now?

If you decide you would like to take part in this study, please complete the questionnaire which is taken as implied consent.

Thank you for taking time to read this information sheet and consider this study.

If you would like to discuss the study, require further information or have any concerns about the study please contact

Dr Sarah Mohammad	Dnsmm@leeds.ac.uk
Prof Bernadette Drummond	B.K.Drummond@leeds.ac.uk
Dr Kate Kenny	K.Counihan@leeds.ac.uk
Dr Susan Kindelan	susan.kindelan@nhs.net

Appendix 2: Participant Information Sheet (Phase Three)

UNIVERSITY OF LEEDS
University of Leeds School of Dentistry
Tel. +44 (0) 113 343 7497

Study title: Paediatricians' and Trainees' knowledge and comments on oral health in children

We would like to invite you to take part in a research project. Before you decide to take part, it is important for you to understand why the research is being carried out and what it would involve for you. Please take the time to read the following information carefully. Ask us if there is anything that is not clear or if you would like more information. This sheet tells you about the purpose of this project and what will happen if you take part.

What is the purpose of this research?

We would like to invite you to take part in this study which aims to further explore paediatricians' and trainees' (in Yorkshire and the Humber) understanding of and comments on children's oral health.

Who is doing the research?

The study is being undertaken Sarah Mohammad a postgraduate student in paediatric dentistry at the University of Leeds, School of Dentistry. Sarah is conducting this study as part of her specialist training and Professional Doctorate in paediatric dentistry.

Why have you been asked to participate?

You have been chosen because you have already completed a questionnaire and agreed to be contacted to take part in a focus group.

Do you have to take part?

The study is entirely voluntary.

What will happen If you agree to take part?

If you agree to take part, you will be asked to participate in a focus group interview which will take approximately 1 to 1.5 hours. It is hoped to have two focus groups with 4-6 participants in each group. Focus groups will be held in locations to best suit the participants. We would like to have the focus groups in person but are happy to arrange the groups using Skype or Zoom to link up the participants at a convenient time to avoid travel. These will also be audio recorded.

Each discussion will be recorded for verbatim transcription. All conversations in the focus groups will be audiotaped and transcribed at a later stage and will remain confidential. If during the group you feel uncomfortable in any way or worried, you can refuse to answer the

questions and can leave at any time without giving an explanation. You will be asked to sign a consent form to confirm you are happy to take part in the interview.

What are the benefits/disadvantages of taking part?
Every effort will be made to deliver this efficiently , minimise the inconvenience and ensure your comfort. This work will explore the paediatricians' and trainees' knowledge about child oral health and subsequently work towards further supporting multidisciplinary care for children between paediatricians and paediatric dentists.

Can you withdraw from the study at any time?
If you do take part and then change your mind afterwards you can withdraw from the study at any time up until the data has been analysed.

Will the information obtained in the study be kept confidential?
All the information that we collect will be kept strictly confidential. You will not be able to be identified in any reports or publications. Data collected may be shared in an anonymised form to allow for further use by the research team. The anonymised data will not allow any individuals to be identified or identifiable. Any information that might personally identify you from the interview will be removed from the written record and the audio recording will be destroyed .Only members of the research team will have access to the data which will be stored securely at the University of Leeds and handled in strict accordance with the 1998 Data Protection Act.

What will happen to the findings of the study?
At the end of the study we will publish our findings in professional and academic journals, and you will not be identified in any report or publication. Dr Mohammad will publish the findings in her doctoral thesis. If you would like a copy of any publication arising from this research to read for yourself, please contact us.

What if there is a problem?
If you have any concerns about this study, please contact a member of the research team in the first instance. If you are unhappy about any part of this project or any activity of a member of the research team and wish to complain formally, you can do this by contacting Prof Bernadette Drummond on B.K.Drummond@leeds.ac.uk or Dr Kate Kenny on K.Counihan@leeds.ac.uk or Dr Susan Kindelan on susan.kindelan@nhs.net

Who has reviewed this study?
This study has been reviewed by the University of Leeds Dental Research Ethics Committee.

What happens now?
If you decide you would like to take part in this study, please complete the consent form attached.

Thank you for taking time to read this information sheet and consider this study.

If you would like to discuss the study, require further information or have any concerns about the study please contact

Dr Sarah Mohammad Dnsmm@leeds.ac.uk

Prof Bernadette Drummond B.K.Drummond@leeds.ac.uk

Dr Kate Kenny K.Counihan@leeds.ac.uk

Dr Susan Kindelan susan.kindelan@nhs.net

Appendix 3: Consent form sheet (Phase Three)

UNIVERSITY OF LEEDS

University of Leeds School of Dentistry
Tel. +44 (0) 113 343 7497

Consent Form

Paediatricians' and Trainees' knowledge and comments on oral health in children

Name of Researcher: Dr. Sarah Mohammad

1. I confirm that I have read the information sheet for the above study. I have had the opportunity to consider the information, ask questions and have had these answered satisfactorily. ☐
2. I understand that my participation is voluntary and that I am free to withdraw at any time up until the data has been analysed. ☐
3. I understand that the information collected about me may be used to support other research in the future and may be shared anonymously with other researchers. ☐
4. I agree for the focus group/interview to be audio recorded ☐
5. I agree to take part in the above study. ☐

Name of Participant	Date	Signature

UNIVERSITY OF LEEDS

Appendix 4: Questionnaire sheet

University of Leeds School of Dentistry
Tel. +44 (0) 113 343 7497

I. Demographic characteristics

1. Gender
- □ Male
- □ Female
- □ Other

2. Year of medical qualification:

……

3. Role
- □ Trainee
- □ Consultant

II. Knowledge of child oral health

1. What do you believe is your knowledge of child oral health?
   - □ Poor
   - □ Fair
   - □ good
   - □ very good
   - □ excellent

2. Where have you gained your knowledge of child oral health? (tick what applicable)
   - □ Undergraduate medical education
   - □ Post graduate training
   - □ Own research
   - □ Colleagues
   - □ Courses
   - □ Others (Please specify)

   ……
   ……

3. Do you routinely examine the mouth of your patients and look at the condition of the teeth?

   ……
   ……

4. Where do you refer children when you identify a need for oral health care?

   ……
   ……

III. **Knowledge about oral conditions.** Please describe what you believe the following pictures show? What is your diagnosis? What would you do?

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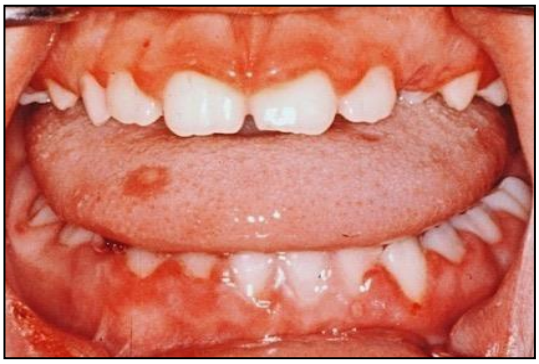
5. 

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IV- Oral health advice

1. What do you believe are the main risk factors for dental decay in children?

   ……

   ……

2. What preventive advice you give parents to keep their children's teeth healthy?

   ……

   ……

3. When is it recommended that children should have their first dental check?

   ……

   ……

4. What advice you give parents about using fluoride toothpaste for their child?

   ……

   ……

5. Do you give any advice about feeding bottles in relation to oral health?

   ……

   ……

6. Do you have any comments about how easy or difficult it is for your patients to find a dentist?

   ……

   ……

7. Do you have any suggestions for the most appropriate ways oral health information can be delivered to trainees and paediatricians?

   ……

   ……

Thank you for completing the questionnaire

- **If you are willing to take part in stage 2 of this study which is focus group interview, please add your email address below.**

☐ **Yes** ☐ **No**

- **If you would like a summary of the outcomes from this study, please add your email address below.**

☐ **Yes** ☐ **No**

- **This will be detached from the questionnaire before the data is recorded to preserve your anonymity.**

- Email: ……

Appendix 5: Handout- Child Oral Health Information

University of Leeds School of Dentistry
Tel. +44 (0) 113 343 7497

Study title: Paediatricians' and Trainees' knowledge and comments on oral health in children

I. Oral Conditions in Children.

1.

This is the appearance of severe early childhood caries (decay) and erosion from drinking sweet drinks and acidic drinks usually in a feeding bottle. The upper front teeth are the most severely affected because the lower teeth get some protection from being covered by the tongue and also from saliva in floor of the mouth from the submandibular and sublingual salivary glands.

2.

This is a 5-year-old child who has suffered dental trauma. The upper left primary central incisor has turned grey from bleeding into the crown of the tooth. Discolouration can be temporary in primary(baby) teeth but it may indicate the nerve has died and this should be followed up to check for infection as it can damage the developing permanent tooth.

3.

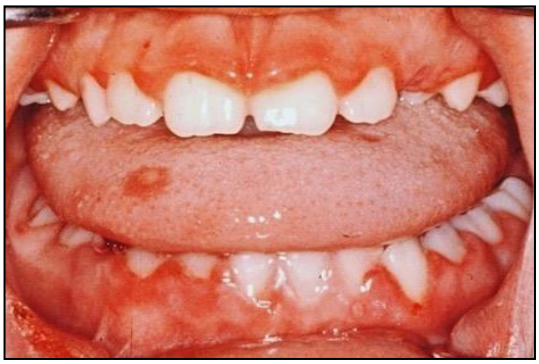
This shows a child with ectodermal dysplasia. There are missing teeth and the upper and lower front teeth have an unusual conical shape. Treatment options will involve building up the upper and lower front teeth with white composite resin fillings to improve the appearance and dentures to replace the missing teeth. Ongoing treatment may involve implants in adolescence and adulthood.

4.

This young adolescent has gingivitis- inflammation of the gums. This is generally because of poor oral hygiene but can be an indicator of systemic conditions eg: blood dyscrasias/insulin dependent diabetes mellitus.

Dentists will refer to periodontal specialists for further assessment which may involve a full blood screen if this does not improve with routine cleaning.

5.



This is a typical appearance of primary herpetic gingivostomatitis which usually appears in young children. However as seen in this case it can appear in later childhood as in this 9year-old. Advice includes fluids, soft food and appropriate analgesia.

It should resolve in a week to 10 days.

6.

This 10-year-old fell off his bike and fractured both upper incisors. These were repaired with plastic resin composite fillings like those shown in the second picture. If this is done by the dentist as soon as possible, outcomes for the teeth are better.

Ongoing fillings will be needed over time and this boy will probably have crowns when he is an adult.

7.

The swelling above the upper right lateral incisor is a dental abscess from infection of the nerve of the tooth following dental trauma. A dental abscess like this can also occur in a tooth with very deep caries(decay).

Antibiotics are a very temporary help as there is no blood supply in the tooth and it will become re-infected again. The tooth requires root canal treatment.

8.

The enamel of the upper front central incisors has not formed properly and is soft and brown stained. This child was being bullied in school. There are several conditions where this can occur including developmental conditions eg: amelogenesis imperfecta or molar incisor hypomineralisation.

There are several treatment options but in this case the teeth were minimally abraded with acid and an abrasive and allowed to harden in the mouth saliva which is supersaturated with calcium and phosphate – the building blocks of dental enamel.

9.

The upper left central incisor in this 7-year-old is in cross bite with the lower tooth. This prevents the child closing properly and if left can cause wear of the front of the upper tooth, or mobility of the lower tooth and recession of the gum.

This can be corrected with an orthodontic appliance and is best done early.

10

This is the appearance of dental erosion. It can be caused by frequent use of acidic foods and drinks or by gastro-oesophageal reflux disease. In this case the teeth are severely worn, and the nerves of the upper incisor teeth are almost exposed. The teeth can be covered with plastic composite material to protect them.

Dentists may refer these children for assessment by their GP or a paediatrician if all dietary causes have been excluded.

11.

This child has an open bite which is most often caused by prolonged dummy or thumb/finger sucking. Children are encouraged to give these habits up as soon as they are able and ideally before the permanent teeth start erupting so that there is a better chance of a developing malocclusion resolving without orthodontic intervention.

Orthodontic treatment can be done when the child is older if required.

II- Oral health advice

Main risk factors for dental decay in children:

- A diet with frequent intake of sugar and other fermentable carbohydrates
- Poor oral hygiene /toothbrushing habits
- Inadequate exposure to fluoride therapy
- Lower saliva flow than normal

Preventive advice to keep their children's teeth healthy:

Recommended first dental check?

https://www.bspd.co.uk/Patients/Dental-Check_by_One

Fluoride toothpaste

- Start toothbrushing as soon as the first tooth erupts
- Brush teeth twice a day especially night time
- Children under 3 years old : a smear of fluoride toothpaste containing
    - Low caries risk: no less than 1000ppm F
    - Increased caries risk: consider 1350-1500ppm F
- Children above 3-years old : a pea sized amount of fluoride toothpaste containing 1350-1500ppm F.
- Tooth brushing should be supervised by parent/carer until 7-years-of-age .
- Spit out -do not rinse.

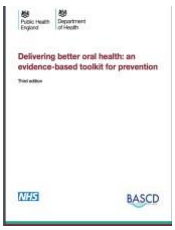
Feeding bottles

- Never add sugar/solids to a feeding bottle.
- Infants should not be put to bed with milk /sugary drinks in a bottle.
- Infants should be introduced to drinks from flow-free cups from the age of 6 months.
- Introduction of complementary foods (weaning) is recommended around 6 months.
- Bottles should be discouraged from the age of 12 months.

Here are some resources for guidelines which provide preventive oral health care for children

1- Delivering better oral health: an evidence-based toolkit for prevention

https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/605266/Delivering_better_oral_health.pdf



2-Prevention and Management of Dental Caries in Children

http://www.sdcep.org.uk/published-guidance/caries-in-children/

Here is the link of a videoed lecture for information on common oral conditions in children

https://www.youtube.com/watch?v=xQFXXLq4z04

We are also happy to hear from you in the Department of Paediatric Dentistry

Dr Sarah Mohammad Dnsmm@leeds.ac.uk

Prof Bernadette Drummond B.K.Drummond@leeds.ac.uk

Dr Kate Kenny K.Counihan@leeds.ac.uk

Dr Susan Kindelan susan.kindelan@nhs.net

Appendix 6: Topic Guide – Interviews

UNIVERSITY OF LEEDS

University of Leeds School of Dentistry
Tel. +44 (0) 113 343 7497

Topic Guide – focus group interview

Introduction:

The purpose of this interview is to talk to paediatricians and paediatric trainees about your experience of diagnosing and managing oral health conditions in your child patients and whether the handout and or the online lecture has helped your knowledge and understanding.

Focus Group:

After participants have signed the consent and agreed to take part in this study, a focus group interview will be undertaken to allow for greater discussion and exploration of participants experiences.

The interview is likely to take 1- 1.5 hours. It may be difficult to be arranged in person as all volunteers are busy clinicians who work in different regions in Yorkshire and the Humber with limited or no time for research activity. Therefore, an online group in real time will be the most appropriate alternative to reduce the burden on participants if they find it more convenient (Skype/Zoom application). Participation is entirely voluntary and participants can change their mind and stop contributing at any point.

Confidentiality:

The two groups (specialists & trainees) will be audio recorded to allow transcribing of the comments and to allow discussion without having to stop to take notes. Any quotes and comments thatare published will be anonymised.

Participants will be reminded that all discussion in the group is confidential and the comments they make will be kept private and will not have anything published that can break their anonymity. The interviewer will open to the participants' narratives and be flexible in switching between the interview topics.

We shall confirm that all personal information will be kept confidential and data will be coded and kept safe. All digital recordings will be deleted when we finish this study.

Questions and Topic Guide

This may have addition or changes based on the answers given in Stage 1 of the research.

Paediatricians' experience of diagnosing and managing oral health conditions in children

- **Do you perform oral examinations for your patient?**

- Is it routinely done for all patients?
- Or only if the patient has a complaint?

- **Do you deliver any advice to children's parents or carers about prevention of oral disease?**

  Eg:

  -Timing of first dental visit (when to start/ access dentist through 111)

  -When to stop milk bottle feeding especially night time?

  -Use fluoridated toothpaste (when/amount of ppm F)

- **Sources of knowledge about prevention of oral disease?**

- **Do you usually check if children have a dentist and recommend or refer if not?**

- When do you consider that?
- How often does it happen?
- Do you have a route of referral, or do you have any problems?

- **Paediatricians' thoughts about the Lecture & Handout they were given in Stage 1**

- Was it useful to increase your level of knowledge on child's oral health?
- Did it help in clinical diagnosis of oral diseases in children?
- Has it led to you making any changes so far in looking at children's oral health?
- Were there aspects of oral health you think we should have included?
- What do you think are the most appropriate ways that oral health can be included in your training and in your continuing education?

Closing

Thank you for participation in the group.

I think we have covered everything but is there anything else that you would like to raise?

I would like to re-confirm that all data are highly confidential and you will not be identified in any reports of this work.

If you would like a summary of the outcomes of this study, we will email you if you have provided your email address with your signed consent.

Appendix 7: PowerPoint Presentation of Child Oral Health

1

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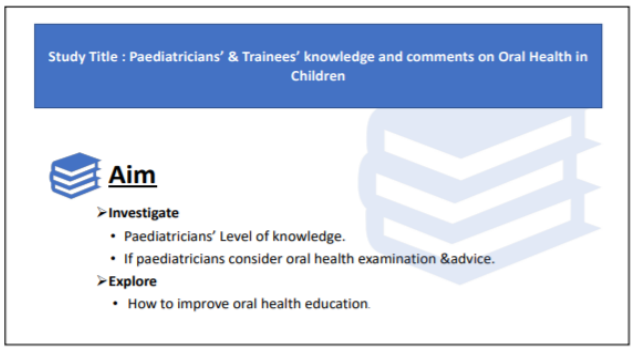

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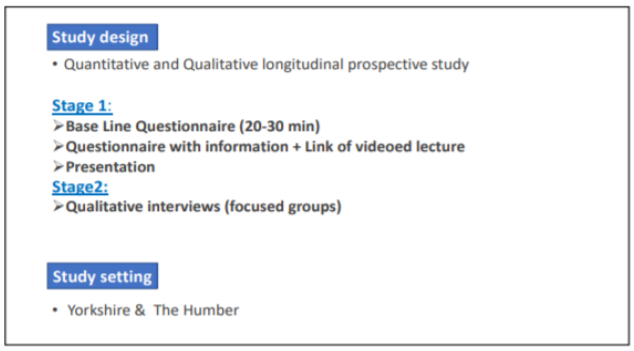

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Distribution of :

5

Questionnaire

Section I

Demographic characteristics

Section II

Knowledge of child oral health

6

Section III

Knowledge about oral conditions

Please describe what you believe the following pictures show?
What is your diagnosis? What would you do?

1.

7

Describe what you believe the following picture shows?

What is your diagnosis? What would you do?

2.

8

Describe what you believe the following picture shows?

What is your diagnosis? What would you do?

3.

9

Describe what you believe the following picture shows?

What is your diagnosis? What would you do?

4.

10

Describe what you believe the following pictures shows?

What is your diagnosis? What would you do?

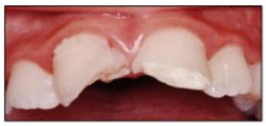
5.

11

Describe what you believe the following picture shows?

What is your diagnosis? What would you do?

6.



12

Describe what you believe the following picture shows?

What is your diagnosis? What would you do?

7.

13

Describe what you believe the following picture shows?

What is your diagnosis? What would you do?

8.

14

Describe what you believe the following picture shows?

What is your diagnosis? What would you do?

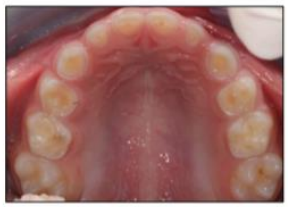
9.

15

Describe what you believe the following picture shows?

What is your diagnosis? What would you do?

10.



16

Describe what you believe the following picture shows?

What is your diagnosis? What would you do?

11.

17

Section IV

IV-Oral health advice

1-What do you believe are the main risk factors for dental decay in children?

.....

2-What preventive advice you give parents to keep their children's teeth healthy?

.....

3-When is it recommended that children should have their first dental check?

.....

4-What advice you give parents about using fluoride toothpaste for their child?

.....

5-Do you give any advice about feeding bottles in relation to oral health?

.....

6-Do you have any comments about how easy or difficult it is for your patients to find a dentist?

.....

7-Do you have any suggestions for the most appropriate ways oral health information can be delivered to trainees and paediatricians?

.....

18

Thank you for completing the questionnaire

- **If you are willing to take part in stage 2 of this study which is focus group interview, please add your email address below.**
  - ☐ **Yes** ☐ **No**
- **If you would like a summary of the outcomes from this study, please add your email address below.**
  - ☐ **Yes** ☐ **No**
- **This will be detached from the questionnaire before the data is recorded to preserve your anonymity.**

- Email:

.....

19

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Outline

- Backgrounded on Child's oral health
- Discussion about oral conditions in children

21

Poor oral health → May impact on children's physical and psychological wellbeing → Reduction in quality-of-life

Some children may suffer from problems with

pain | infection | eating | sleeping | socialising

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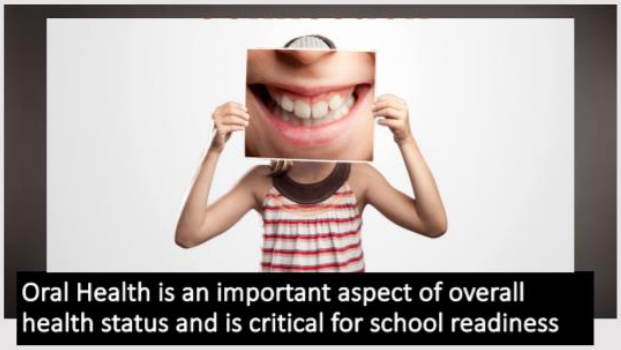


23

Tooth (Decay) Caries

12% of 3 year old & 23% of 5 year old children in England have visible tooth decay .
(Public Health England 2019)

Tooth Extraction is the most common reason for hospital admission for children aged 5-9 yrs.
(Public Health England 2019)

24

Dental Trauma

30% primary dentition

33% permanent dentition

Note: 50% to 75% of children with NAI have orofacial signs of abuse

25

Periodontal (Gum) Disease

- Main cause is plaque build up on teeth.
- Children are more likely to have→ Gingivitis (gum inflammation)

Signs & Symptoms

Red ,Swollen ,Sore , Bleeding Gums

26

Risk of **tooth decay** ⬆ in children live in more deprived areas

27

Medically Compromised Children are at ⬆ increased risk of developing systemic complications because of

Poor Oral Health **Dental infections**

which may lead to severe & even life threatening consequences.

Cardiovascular

Bleeding disorders

Diabetes

Cancer

Respiratory Disease

Liver disease

Renal disease

28

29

Priorities of child public health in England

Prevention Green Paper 2019 Key Recommendations On Oral Health

- **Prevention**
  Introduce supervised tooth brushing scheme in schools / Sugar free schools /Soft drinks industry levy / Support Water fluoridation)
- **Access preventive dental services**
- **Education Public Health Campaigns** :
  (Change4life / Sugar Smart /Dental Check By 1)

Public Health England

30

Leeds City Council Program

Leeds CITY COUNCIL

Initiatives to increase awareness of Oral Health in Children and Young People

Objectives & Priorities:

1. Parents & carers of children and young people to be supported to care for oral health.
2. Promote healthy eating by reduce sugar intake.
3. Exposure to adequate amount of fluoride.
4. Raise awareness about the importance of dental attendance.

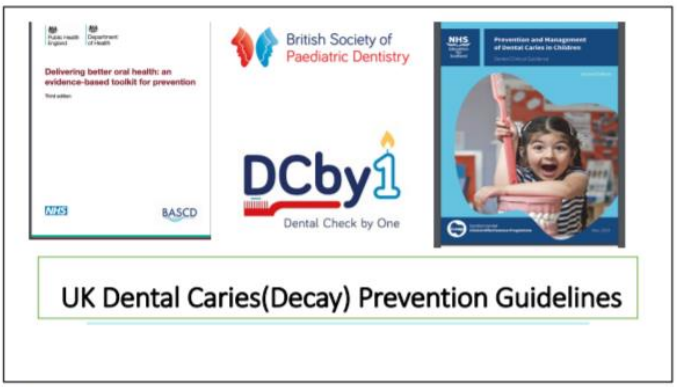
31

Tooth Decay
&
Gum disease
are
Preventable

32


✓ Diet
✓ Oral Hygien
✓ Regular Dental Check Up
DCby1
Dental Check by One

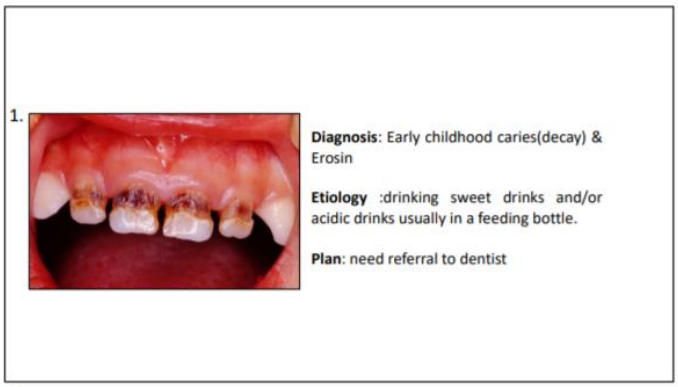
33


Delivering better oral health: an evidence-based toolkit for prevention
British Society of Paediatric Dentistry
DCby1
Dental Check by One
Prevention and Management of Dental Caries in Children
UK Dental Caries(Decay) Prevention Guidelines

34


ORAL CONDITIONS IN CHILDREN

35


1.
Diagnosis: Early childhood caries(decay) & Erosin
Etiology :drinking sweet drinks and/or acidic drinks usually in a feeding bottle.
Plan: need referral to dentist

36

2.

Diagnosis: dental trauma upper left primary central incisor.

Etiology : injury to the front teeth

Plan: need referral to dentist

37

3.

Diagnosis: Ectodermal Dysplasia

Etiology : genetic disorder charactarised by abnormal development of skin, hair, nails, teeth and sweat glands

Plan: need referral to dentist for assessment

38

4.

Diagnosis: Gingivitis (inflammation of the gum)

Etiology : poor oral hygiene

Plan: need referral to dentist for routine cleaning

39

5.

Diagnosis: primary herpetic gingivostomatitis

Etiology :viral infection (HSV)

Plan: usually resolve in 10 days

40

6.

Diagnosis: dental trauma -fracture of both upper central incisors

Etiology : fell of bike

Plan: need to be referred to dentist

41

7.

Diagnosis: dental abscess associated to upper right lateral incisor

Etiology : infection in the tooth 2ry to trauma

Plan: need to be referred to dentist

42

8.

Diagnosis: hypomineralisation of upper central incisors

Etiology : developmental either(AI) or (MIH)

Plan: need to be referred to dentist

43

9.

Diagnosis: cross bite of the upper left central incisor

Etiology : lingual erupting path of the tooth.

Plan: need to be referred to a dentist

44

10.

Diagnosis: dental erosion

Etiology : frequent use of acidic foods and drinks or by Gastro-oesophageal reflux disease.

Plan: need to be referred to a dentist for assessment

45

11.

Diagnosis: anterior open bite

Etiology : prolonged dummy or thumb/finger sucking.

Plan: need to be referred to a dentist

46

Lift The Lip

Mini Mouth Care Matter

minimouthcarematters@hee.nhs.uk

47

Thank You

48

How to find NHS dentist

- NHS Choice at www.nhs.uk →Contact local dental practice
- Urgent care → Dial 111
- Call NHS England 0300 311 2233

49

Specialist Dental Services in Yorkshire & The Humber

LEEDS

Beeston Hill Community Health Centre Tel: 0113 843 1022
The Reginald Centre Tel: 0113 843 4333
Middleton Health Centre Tel 0113 207 7064
Armley Moor Health Centre Tel: 0113 843 0292
Yeadon Health Centre Tel: 0113 843 5613

BRADFORD

Barkerend

Horton Park

Keighley Shipley

Westbourne Green

HUMBERSIDE

Highlands Dental Health Centre

Hambleton and Richmond

Harrogate Dental Department

Scarborough and Whitby

Selby and York

HALIFAX

St. Johns Health Cente

Batley Health Centre

Cleckheaton Health Centre

Todmorden Health Centre

HUDDERSFIELD

Greenhead Rd, Huddersfield HD1 4EW
TEL: 0300 304 5555

Princess Royal Community Clinic

50

Any Questions?

51

Appendix 8: DREC Ethical Approval

Dear Sarah

DREC ref: 030719/SM/278
Study title: Paediatricians' knowledge of common oral and dental conditions in children

Thank you for submitting the amended documents for the above ethics application. The application has been re-reviewed by the Dental Research Ethics Committee (DREC) and I am pleased to inform you that it has been approved.

Documents reviewed

Document name	Version number and date
Ethics application form	
Protocol	Version 1 21/01/2019
Information sheet – questionnaire	Version 3 21/10/2019
Information sheet – interview	Version 3 21/01/2019
Consent form – interview	Version 3 21/10/2019
Questionnaire	Version 3 21/10/2019
Handout	Version 3 21/10/2019
Topic Guide	Version 3 21/10/2019

With best wishes for the success of your project.

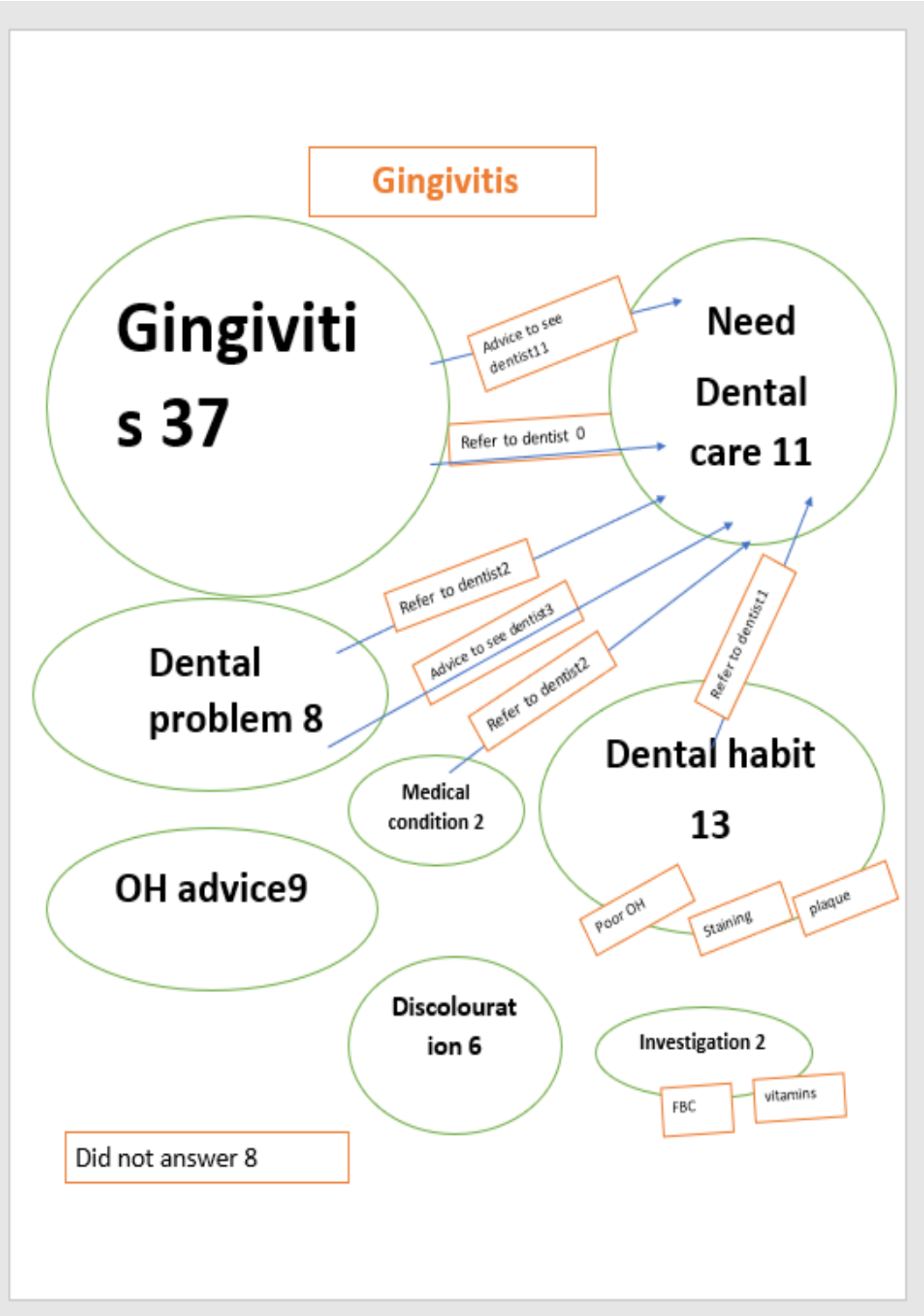
Please note: You are expected to keep a record of all your approved documentation, as well as documents such as sample consent forms, signed consent forms, participant information sheets and all other documents relating to the study, including risk assessments. This should be kept in your study file, and may be subject to an audit inspection. If your project is to be audited, you will be given at least 2 weeks' notice.

It is our policy to remind everyone that it is your responsibility to comply with Health and Safety, Data Protection and any other legal and/or professional guidelines there may be.

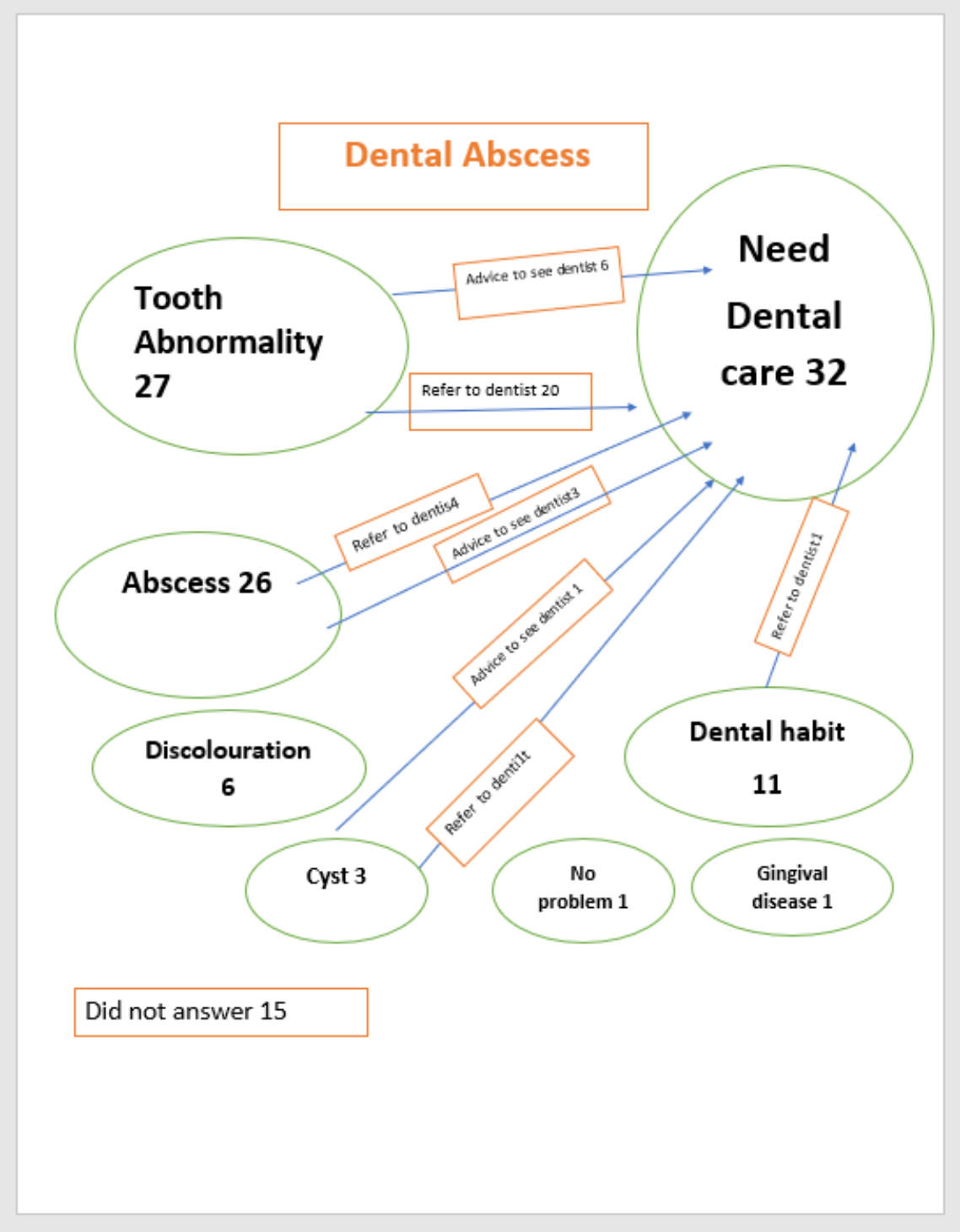
For and on behalf of
Dr Jinous Tahmassebi
DREC Chair

Appendix 9: Spider diagrams

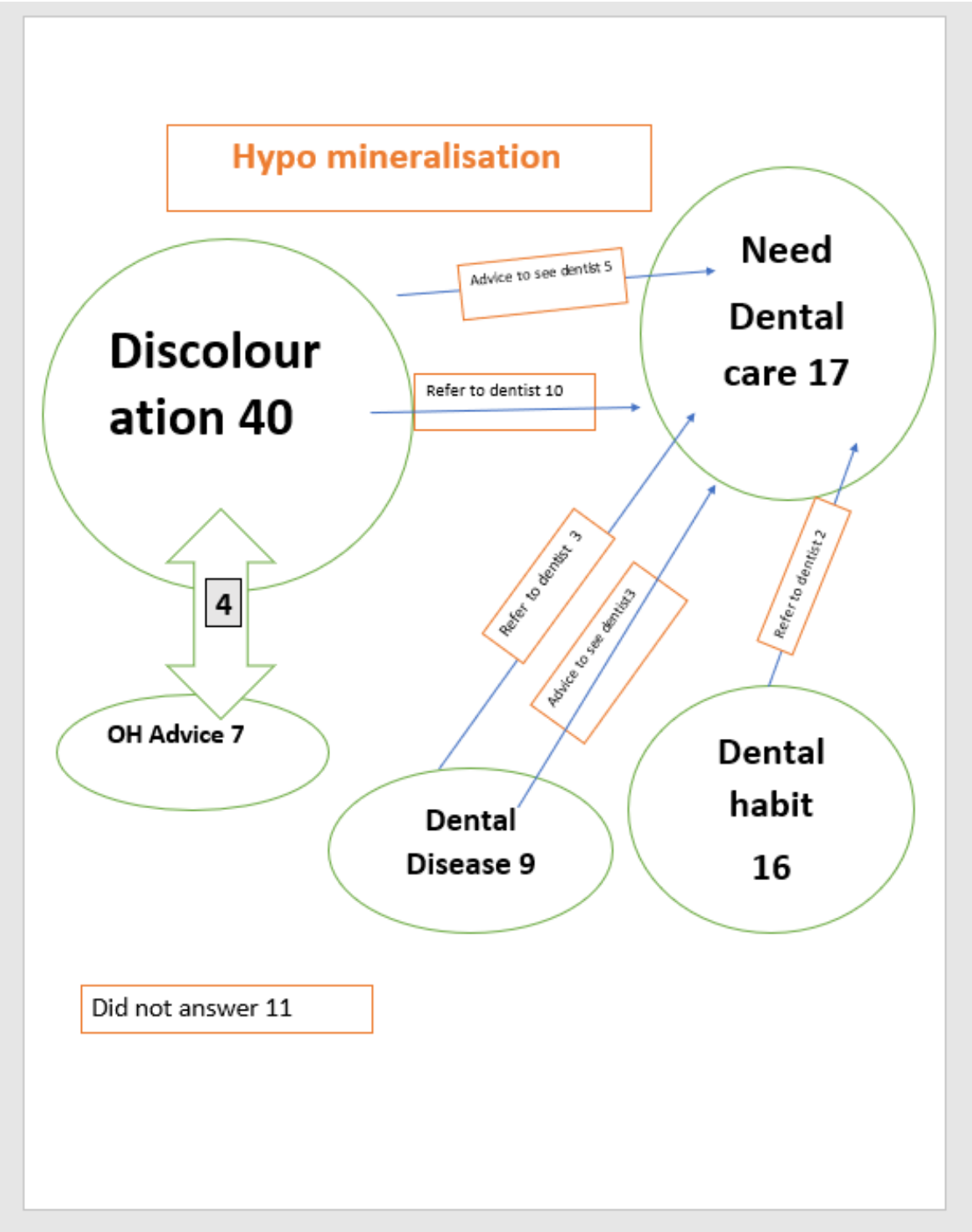
Appendix 9A : Spider Diagram of the fourth question of section III of the questionnaire



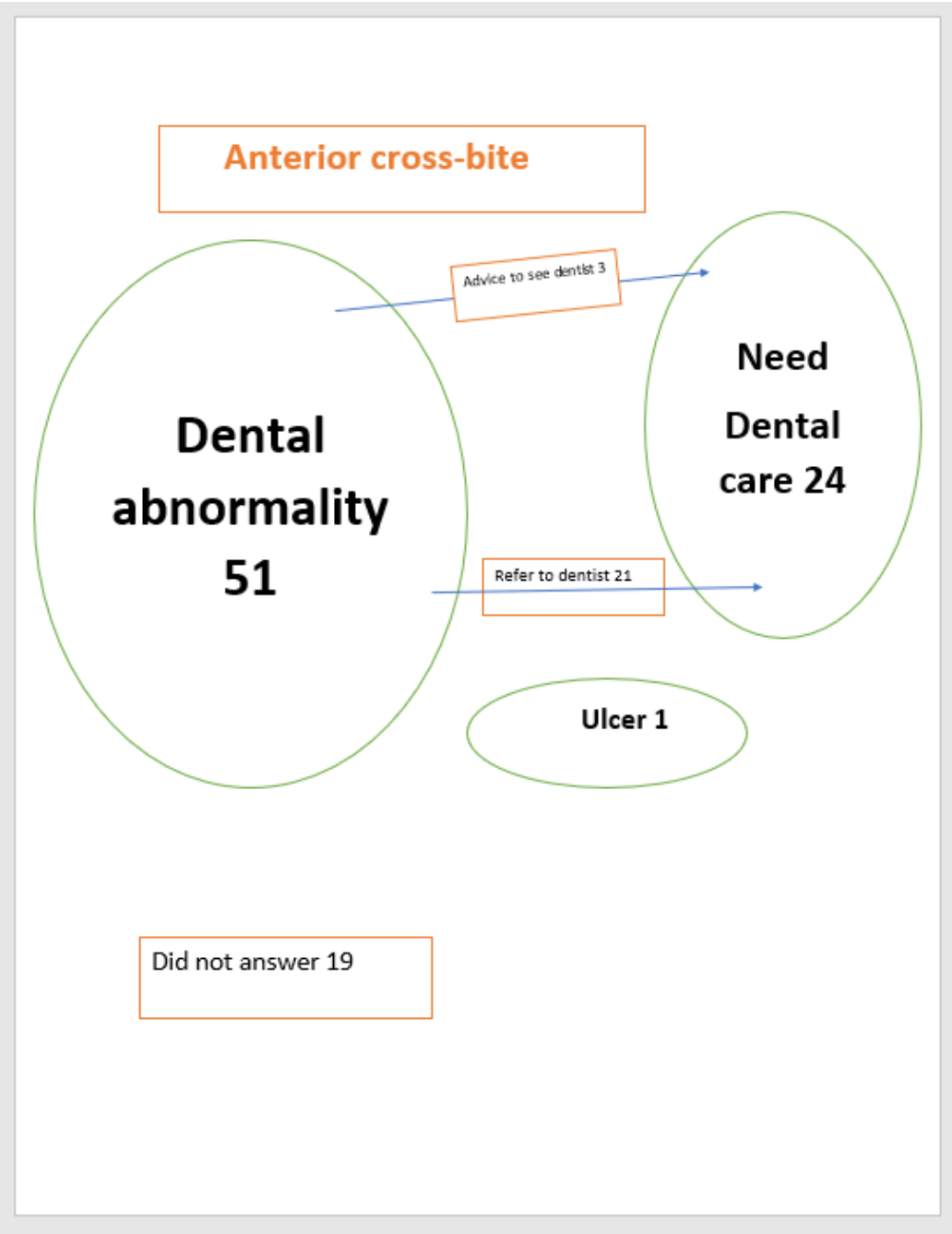
Appendix 9B: Spider Diagram of the seventh question of section III of the questionnaire



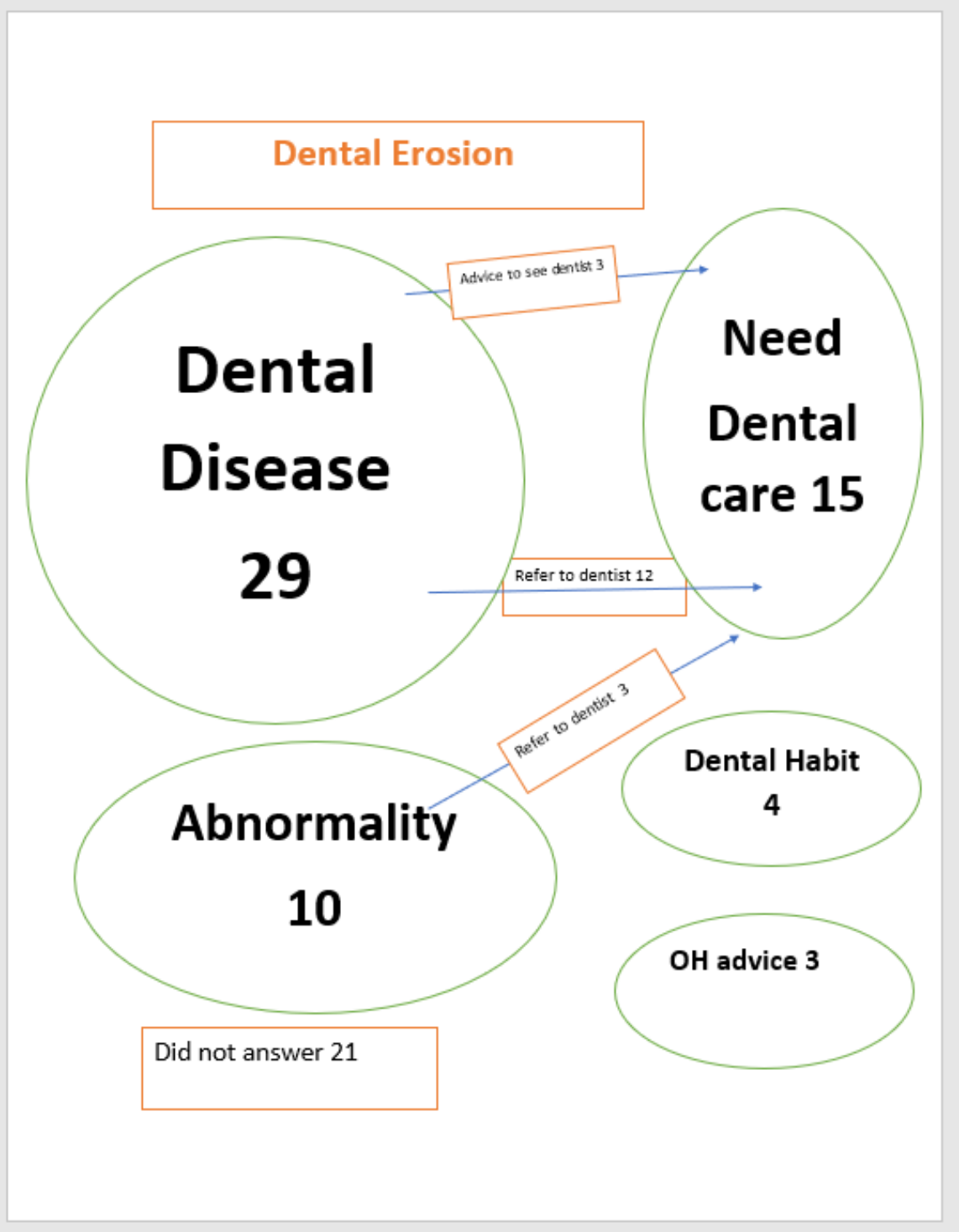
Appendix 9C: Spider Diagram of the eighth question of section III of the questionnaire



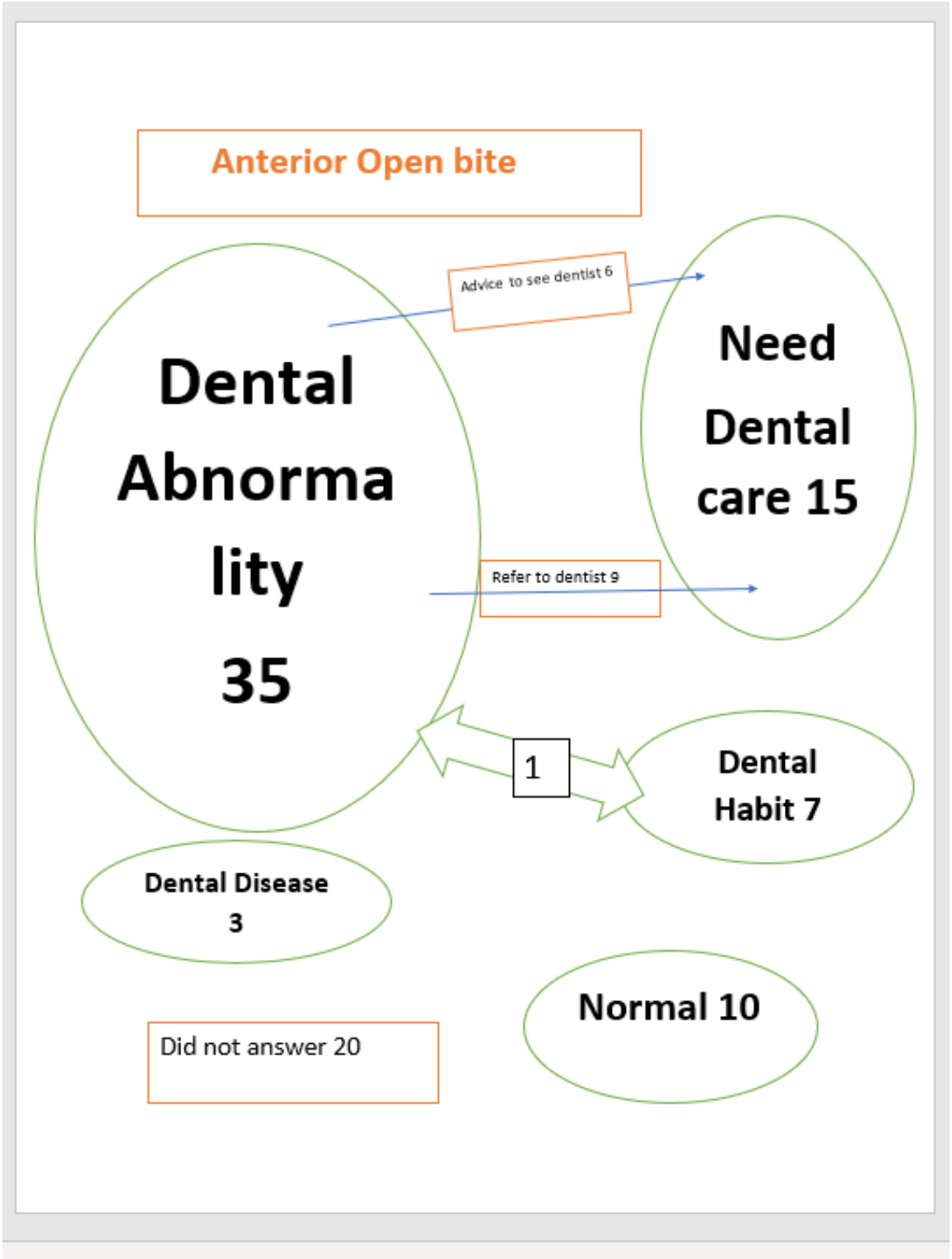
Appendix 9D: Spider Diagram of the ninth question of section III of the questionnaire



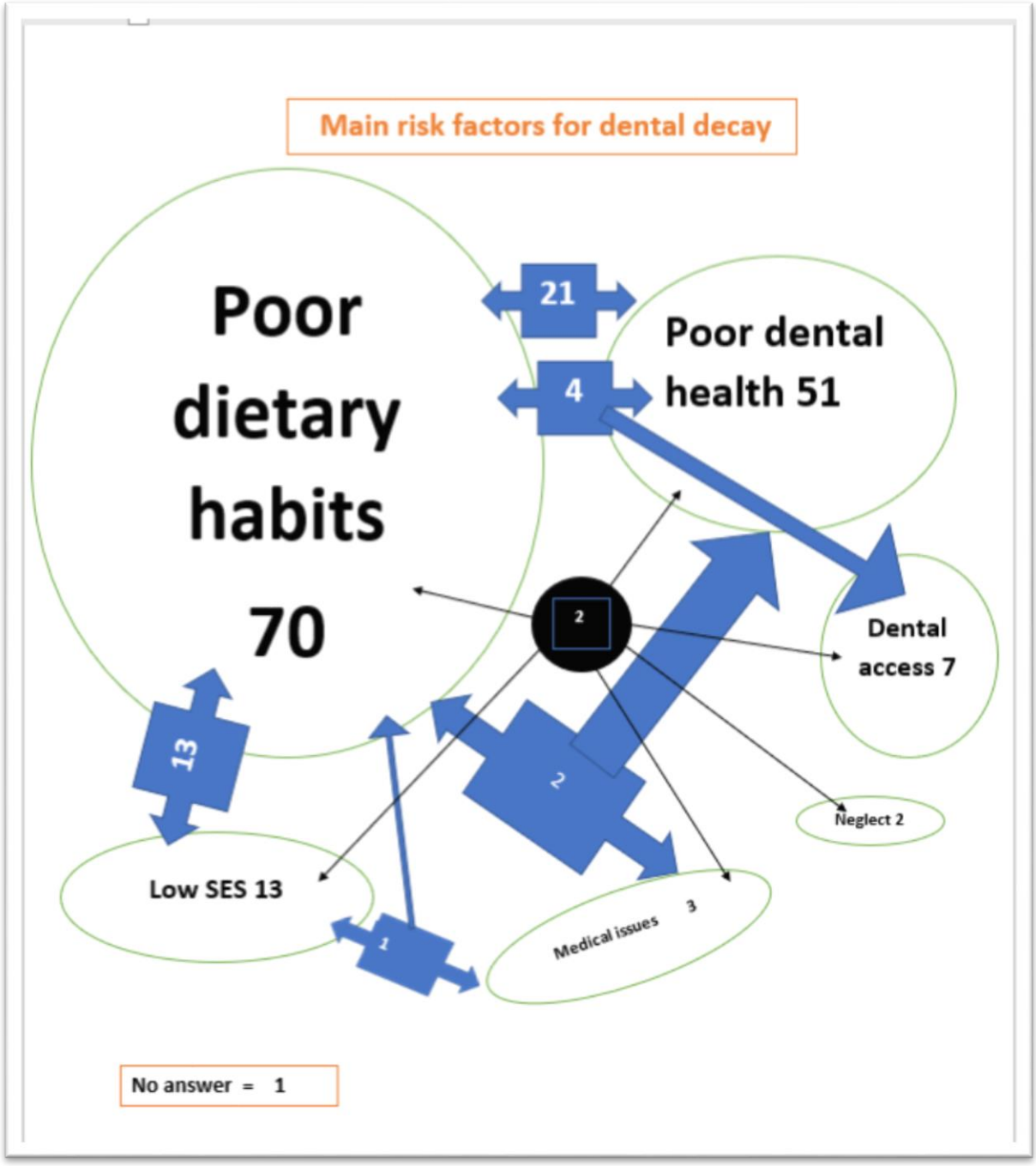
Appendix 9E: Spider Diagram of the tenth question of section III of the questionnaire



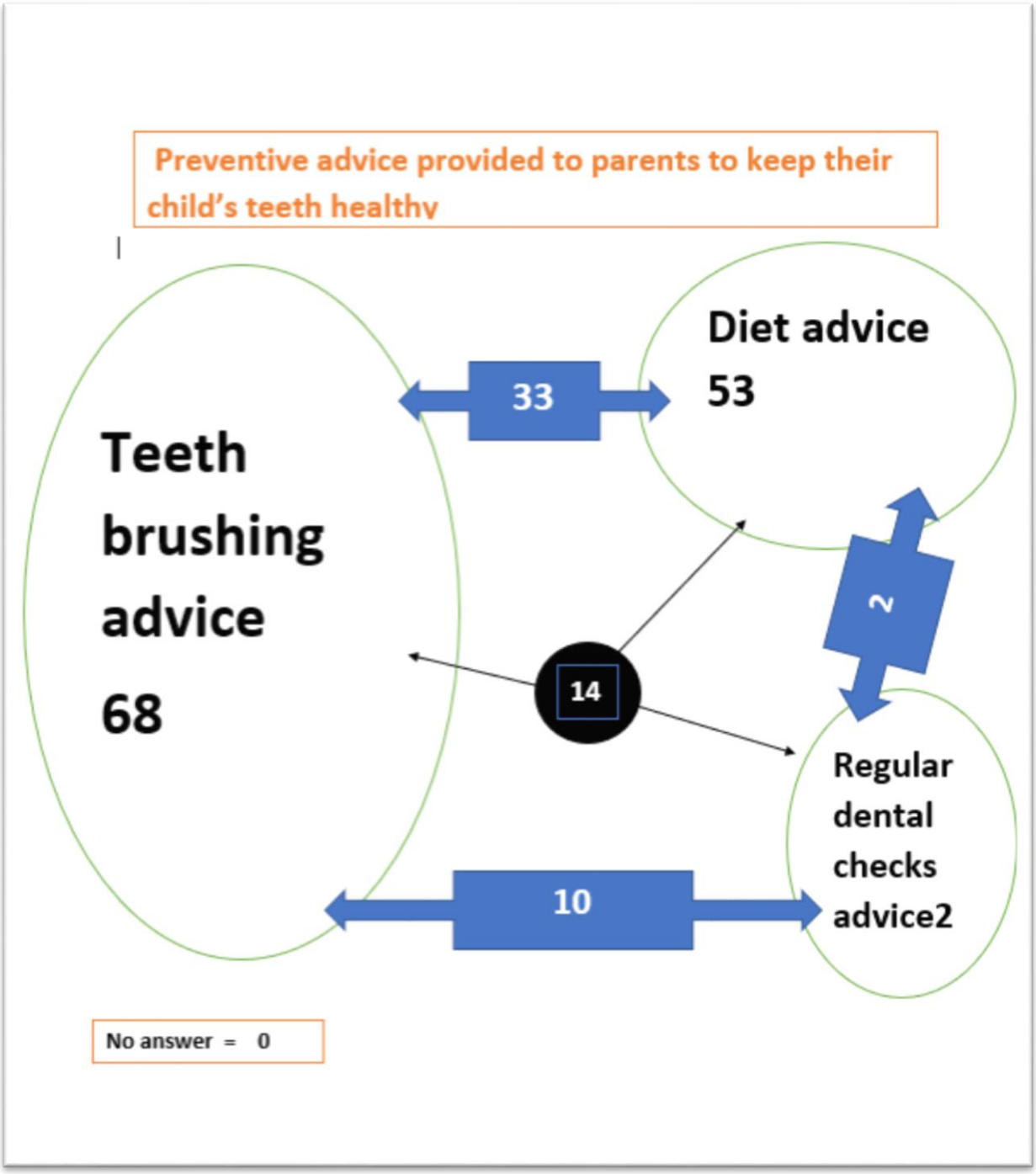
Appendix 9F: Spider Diagram of the eleventh question of section III of the questionnaire



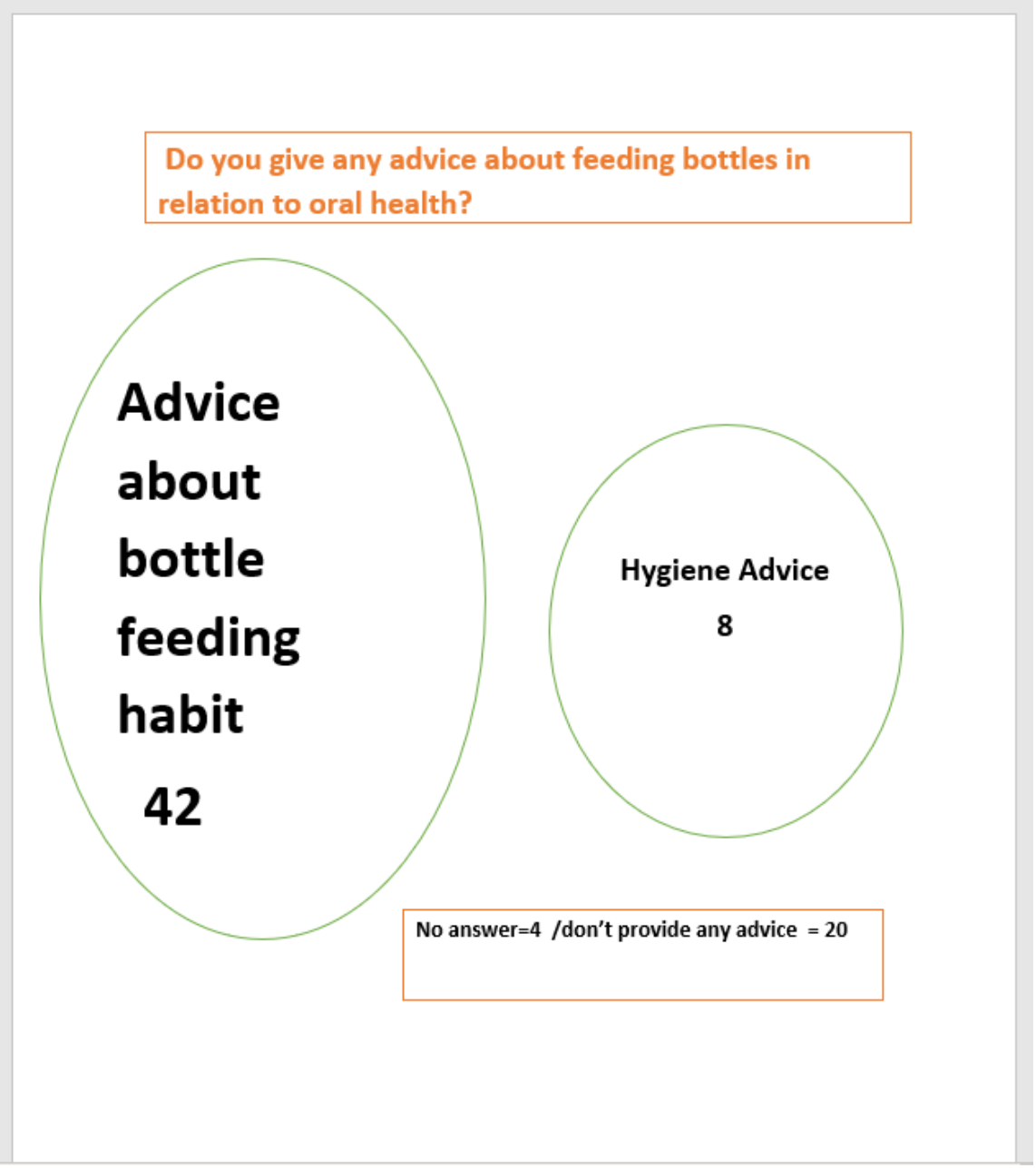
Appendix 9G : Spider Diagram of the first question of section IV of the questionnaire



Appendix 9H : Spider Diagram of the second question of section IV of the questionnaire



Appendix 9I : Spider Diagram of the fifth question of section IV of the questionnaire



Appendix 9J : Spider Diagram of the sixth question of section IV of the questionnaire