



Prevalence of early childhood caries and associated factors among a group of preschool children in Benghazi

(Clinical Study)

By

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**A thesis submitted in partial fulfillment of requirements
For the degree of master of science In Pediatric Dentistry**

University of Benghazi

Faculty of Dentistry

2021

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Dedication

Dedicated to

The pure spirit of my father , my great mother for her constant love , my lovely husband for his support and encourage and last but not least , my children .

Acknowledgements:

At first I thank all mighty Allah for his grace on me and for what I have reached .

I offer my thanks and gratitude to my research supervisor **Dr. Marie H EL Mugarbi** for his continued support and guidance so I can do my research in a better form, I thank him for his wise words and his great efforts and patience .

I want to give special thanks **Dr. Arheiam Alawami** for his valuable assistance and cooperation, thanks for the University Graduate Department coordinator **Dr. Fawzia Elzawie**.

I would like to have mercy on my teacher soul **Dr. Khadiga Harwis** .

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List of abbreviation or symbols

Abbreviation or Symbols	Meaning
WHO	World Health Organization
SES	Socioeconomic status
LMICs	Low and Middle-Income Countries
ECC	Early childhood caries
OR	Odds ratio
CI	Confidence interval
DS	Decayed surfaces
dmft	Decayed, missing, and filled primary teeth
DMFT	Decayed, missing, and filled permanent teeth
ICC	Intra-class correlation coefficient
\leq	Less than or equal
\geq	more than or equal

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Abstract

Background : dental caries is a public health problem worldwide with significant impact on quality of life particularly among children. **Aims and objectives :** to explore caries experience and associated factors among Libyan preschool children in the city of Benghazi . **materials and methods :** this was a descriptive cross- sectional study conducted among children attending preschool nurseries. **Result :** response rate was 72% , the study included 506 preschool children ,dental caries affecting 59.5% of children, most of dental caries is untreated ,most of parents showed positive attitude toward oral health, **conclusions :** the prevalence of dental caries is relatively high among Libyan preschool children in Benghazi , parents education is associated with better dental care ,prolonged feeding and increasing sugar consumption are strongly associated with dental caries in preschool children ,children from larger families appeared to be higher risk of dental caries, oral health promotion programs are needed to increase oral health awareness and provide appropriate knowledge.

Chapter 1 :

Introduction

Dental caries is a public health problem worldwide and one of the greatest burdens on individuals and societies since caries affects 60–90% of children and most adults in most industrialized countries and around 65% of preschool children in Middle East and North Africa region, according to The World Health Organisation (WHO)⁽¹⁾. Despite the undeniable decline in dental caries prevalence in many western countries, dental caries persists as the most prevalent disease worldwide.

Caries in children has been ranked as the 9th most common condition affecting children in the world ⁽²⁾, in many developing and developed countries, with significant impacts on quality of life, particularly among children. ^(3,4). Untreated dental caries has considerable economic and quality-of-life burdens, causing severe tooth pain ^(5, 6) sepsis and tooth extraction ⁽⁷⁾, and consequently significant impact on school attendance ⁽⁸⁾, and self-esteem of children ⁽⁹⁾.

The widespread use of fluorides and oral health program in industrialised countries has led to change in the pattern of diseases distribution. In children dental caries prevalence remains unacceptably high among children from low social class. Therefore, socioeconomic status (SES) has been suggested as a predictor of caries prevalence in preschool children. A systematic review of studies on SES and dental caries concluded that: Low SES is associated with a higher risk of having caries lesions or

caries experience⁽¹⁰⁾. Higher caries rate was observed among children in the lower socioeconomic group and countries, compared to lower caries rates and significant improvement⁽¹¹⁾. It is well-recognised that broader socioeconomic determinants shape oral health behaviours and health status, where the social class is favouring better oral behaviours and outcomes among people from higher social class ^(12, 13). Therefore, evaluating and identifying social factors associated with dental caries is highly important in understanding caries distribution and its risk factors.

Dental caries is a multi-factorial disease that is influenced by many interacting personal, behavioural and environmental factors ^(5, 14). These factors have been reported in many review articles, and include, for example, increased consumption of sugar, feeding habits of children, oral hygiene practices, and dental attendance ⁽¹⁵⁾. However, individuals' behaviours can be shaped by wider contextual and environmental factors ^(16, 17). For instance, there is evidence to show that caries is lower at times of war and sanctions, which has been attributed to the reduced availability of sugar. It is, therefore, not surprising to find wide variations in caries prevalence and aetiology, both between and within countries^(15, 18).

Whilst the oral health inequalities are widely reported in high-income countries, there is a dearth on evidence in Low and Middle-Income Countries (LMICs), which hinders the full understanding of the situation in LMICs ⁽¹⁹⁾.

Thus, there is a need to conduct more research in low-income countries to fully understand the interaction between contextual and individual factors and how these may affect population oral health and result in health inequalities.

Understanding the aetiology of dental caries in its context is essential to help development of effective preventive oral care programmes and in order to inform oral health promotion and public health care policies, in order to maintain a functional, pain-free, aesthetically and socially acceptable dentition over the lifespan of most people ⁽²⁰⁾, and hence improve the quality of life ⁽²¹⁾.

Libya is one of the Arab spring countries, which suffered from ongoing unrest, civil wars and financial crises since the February uprisings in 2011. With the country now started recovering from these crises, it is timely to investigate the health status, determinants and treatment needs to inform health care planning and health promotion.

What is more, little research has been done on assessing the prevalence of early childhood caries (ECC) amongst Libyan preschool children and only a few studies related to dental caries have been published which mainly addressed the issue among younger than 5-year olds. Also, very little research has explored the risk factors caries in primary dentition, and most studies in this area have only focused on permanent dentition ⁽²²⁾.

What is more, to the date, very few studies have investigated social disparities in oral health of Libyan preschool children. Social inequality in oral health is a universal phenomenon, that should be identified and tackled⁽²³⁾. Therefore, assessing the prevalence of dental caries in deciduous teeth and its related factors in Libyan population is necessary to help in creating baseline data to reform oral health in Libya, where dental services are exhausted from corruption, instability, and lack of leadership and appropriate planning and monitoring of services.

Chapter 2: Literature Review

2.1 Overview

This chapter gives an overview of dental caries process and the concepts of oral health disparities, highlighting the association between these two issues. This chapter reviews the dental literature on dental caries, its risk factors related to early life behaviours, and caries prevalence among Libyan preschool children.

2.2 Dental caries

Dental caries is a diet-bacterial, multifactorial disease process, characterised by both demineralization and remineralization of dental hard tissues⁽²⁴⁾. It can occur at any age both in primary and permanent teeth and can cause permanent damage to tooth crown or root. The outcome of caries process, whether to healing or cavity formation depends on the prevailing of remineralization or demineralization , It should be noted that dental caries process can be stopped or reversed unless it reached the final irreversible phase of cavity formation. The initial stages of caries are asymptomatic, with symptoms starting after the carious lesion has progressed into dentine⁽⁵⁾.

Visible caries (cavity formation) is the last and irreversible phase in this process. It occurs when demineralisation outstrips remineralisation A sustainable pH below 5.5 results in net mineral loss. Until this point, an intervention can be made, the demineralisation can be reversed, and cavity

formation avoided, by interfering with or eliminating factors fostering the demineralisation^(25, 26).

Among the multi-factorial determinants of dental caries, lifestyle and behavioural factors are major contributors to its occurrence and severity⁽⁵⁾, however, dental caries is a preventable disease provided that its risk factors are controlled. The imbalance between multiple pathological and protective factors results in the initiation of caries process and the progression of dental caries⁽⁵⁾

Dental caries is a behavioural disease caused by diet-bacterial interaction in which bacteria in dental plaque ferment dietary carbohydrates (mainly sugars) to release organic acids as metabolic by-products^(5, 24), tooth demineralisation (loss of tooth minerals) occurs due to acid production, when the pH decreases to levels below critical pH in the enamel, which is accepted as 5.5⁽²⁷⁾.

Remineralization occurs due to the buffering effect of saliva which results in an increase in pH to its normal level and movement of calcium and phosphate and fluoride from the oral environment into enamel⁽²⁶⁾.

The aetiology of dental caries involves a complex interplay of social, biological, environmental, and behavioural factors⁽²⁸⁻³⁰⁾, however, four primary factors must exist to initiate dental caries. These are acid-producing bacteria, dietary carbohydrates (mainly sugar), a host and time. The

interaction between these factors is influenced by several modifying factors which effect of pH drop and hence tip the caries balance toward either demineralization or remineralization ⁽²⁸⁾ . For example , the use of fluoride increases enamel resistance to demineralization and enhances remineralisation ⁽²⁶⁾. On contrary, teeth that have enamel defects such as hypoplasia are less resistant to bacterial acids ⁽³¹⁾ .

2.3 Early Childhood caries (ECC)

The Expert Panel at the Bangkok Global Summit on ECC further defined dental caries as a biofilm mediated, sugar-driven, multifactorial, dynamic disease that results in the phasic demineralization and remineralization of dental hard tissues, determined by biological, behavioural, and psychosocial factors linked to an individual's environment⁽³²⁾. The Panel's clinical description of ECC reaffirmed the 1999 definition as “the presence of one or more decayed (non cavitated or cavitated lesions), missing (due to caries), or filled surfaces, in any primary tooth of a child under the age of six” ⁽³²⁾.

Furthermore, the Panel's lay definition of ECC was “tooth decay in preschool children which is common, mostly untreated and can have profound impact on children's lives” , dental caries in preschool children has been described by numerous terms and attributed to many aetiologies over the years. Dental caries in preschool children was first described as

“Comforter Caries” in 1911, and in 1962 as “Milk Bottle Mouth”. Over the years, it also has been referred to as “Baby Bottle Syndrome”, “Nursing Bottle Caries”, “Nursing Caries”, and “Baby Bottle Tooth Decay”⁽³³⁾.

These references to dental caries in preschool children generally assumed causality to inappropriate feeding with a baby bottle. The current term early childhood caries (ECC) suggests a more complex disease, related to frequent sugar consumption in environment of enamel adherent bacteria that is not necessarily related to bottle feeding⁽³³⁾.

Although , caries develops when the cariogenic potential of pathological factors outweighs the counterbalancing effect of preventative factors in the oral environment⁽³⁴⁾ ,This association is affected by behavioural and social risk factors. A multilevel conceptual model has been described which explain the multifactorial nature of ECC, with the individual, family, and community levels of influence on oral health outcomes (Figure 1)⁽³⁵⁾. The model recognizes the presence of a complex interplay of causal factors. Last, the model incorporates the aspect of time, recognizing the evolution of oral health diseases (eg, caries) and influences on the child-host over time

According to this model, almost all risk factors for ECC are modifiable. This is particularly the case with the importance of the parents’ health (including nutritional status and oral health); family beliefs and behaviours, such as infant feeding and choice of complementary foods and

drinks; and the ability, knowledge and will to purchase and provide a healthy diet for the child. As with the causal factors of childhood obesity, an appreciation of the effects of excessive and frequent consumption of free sugars is essential in the understanding of the aetiology and control of ECC. The importance of establishing good eating habits in childhood to minimize the risk of ECC and obesity cannot be overestimated. Since eating patterns track from childhood to adulthood, establishing appropriate habits in the early years is a major target.

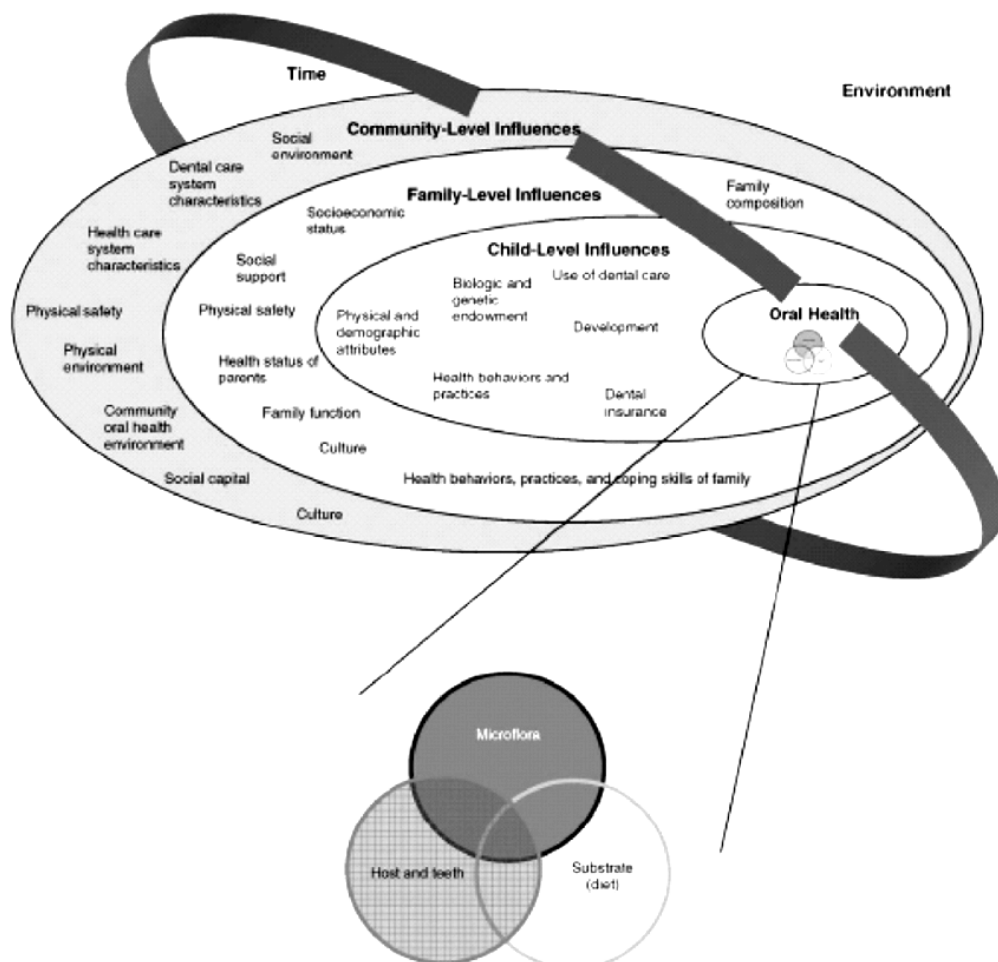


Figure 1: Influences on children's oral health: a conceptual model⁽³⁵⁾

2.4 Behavioural Risk factors of ECC

This section provides an overview of the literature on behavioural risk factors of ECC. Given that several systematic reviews have been carried out in this area. The review will focus on systematic review and randomised controlled trials. It is well known that dental caries is a multi-factorial disease with many factors related to individual's characteristics, behaviours and oral environment affecting the initiation and progression of dental caries. Regular brushing, using fluoridated toothpaste; regular dental visits and less consumption of sugars are known as caries preventing behaviours^(31, 33)

These behaviours in preschool children are influenced by behaviours of mothers or caregivers. For example, adding sugar to milk formula or a pacifier dipped in sugar can increase risk of dental caries^(36,37). Another example of bad manners of child caregivers is the cooling the child food by mothers mouth which is deemed as the main source of bacterial infection of the child and known as 'vertical transmission' from mothers or the primary caretaker^(38, 39). Systematic review evidence suggests that children are most likely to develop caries if *Streptococcus Mutans* is acquired at an early age, although this may be partly compensated by other factors such as good oral hygiene and a non-cariogenic diet. Therefore, it has been concluded that ECC is related to the **socioeconomic status** level of the family strictly⁽⁴⁰⁾.

A previously published comprehensive review , in 1996 , including studies from developing and developed countries reported many risk factors are associated with ECC, but the main one is low socioeconomic status of the parents, with a prevalence of ECC is about 70% in socially disadvantaged groups ^(15;18;41) .

Many systematic reviews were conducted to review the association between dental caries and socioeconomic status, dietary and oral behaviours. A systematic review evidence of dental caries ,in 2004 , related risk factors included seventy-three studies and reported 106 risk factors having noticeable association with caries in children of 6 years and younger. Low parental or maternal education (in 11 studies) and low income (in 4 studies) were significant risk factors. More frequent sweetened snacks especially between meals (in 9 studies), long duration of breast feeding for more than 12 months (in 11 studies), nocturnal breast (in 1 study) and bottle feeding (in 9 studies), frequency of teeth brushing (in 11 studies) and age of starting brushing indicated as main factors associated with ECC ⁽¹⁵⁾ .

Another systematic review , in 2012 , of dental caries in children aged (0 - 6) years and associated risk factors included 55 studies conducted in 28 countries reported. This review found that lower socioeconomic status is associated with higher caries prevalence and severity. Interestingly, parental educational attainment was found to be the prime predictor of a

range of health risk factors over and above the income and occupation. In 48 of 55 studies low parental educational level associated with higher caries level. This is partly because parents with high educational levels have better knowledge, skills and more positive attitudes towards sugar intake and oral health behaviours. with regards to early life feeding behaviours, nocturnal bottle feeding with milk and sugary liquids (in 10 studies), nocturnal breast feeding (in 3 studies), delayed age of both bottle and breast weaning especially in age older than 12 months (in 7 studies), and bed time sweets and sugary liquids (in 10 studies) were identified as risk factors for caries⁽¹⁸⁾

Seven studies found no effect of the breast and bottle feeding on dental caries. In 30 studies feeding behaviours such as sweetened solid snacks and liquids between meals are strongly associated with high risk of caries. Oral hygiene habits were also assessed in this review. six out of nine studies reported , a significance correlation between the delayed age (older than 12 months) to start teeth brushing and high risk of caries. More frequent brushing (in 7 studies) and parental supervision during brushing (in 11 studies) are associated with lower caries levels⁽¹⁸⁾.

Another review in 2014 confirmed that high prevalence of childhood dental caries is strongly related to the socioeconomic status of the family (parents especially maternal educational level and income) and they are the most decisive factors involved. High frequency consumption of sugary liquid

in bottle especially at night and solid sugared snacks between meals considered of the most significant caries risk factors. Furthermore, the results showed an association between the frequency, long duration and nocturnal breastfeeding and high risk for ECC⁽⁴²⁾.

A systematic review and metanalysis ,in 2015 , on the associations between breastfeeding and dental caries which included sixty-three studies⁽⁴³⁾, found that children exposed to longer versus shorter duration of breastfeeding up to age 12 months (more versus less breastfeeding), had a reduced risk of caries (OR 0.50; 95%CI 0.25, 0.99, I(2) 86.8%). Children breastfed >12 months had an increased risk of caries when compared with children breastfed <12 (seven studies (OR 1.99; 1.35, 2.95, I(2) 69.3%). Amongst children breastfed >12 months, those fed nocturnally or more frequently had a further increased caries risk (five studies, OR 7.14; 3.14, 16.23, I(2) 77.1%). The authors concluded that breastfeeding in infancy may protect against dental caries. Further research be needed to understand the increased risk of caries in children breastfed after 12 months.

Another systematic review and meta-analysis were conducted, on 2015, to search for scientific evidence in response to the question: do bottle fed children have more dental caries in primary dentition than breastfed children? (Five cross-sectional, one case-control , one cohort study) were included. A meta-analysis of cross-sectional studies showed that

breastfed children were less affected by dental caries than bottle fed children (OR: 0.43; 95%CI: 0.23-0.80). Four studies showed that bottle fed children had more dental caries ($p < 0.05$), while three studies found no such association ($p > 0.05$). The scientific evidence therefore indicated that breastfeeding can protect against dental caries in early childhood. The benefits of breastfeeding until age two is recommended by international guidelines⁽⁴⁴⁾.

A randomized field trial was conducted , on 2007 , in mothers who gave birth within the public health system in the Brazilian city of Sao Leopoldo, to assess the effectiveness of home visits for advising mothers about breast feeding and weaning on early childhood caries (ECC) at the age of 12 months. The intervention group received the advice 10 days after the child's birth, monthly up to 6 months, at 8, 10 and 12 months, based on the 'Ten Steps for Healthy Feeding', a Brazilian national health policy for primary care, based on WHO guidelines⁽⁴⁵⁾ .

Both groups had research assessment at 6 and 12 months, with dental caries investigated in this last assessment; 122 children were lost in the 1-year follow-up; 378 were assessed for caries. The analysis showed that 0.2% of the children in the intervention group and 18.3% of the controls had caries. The odds of caries was 48% lower for the intervention group, adjusted for number of teeth (OR = 0.52, 95% CI = 0.27-0.97).

Mean decayed surfaces (DS) were lower for the intervention group (0.37) when compared with the control group (0.63), (Mann-Whitney U, $P = 0.03$). The intervention group had significantly longer duration of exclusive breast feeding ($P = 0.000$), later introduction of sugar ($P = 0.005$), and smaller probability of ever having eaten biscuits ($P = 0.000$), honey ($P = 0.003$), soft drinks ($P = 0.02$), fromage-frais ($P = 0.001$), chocolate and sweets ($P = 0.001$)⁽⁴⁵⁾.

2.5 Social Determinants of dental caries

Caries prevalence in children and their associations with socioeconomic factors (oral health inequalities) have been well studied worldwide. ^(11, 19) Disadvantaged children, wherever they live, are more likely to develop caries than their better off peers. This was observed by several studies that have highlighted social differences in the prevalence rates of ECC; disadvantaged children also have poorer dental health ⁽⁴⁶⁻⁵¹⁾.

Likewise, a cross sectional study ,in 2007, assessing dental caries experience and its relation with socioeconomic status among twelve-years school children, showed that income, education level, housing conditions and socioeconomic status have a significant relationship with higher prevalence of dental caries ⁽⁵²⁾. Similarly, a study conducted in Brazil, in 2009 found an inverse association between dental caries with income and with education level of the father and the mother ⁽⁵³⁾.

A recent study in Lausanne, Switzerland, in 2015, assessed a sample of 856 children from 3 to <6 years of age and reported that children from lower socioeconomic background have higher rates of dental caries , Where children with parents did not complete their primary education, ECC= 64.3 %; but with parents with a university education, ECC = 15.8 %; children with unemployed parents, ECC = 48.3 %; but with parents with a higher occupational level, ECC = 16.0 %; and children in lower income families, ECC = 42.6 %; but in higher-income families, ECC = 12.8 % ⁽⁵⁴⁾.

An observational cross-sectional study was designed , in 2014 , to evaluate the influence of several determinants on the presence of early childhood caries (ECC) in preschool children living in northern Sardinia, Italy. These determinants include the educational level and occupational status of the parents as a proxy for the socioeconomic status (SES) and behavioral factors (dietary and oral hygiene).

Caries risk increased with lower parents' educational level ($P = 0.01$), increased number of siblings ($P < 0.01$), the use of bottle feeding ($P = 0.02$), and the use of a sweetened baby's pacifier at night ($P = 0.01$). A high parental educational level played a protective role on the presence of caries lesion [odds ratio (OR)=0.51, 95% confidence interval (CI) 0.34-0.78]; the mother's being employed had a positive statistically significant association with the child having decayed, missing, filled tooth surfaces = 0 (OR = 0.64,

95% CI 0.23-0.97). The presence of more than one sibling in the family was associated with caries (OR = 1.70, 95% CI 1.20-2.40). The authors concluded that ECC prevalence evaluated was similar to other western countries, and SES and behavioral habits influence the development of ECC⁽⁵⁵⁾.

In China, Data from the Fourth National Oral Health Survey of China (2015), comprising of 4360 children aged 3–5 years were analysed. There were significant associations between SES and prevalence of dental caries and dmft ($p < 0.001$). Children from lower educated (RII 1.36, 95% CI 1.3 to 1.43; SII 0.97, 95% CI 0.81 to 1.13) and lower household income (RII 1.17, 95% CI 1.11 to 1.24; SII 0.55, 95% CI 0.35 to 0.75) families had higher dmft than those from well-educated and most affluent families. Relative and absolute inequalities in dental caries were larger in urban areas by household income, and in rural areas by parental education. Conclusions; Association between dental caries and SES was demonstrated and socioeconomic inequalities in dental caries existed among Chinese preschool children⁽⁵⁶⁾.

2.5.1 Measurement of SES

Different measures of SES have been used in health research, including, mainly, education, occupational class and income^(57;59), which showed strong association with oral health^(60;70). SES can be generally divided into Objective and subjective SES. Objective SES indicated by occupation, income and education⁽⁷¹⁾. The subjective SES is ‘the

individual's perception of [his] own position in the social hierarchy⁽⁷²⁾. Within this research, objective SES will be used as a SES indicator of these, education is the most common single measure of SES due to many reasons. For example, it is collected easily, it can give a picture on the early life stages SES, its stability through course of life , and its usually give a prediction and can define employment and average income for the individual^(73;74). furthermore, education is relatively easy to interpret and allows categorising the whole population and not only those who are active in the employment sector ^(75;76). Therefore, education is commonly used in cross-national studies because of its high comparability ⁽⁷⁶⁾. However, Education remains stable after reaching certain levels and hence it may reflect less precisely the current SES of the individual ⁽⁷⁷⁾. Also, its outcome may vary in different contexts. In other words, education might result into different occupational opportunities and income ⁽⁷³⁾.

Education has been associated with health in many aspects. Education can determine the opportunities of occupation and hence, the economic status. In many countries, people with higher educational level have more chances to obtain better jobs with the highest income than less educated partner⁽⁷⁸⁾. Also, education can influence the access to better health resources and allow better control on lives and more social support ⁽⁷⁸⁾.

The level of education could also influence the cognitive functioning and time preferences, leading to better health related decisions. Consequently, these individuals tend to give more importance to long-term goals over short-term outcomes, and hence these shape their decisions on particular behaviours and habits^(57, 59).

2.5.2 Role of parents in oral health of Children

Children's health-related attitude and behaviours are taught and adopted at home through a process called primary socialization. Later, these attitude and behaviours are shaped and formalized through the community network formed with friends, peers and teachers and significant others the children interact with through a process called secondary socialization⁽⁷⁹⁾.

Among family members, mother play a determinate role in maintain oral health of their children and developing their oral health related beliefs and practices. The educational level of mothers is believed to positively associated with their oral health related knowledge^(81). For example, a study of Kuwaiti mothers , in 2013, showed that mothers and caregivers with higher education had better knowledge and practices. Education and attitude appeared to be favourable indicators of the caregivers' practices with regard to the oral health of their preschool children⁽⁸⁰⁾. In addition, there is evidence that oral health knowledge of mothers is associated with caries levels in their 3-year-old children^(81; 82)

Health promotion theory has discredited the efforts of improving knowledge as being ineffective in changing behaviour⁽⁸³⁾. However, many dental studies have demonstrated that increased dental knowledge had positive effects on oral health status⁽⁸¹⁾. Therefore, it has been considered that increasing knowledge still has an important role in today's dental arena.

2.6 Prevalence of ECC

Traditionally the prevalence and severity of dental caries are presented as the percentages of people with dental caries and the mean number of teeth affected by dental caries per person. Information collected by the WHO Collaborating Centre for Community Oral Health Programme and Research, University of Copenhagen is given in Figure 2, which indicates that the burden of dental caries affects significant numbers of children in all WHO regions⁽⁸⁴⁾.

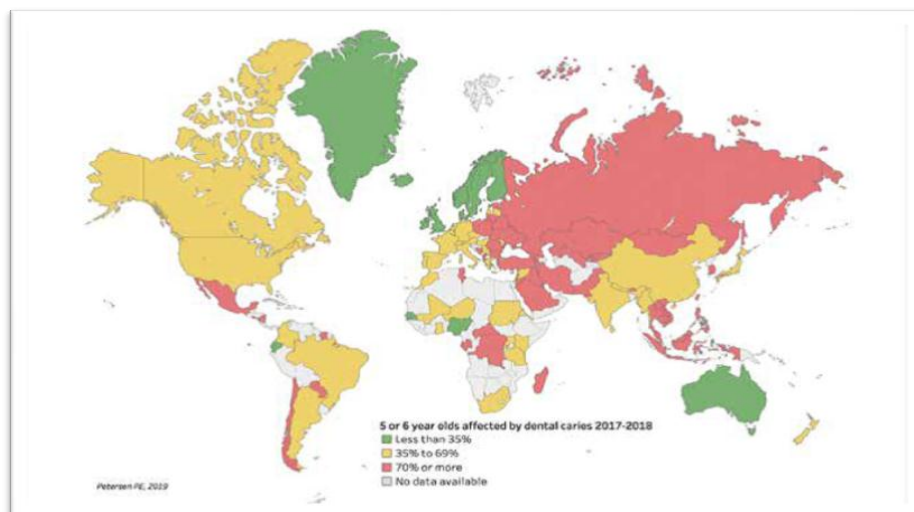


Figure 2: Percentages of children aged 5 and 6 years affected by dental caries in 2017–2018⁽⁸⁴⁾

During the International Association of Paediatric Dentistry Bangkok Conference on early childhood caries (ECC) held in 3-4 November 2018, data were abstracted from 72 worldwide studies between 1998 and 2018 that measured caries prevalence in preschool children. The caries prevalence for 4 year old children from these studies ranged from 12% in France, to 98% in Australia. It was noted that the mean caries prevalence for 1 year olds was 17%, and greatly increased to 36% in 2 year olds. Additionally, the 3 - 4 and 5 year olds mean caries prevalence were 43%, 55%, and 63%, respectively. However, these reports used different criteria for caries assessment and hence the findings are considered imprecise^(33;42;43).

A very recent systematic review of studies on the prevalence of ECC across the world was published in the year 2021, From 472 studies, 214 used WHO criteria and 125 fit the inclusion criteria. Sixty-four reports published between the years 1992-2019 had adequate data to be summarised in the meta-analysis. They covered 29 countries and 59018 children. Global pooled prevalence was 48%. The prevalence by continent was Africa: 30%; Americas: 48%; Asia: 52%; Europe: 43%; and Oceania: 82%. The authors concluded that ECC prevalence varied widely, and there was more variance attributable to between-country differences rather than continent or change over time^(33;85).

Another recent systematic review described the prevalence of early childhood caries (ECC) among 5 years old children globally, two independent reviewers performed a systematic literature search to identify English publications from January 2013 to December 2017 that used epidemiological surveys for reporting the caries status of 5 years old children with the decayed, missing, and filled primary teeth (dmft) index. Among the 2410 identified publications, 37 articles of moderate or good quality were included. Twenty of the included studies were conducted in Asia (China, India, Indonesia, Korea, Nepal, and Thailand), seven in Europe (Greece, Germany, Great Britain, and Italy), six in South America (Brazil), two in the Middle East (Saudi Arabia and Turkey), one in Oceania (Australia), and one in Africa (Sudan)⁽⁸⁶⁾.

The prevalence of ECC ranged from 23% to 90%, and most of them (26/37) were higher than 50%. The mean dmft score varied from 0.9 to 7.5. Based on the included studies published in the study period, there was a wide variation of ECC prevalence across countries, and ECC remains prevalent in most countries worldwide⁽⁸⁶⁾.

A systematic review to determine prevalence of dental caries in primary and permanent teeth Arab league countries was conducted and published in 2014. The review included children aged 2-12 years of age and found that mean dmft was 4.341 (95% CI 3.714, 4.969) which is higher than

that in permanent dentition ⁽⁸⁷⁾. another systematic review of studies on dental caries in primary dentitions published during the period from January 1992 to June , 2016, which was conducted in Arabic Gulf countries showed that the overall mean dmft in the primary teeth was 5.14 with prevalence of 80.9% in this area⁽⁸⁸⁾.

2.6.1 Dental caries in Libyan pre-school children:

There are few studies that addressed the prevalence and severity of dental caries in primary dentition among Libyan children. A study by Hawew, Ellwood ⁽⁸⁹⁾ , reported that the prevalence of dental caries of 6 and 12-year-old children in two cities in Libya was 39% in Jardinah, with mean dmft 1.07 and DMFT 0.87, and 48% in Benghazi, with mean dmft 2.32 and DMFT 1.17 a study by Al-Shabarti et al carried out in1993-1994, with sample of 762, 6-12 years old schoolchildren in Benghazi showed that the prevalence of dental caries was 61.9 %. The most recent paper on prevalence of caries in preschool children dated back to 2003. Of 685 preschool children included in the study , which was conducted in Benghazi, 58% of children had carious primary teeth with mean dmft of 2.58 ⁽⁹⁰⁾.

A recent cross-sectional survey including 706 six-year-old children was conducted in 2017 in Benghazi, Libya. Data were collected through a self-administered questionnaire assessing socioeconomic status and oral health and quality of life impacts. Clinical examination assessed caries

experience at tooth level (dmft) . Caries prevalence was 71%. The mean \pm SD dmft score was 3.23 ± 3.32 . There was a significant and direct association between dmft scores and daily consumption of sugary snacks and a significant inverse association with tooth brushing twice daily. The authors concluded that 6-year-old Libyan children had a relatively high caries experience and untreated decay in their primary dentition. Social disparities, sugar consumption patterns and oral hygiene practices were associated with high caries experience⁽⁹¹⁾.

Another study included a convenience sample of thousand 6-7 years old children from the capital Tripoli found that 78% of children had dental caries in their primary dentition, with a mean dmft of 3.7 ± 3.3 . In this study, caries was associated with SES attributes such as maternal employment and behavioral factors, including: tooth brushing duration, past dental treatment, and past emergency visit⁽⁹²⁾.

Chapter 3: Aims and objectives

3.1 Aim

To explore caries experience and its associated factors among Libyan preschool children aged 3-5 years

3.2 Objectives

1. To assess caries experience among preschool children aged 3-5 years using dmft index
2. To assess the knowledge of parents' regarding caries etiology
3. To assess parental attitude towards primary dentition
4. To assess sociodemographic risk factors associated with caries prevalence among study sample
5. To assess behavioral risk factors associated with caries prevalence among study sample

Chapter 4 :

Methods

4.1 Study Design:

A cross-sectional survey of 506 male and female Libyan preschool children aged 3-5 years in the city of Benghazi. The study included clinical examination of the children as well as a self-administered questionnaire completed by parents at homes.

4.2 Setting

The study was conducted in the city of Benghazi which is located on the eastern Libyan coast. Libya is one of the Arabic countries, which located in the North Africa. Libya is the fourth largest country in Africa. The official language is the Arabic language.

In recent years preschool nurseries have become very popular and accept children from various social classes. The nurseries in Benghazi are widely distributed and included both private and state-run nurseries. Children aged less than six years are accepted in nurseries.

4.3 Study population and sampling

The study population consist of 3-5 years old children attending preschool nurseries in Benghazi. The study sampling was recruited using convenience sampling technique according to the accessibilities of the

nurseries. For a prevalence study, the sample size required can be calculated according to the following formula.

Where

$$n = \frac{Z^2 \times P(1-P)}{d^2}$$

n =sample size.

Z =Z statistic for a level of confidence.

P =expected prevalence or proportion (in proportion of one).

d =precision (in proportion of one, if 5%, d =0.05).

The sample size was calculated on the basis of giving 50/50 chance of having caries in 3-5-year olds, using a confidence level of 95% and margin error at 5%. Therefore, a minimum sample size of 385 children was required to estimate caries prevalence in the preschool children.

To obtain the eligible population of the study, the following inclusion and exclusion criteria were applied in the survey:

Inclusion criteria:

- Children of 3-5 years of age according to the last birthday.
- Children who were free from systematic disease based on school medical report.

- Libyan nationality.

Exclusion criteria:

- Parents who did not give consent.
- Uncooperative children.
- Not resident in Benghazi (displaced families).

4.4 Data Collection:

4.4.1 Questionnaire

Parents who agreed to take part were then invited to complete a self-administered questionnaire while in the waiting room. The research team developed a self-administered questionnaire from previous studies and literature reviews , to capture information about participant's sociodemographic characteristics (child's gender, maternal education, and family size) and oral health behaviours of children (sugar consumption behaviours, feeding history, and oral hygiene practices). The questionnaire was pre-tested for clarity and face validity among group of parents attending the Faculty of Dentistry clinics. The questionnaire comprised of close-ended questions and takes, on average, 20 minutes to be completed.

4.4.2 Clinical examination

Children participants were invited to oral examination. All examinations were carried out on ordinary chair in their classroom, using

disposable dental examination mirror and day light. One trained and calibrated examiner conducted the examinations. Intra-class correlation coefficient (ICC) for dmfs and dmft were 0.88 and 0.90, respectively. Dental caries was measured according to World Health Organisation criteria (at dentin level), using Decayed, Missing and Filled teeth indices, for primary teeth (dmft) ⁽⁹³⁾.

4.5 Statistical analysis:

Data management and analysis was performed using the SPSS software version 24.0 (Armonk, NY: IBM Corp.). Summary statistics were used to describe children's demographics, behaviours and caries prevalence. Mann-Whitney U test and Kruskal Wallas Test were used to compare mean dmft scores by participants' characteristics. Linear correlation was used to assess the association between caries experience and family size. The Statistical significance for all statistical procedures was set at ≤ 0.05 .

4.6 Ethical consideration

Ethical approval for this study was obtained from local ethics committee before commencing data collection . Consent forms explaining the study aims and potential risks were given to all parents/guardians. Permissions were obtained from involved nurseries. The participation in the study was voluntary.

Chapter 5 :

Results

5.1 Study sample and response rate:

In the present study out of 700 invitations to participate were sent out to parents along with questionnaires, consent forms, 506 were returned, and hence the dental examination was conducted. This gives a total response rate of 72%.

Table 1 presents the sociodemographic characteristics for the study sample. Gender was equally distributed with 253 children males and females. While most of mothers (75.7%) were educated at the university level, and just above the half of mothers were working (51%). The majority of fathers (54%) attained a university degree. Most of the children lives with both parents (95%), in families with an average of 5 members and ranging from 1 to 13 family members.

Table 1: Sociodemographic characteristics for the study sample (n=506)

Variable		N (%)
Gender	Male	253 (50)
	Female	253 (50)
Mothers' education level	Primary	12 (2.4)
	Preparatory	41 (8.1)
	Secondary	70 (13.8)
	University	383 (75.7)
Fathers' education level	Primary	15 (3)
	Preparatory	90 (18.7)
	Secondary	125 (24.1)
	University	276 (54.5)
Working mother	Yes	248 (49)
	No	258 (51)
Caregivers of children	Both parents	481 (95)
	Mother only	18 (3.6)
	Others	7 (1.4)
Family size	Median (Min-Max)	
		5 (1-13)

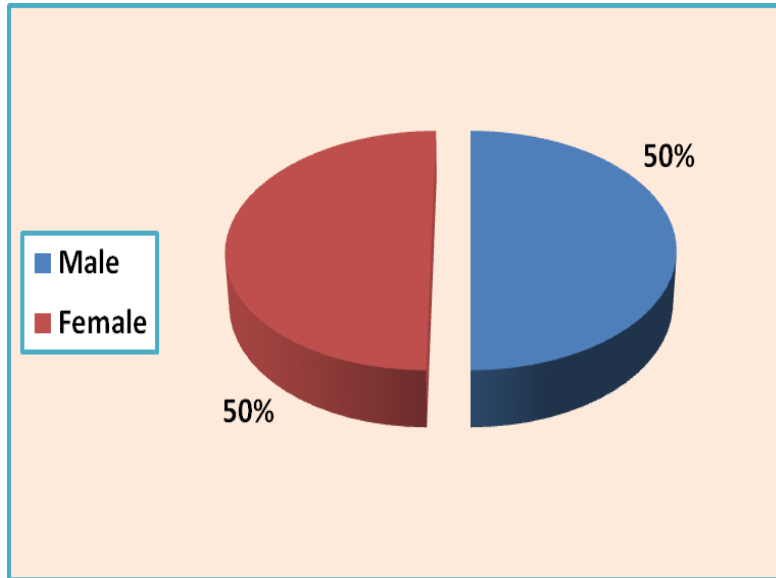


Figure 3 : Distribution of patients according to Gender.

The gender was equally distributed with 253 children males and females

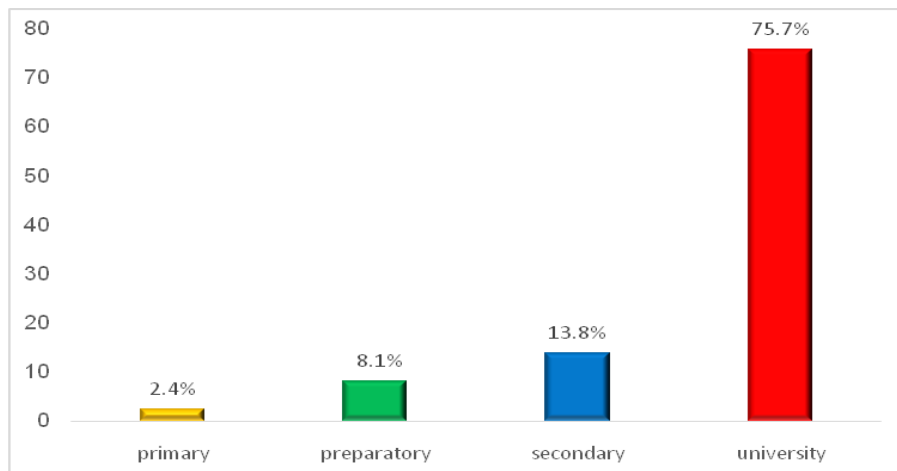


Figure 4: Level of mothers education

most of mothers (75.7%) were educated at the university level

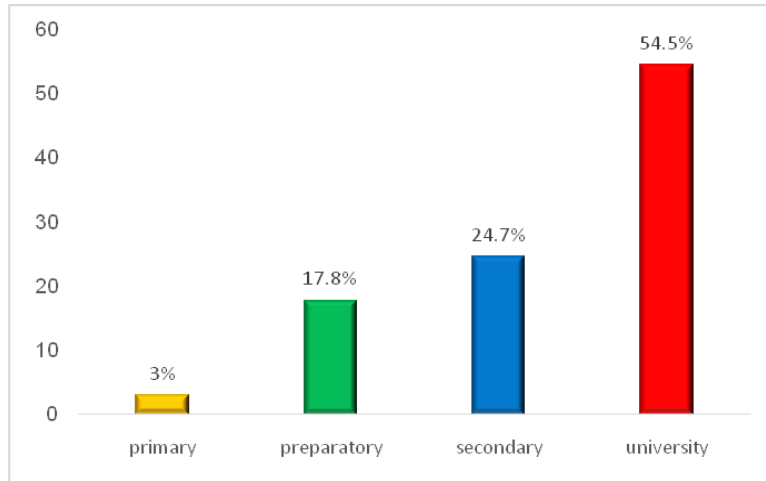


Figure 5: Level of fathers education

The majority of fathers (54%) attained a university degree

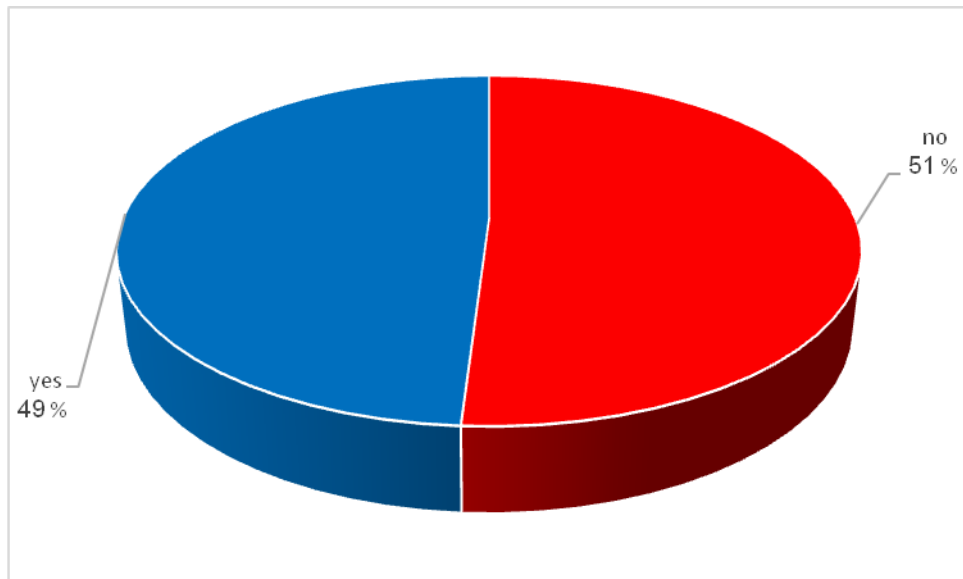


Figure 6 : Working Mother

just above the half of mothers were working (51%)

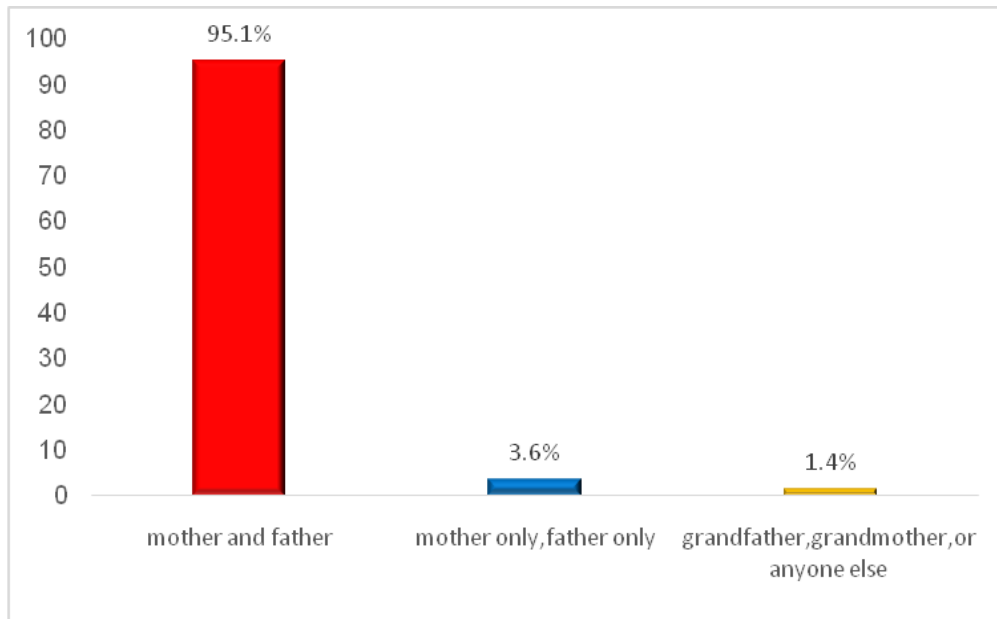


Figure 7 : Distribution of children according to their caregivers

Most of the children lives with both parents (95%)

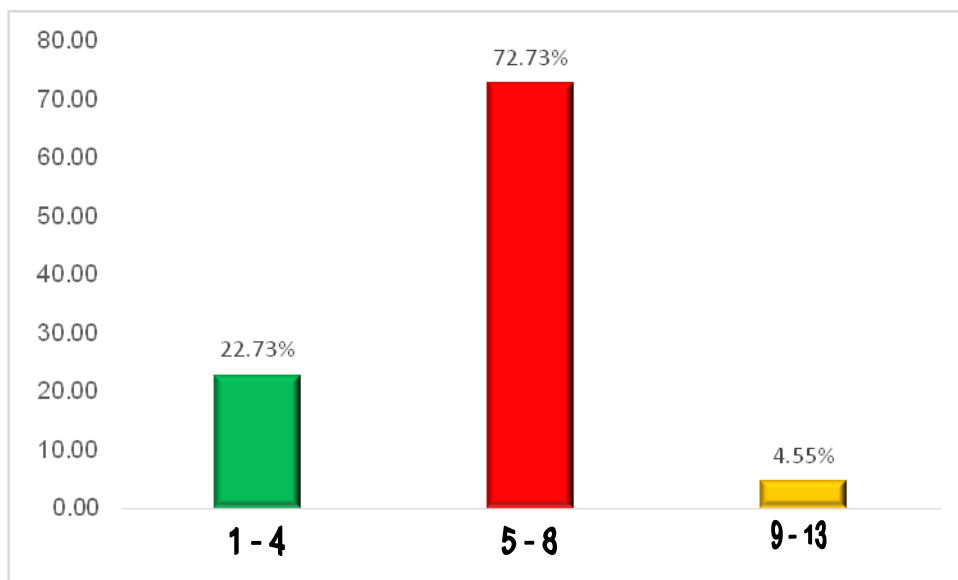


Figure 8: Family size

families with an average of 5 members and ranging from 1 to 13 family members.

Table 2 shows the self-reported oral health behaviours. The majority of respondents reported mixed feeding pattern (59.7%), for a period longer than one year (71.5%), at regular intervals (61.7%). On the other hand, less than the third (28.5%) reported exclusive breast feeding and feeding period for less than one year. Whilst small proportion of mothers (14%) reported adding sugar to milk formulas, the majority indicated frequent snacking between meals (88.7%) and providing sugary snacks as rewards (62.5%). Although most of mothers reported that their children brush their teeth (88.5%), just above the half of them (55%) indicated assisting their children in tooth brushing.

Table 2: Oral health behaviours of the study sample (n=506)

Variable		N (%)
Feeding practices	Exclusive breastfeeding	144 (28.5)
	Bottle-feeding	61 (12.1)
	Mixed feeding	301 (59.5)
Duration of breast/bottle feeding	Less than 1 year	144 (28.5)
	1 year or more	362 (71.5)
Frequency of breast /bottle feeding per day	On demand	194 (38.3)
	Regular feeding interval	312 (61.7)
Adding sugar or sweeteners with formula milk in the bottle	Yes	71 (14)
	No	435 (86)
Consumption of snacks between the main meal	Yes	449 (88.7)
	No	57 (11.3)
Using sweets and chocolate as a reward	Yes	316 (62.5)
	No	190 (37.5)
Tooth brushing with tooth paste	Yes	420 (83)
	No	86 (17)
Mother assistant	Yes	278 (55)
	No	228 (45)

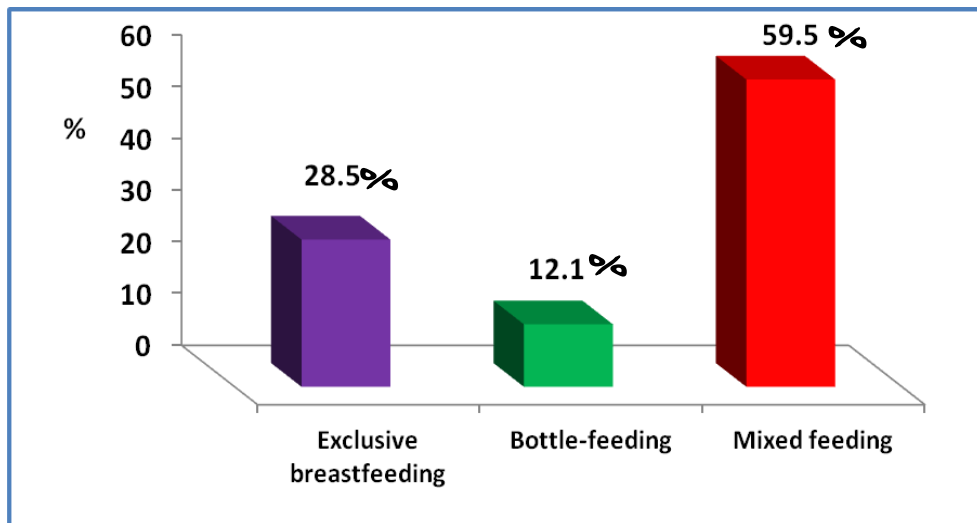


Figure 9 : Distribution of sample according to feeding practice
 majority of respondents reported mixed feeding pattern (59.7%)
 exclusive bottle-feeding uncommon

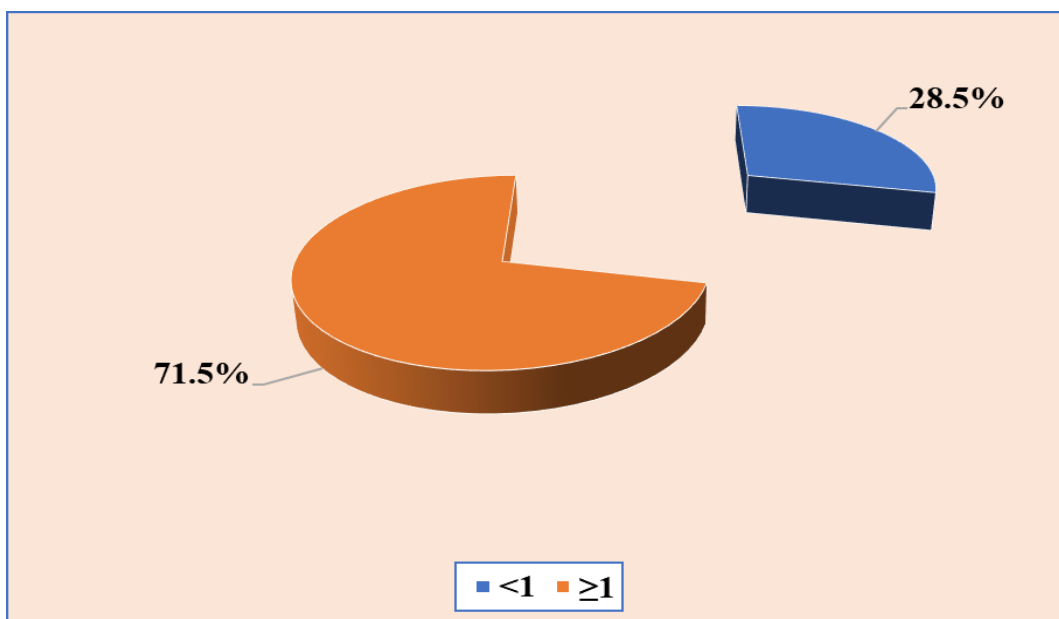


Figure 10 : Distribution of sample according to duration of (breast/bottle) feeding

majority of respondents reported feeding pattern for a period longer than one year (71.5%)

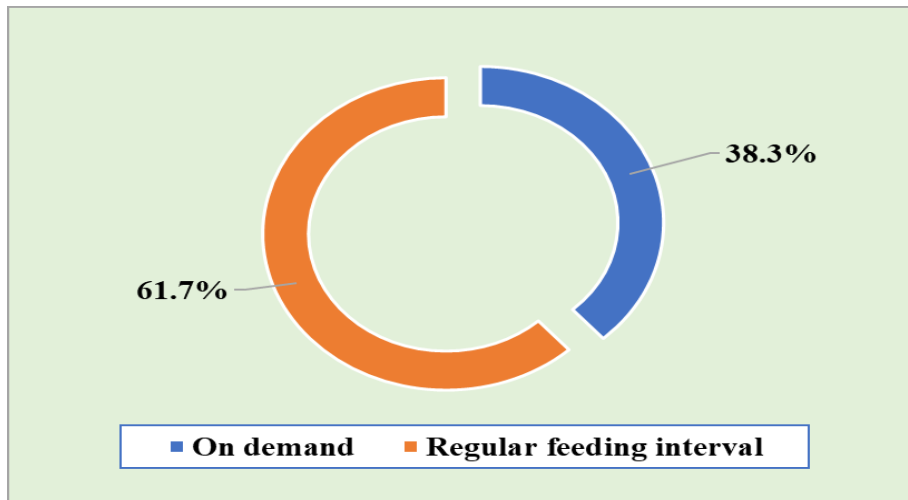


Figure 11: Distribution of sample according to frequency of breast /bottle feeding per day

Most of respondents reported feeding pattern at regular intervals (61.7%)

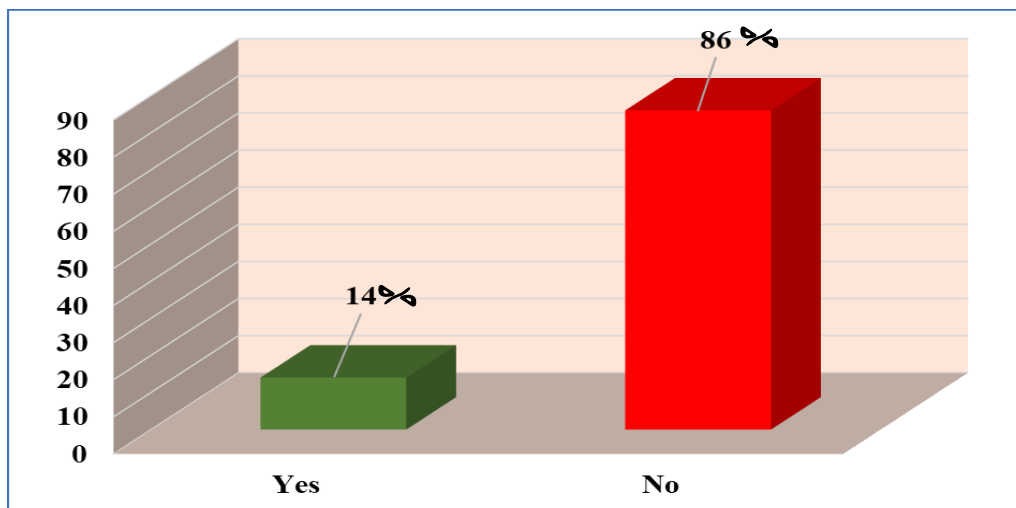


Figure12 : Adding sugar sweeteners with formula milk in the bottle

a small proportion of mothers (14%) reported adding sugar to milk formulas

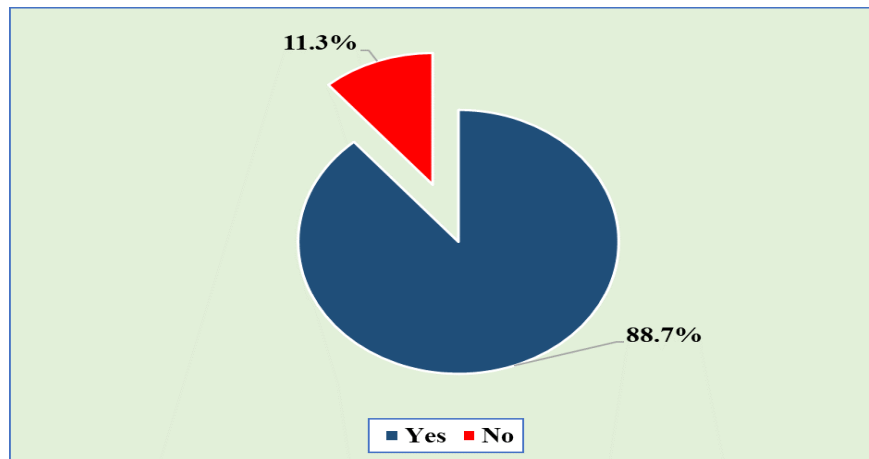


Figure 13 : Consumption of snacks between the main meal
 the majority indicated frequent snacking between meals (88.7%)

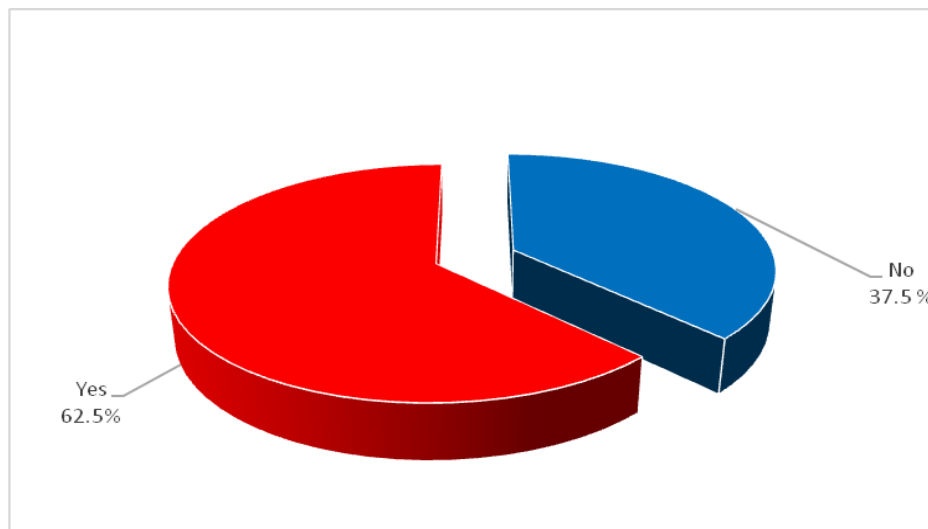


Figure 14 : Using sweets and chocolate as a reward and encouragement method for the child

Most of respondents providing sugary snacks as rewards (62.5%).

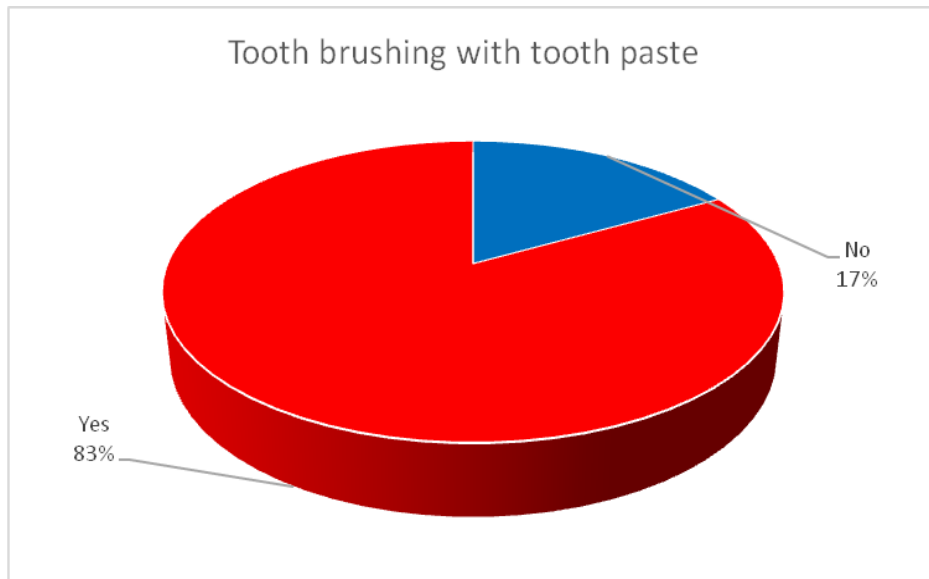


Figure 15: Tooth brushing with tooth paste
 most of mothers reported that their children brush their teeth (88.5%)

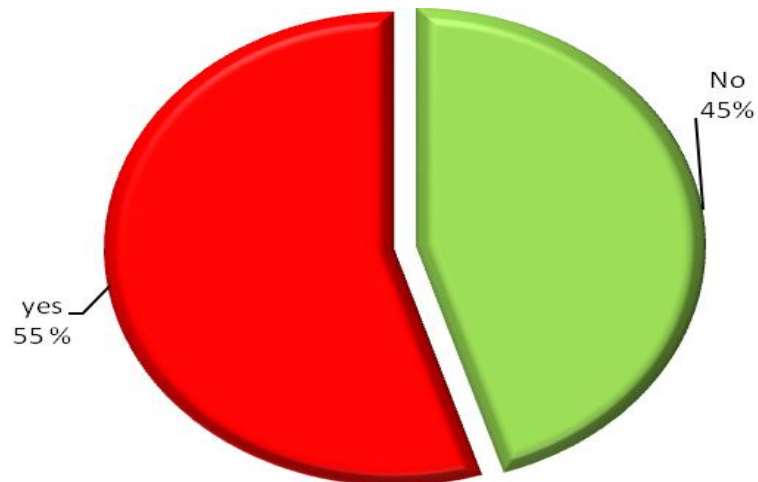


Figure 16: mothers' assistance
 just above the half of them (55%) indicated assisting their children in tooth brushing.

5.2 Attitude to primary dentition and knowledge of causes of dental caries

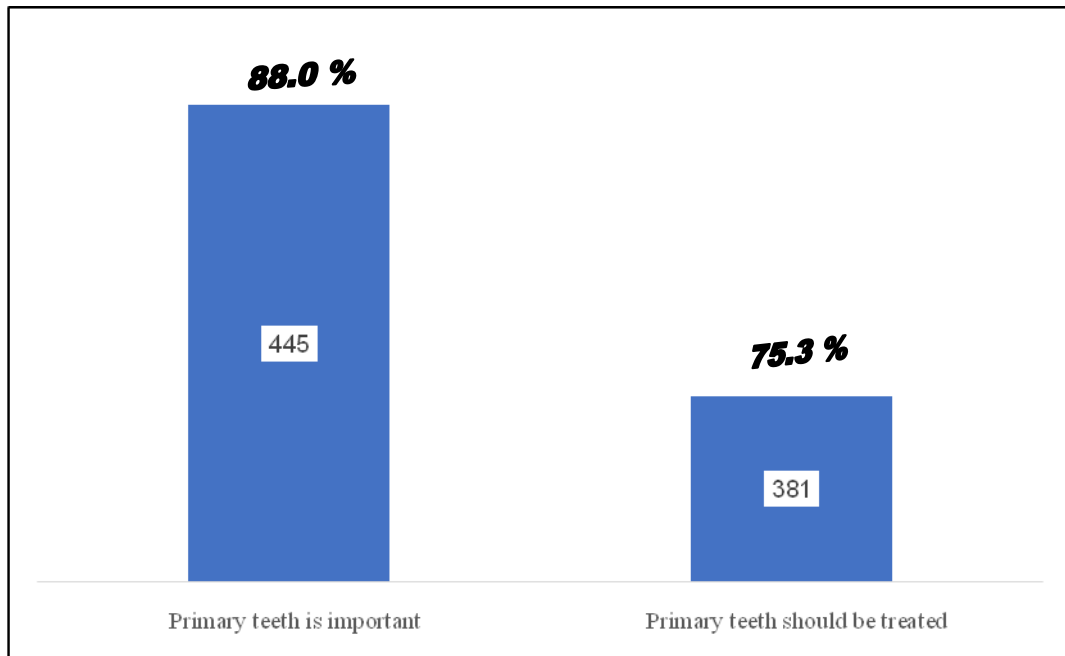


Figure 17: Positive attitudes towards primary dentition

The percentage of respondents to questionnaires who demonstrated positive attitudes toward primary dentition. Most of participants consider primary teeth as important (88%) and the majority of them (75.3%) agree that primary teeth should be treated rather than extracted.

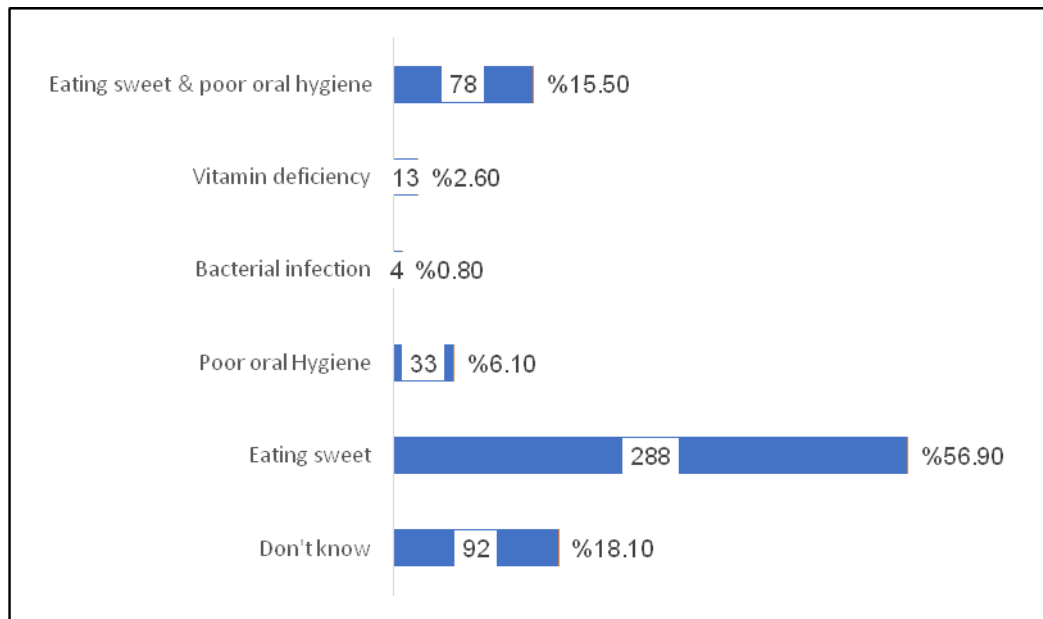


Figure 18 : Perceived causes of dental caries

Depicts the distribution of answers to a question on the cause of dental caries. While nearly the fifth of respondents do not know the answer, the majority believe the consumption of sweets to be the cause of dental decay (56%). Small proportion of participants blamed poor oral hygiene only (6.1%) and 28% attributed caries to multiple factors including sweets and poor oral hygiene. Few respondents believed caries is cause by Vitamin deficiency and bacterial infection.

5.3 Caries experience

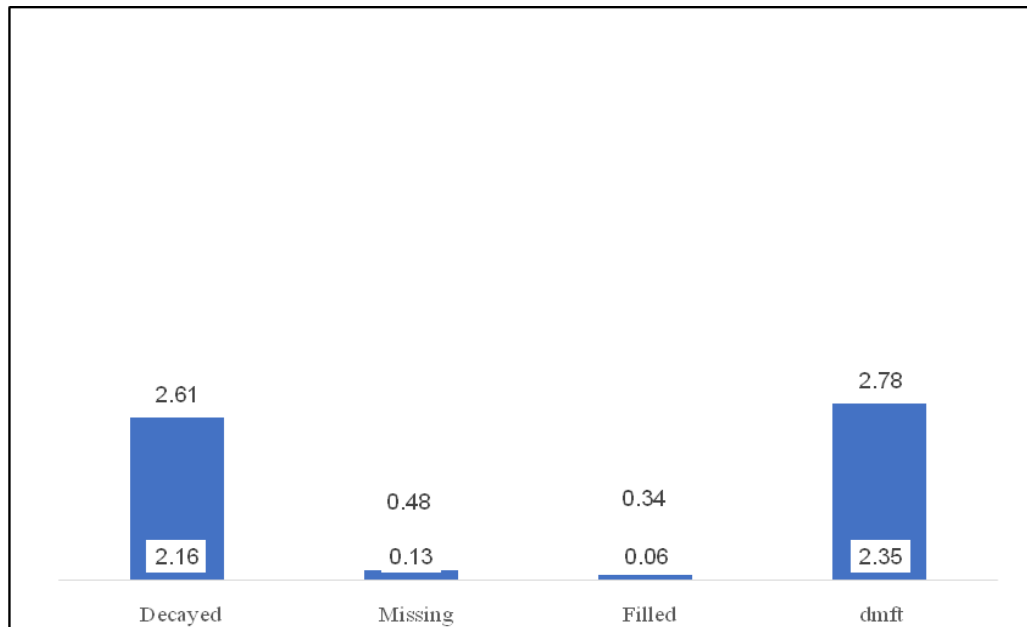


Figure 19: The distribution of caries experience according to dmft index

The Figure describe the caries experience among study sample according to dmft index and its components. The number of decayed teeth was ranging between 0 and 14 with an average of 2.16 ± 2.61 , affecting 59.5% of children. The numbers of missing and filled teeth were generally low , with an average of 0.13 ± 0.48 , and 0.06 ± 0.34 , respectively. The range for missing teeth was 0-5 and for filled teeth 0-4. The proportion of children who had filling was as low as 4.3% of total participants. The average dmft score was 2.35 ± 2.78 , ranging between 0 and 15.

5.4 Sociodemographic factors associated with caries experience

Comparisons of dmft scores according to the sociodemographic characteristics of study participants are presented in table 3 . Although females, children whose parents did not attain university degree and those who don't live with their parents and whose mothers are housewives, had slightly higher numbers of decayed teeth and total dmft score, these differences were not statistically significant. On the other hand, the only statistically significant differences were observed in relation to the numbers of filled teeth according to parents' education. Children of university educated mothers and fathers had higher number of filled teeth ($p=0.008$ and 0.028 , respectively). There is no consistent pattern for the numbers of missing teeth. However, it can be seen than children who do not live with both parents had no missing or filled teeth.

Table 3: Comparison of caries experience by sociodemographic characteristics

Variable		Mean (SD) Decayed	Mean (SD) Missing	Mean (SD) Filled	Mean (SD) Dmft
Gender	Male	2.14 (2.60)	0.14 (0.56)	0.09 (0.42)	2.37 (2.81)
	Female	2.18 (2.64)	0.11 (0.38)	0.04 (0.23)	2.33 (2.75)
	P value	0.931	0.803	0.187	0.936
Mother's Education	Less than university	2.20 (2.64)	0.07 (0.29)	0.02 (0.18)	2.29 (2.72)
	University or higher	2.15 (2.61)	0.15 (0.52)	0.08 (0.38)	2.37 (2.79)
	P value	0.991	0.235	0.028*	0.834
Father's Education	Less than university	2.43 (2.80)	0.15 (0.52)	0.02 (0.13)	2.60 (2.96)
	University or higher	1.93 (2.42)	0.11 (0.44)	0.10 (0.44)	2.14 (2.61)
	P value	0.071	0.207	0.008**	0.131
Working Mother	Working mother	2.05 (2.61)	0.12 (0.46)	0.08 (0.41)	2.25 (2.81)
	House wife	2.27 (2.61)	0.14 (0.49)	0.04 (0.25)	2.45 (2.75)
	P value	0.210	0.440	0.162	0.248
Living condition of the child	Both parents	2.16 (2.59)	0.14 (0.49)	0.07 (0.38)	2.36 (2.77)
	Mother only	2.06 (2.67)	0.00 (0.00)	0.00 (0.00)	2.06 (2.67)
	Others	2.29 (4.03)	0.00 (0.00)	0.00 (0.00)	2.29 (4.03)
	P value	0.797	0.271	0.550	0.666

* $p \leq 0.05$, Mann-Whitney U test was used to compare subgroups.

Bivariate correlation between dmft and family size is present in table 4

A statistically significant but weak positive correlation is observed between family size of number of decayed teeth ($p=0.033$) and dmft score ($p=0.043$)

Table 4: Correlation between caries experience and family size

Variable	Pearson correlation with family size	P value
Decayed	0.095	0.033*
Missing	0.019	0.667
Filled	- 0.021	0.451
dmft	0.090	0.043*

* $p \leq 0.05$

5.5 Behavioural factors associated with caries experience

Table 5 summarise comparisons of dmft index and its components with self-reported oral health behaviours. Statistically significant differences were observed in relation to feeding practices and sugar consumption habits. Children whose mothers reported mixed feeding practices and less than one year feeding had lower number of decayed teeth ($p=0.007$, 0.005 , respectively)and dmft score ($p=0.020$, 0.004 , respectively) than those reported exclusive breast feeding or bottle feeding. Adding sugar to milk formula and frequent snacking of sugar snack between meals are associated with higher numbers of decayed teeth ($p=0.20$, 0.003 , respectively) and dmft score ($p=0.20$, 0.003 , respectively).

Table 5 : Comparison of caries experience by oral health behaviours

Variable vs Mean (SD)		Decayed	Missing	Filled	dmft
Feeding practices	breastfeeding	2.56 (2.63)	0.13 (0.44)	0.06 (0.28)	2.74 (2.86)
	Bottle-feeding	2.66 (3.02)	0.11 (0.37)	0.07 (0.31)	2.84 (3.13)
	Mixed feeding	1.87 (2.48)	0.13 (0.51)	0.07 (0.37)	2.07 (2.62)
	P value	0.007**	0.983	0.971	0.020*
Duration of breast/bottle feeding	Less than 1 year	1.65 (2.89)	0.13 (0.44)	0.05 (0.38)	1.83 (2.59)
	1 year or more	2.36 (2.71)	0.13 (0.49)	0.07 (0.32)	2.56 (2.83)
	P value	0.005**	0.761	0.122	0.004**
Frequency of breast /bottle feeding per day	On demand	2.07 (2.66)	0.10 (0.36)	0.08 (0.43)	2.25 (2.85)
	Regular feeding	2.21(2.58)	0.15 (0.54)	0.05 (0.27)	2.41 (2.73)
	P value	0.280	0.395	0.770	0.277
Adding sugar or sweeteners with formula milk in the bottle	Yes	2.86	0.13 (0.53)	0.13(0.56)	3.11 (3.12)
	No	2.05	0.13 (0.47)	0.05 (0.29)	2.23 (2.70)
	P value	0.020*	0.825	0.224	0.020*
Consumption of snacks between the main meal	Yes	2.25 (2.69)	0.12 (0.46)	0.07 (0.35)	2.43 (2.85)
	No	1.46 (1.74)	0.21 (0.59)	0.04 (0.19)	1.70 (2.05)
	P value	0.003**	0.158	0.728	0.018*
Using sweets and chocolate as a reward	Yes	2.07 (2.48)	0.12 (0.51)	0.09 (0.41)	2.27 (2.65)
	No	2.32 (2.82)	0.14 (0.42)	0.03 (0.16)	2.48 (2.98)
	P value	0.621	0.144	0.134	0.783
Tooth brushing with tooth paste	Yes	2.12 (2.54)	0.13 (0.43)	0.08(0.37)	2.33 (2.71)
	No	2.34 (2.85)	0.13 (0.49)	0.00 (0.00)	2.47 (3.11)
	P value	0.969	0.924	0.030*	0.773
Mother assistant	Yes	2.02 (2.51)	0.13 (0.47)	0.07 (0.34)	2.22 (2.69)
	No	2.33 (2.73)	0.12 (0.48)	0.06 (0.34)	2.51 (2.88)
	P value	0.198	0.807	0.680	0.280

Chapter 6 :

Discussion , Conclusion and Recommendation

6. 1 Discussion

This study aimed to investigate caries experience and its related factors among Libyan children aged 3-5 years of age. As mention in the introduction chapter and the literature review, a few attempts have been made to assess caries experience among Libyan preschool children. The present study used a cross-sectional survey design to collect clinical data from the children and information on oral health behaviours from mothers of children attending nurseries in Benghazi, Libya.

Before discussing the findings of this study, the one should bear in mind that the cross-sectional design can suggest correlation but it cannot confirm any causal relationship ⁽⁹⁴⁾. However, cross-sectional surveys are considered appropriate for developing baseline data and inform future planning and research, particularly in low resourced countries like Libya ⁽⁹⁵⁾. In addition, the study used self-administered questionnaires completed by mothers that are prone to social desirability bias (respondent give the right answer that may not reflect the actual behaviours).

Therefore, respondents were asked to report their usual practices, and assured that the aim is to describe the actual practices and related variations rather than challenging their level of knowledge or judging their practices ⁽⁹⁶⁾.

The study used convenience sample and therefore the generalizability of the finding might be questioned. However, the sample size was relatively large and the sample profile reflects the spectrum of Libyan population. For example, the gender distribution of children was equal and mothers working status was almost equal. In addition, a range of educational levels of parents is presented in the study. The recruitment included children from private and public nurseries and different geographical locations in Benghazi.

The overall aim of the current study was to describe the caries experience among Libyan preschool children who aged 3-5 years. The period of primary dentition is a complex and critical time for caries development in permanent dentition ⁽⁹⁷⁾. This is because cariogenic bacteria can be transmitted by saliva to the newly erupted permanent teeth. A higher caries experience in permanent dentition has been observed among children with high numbers of cariogenic bacteria in their primary teeth ⁽⁹⁸⁾.

Caries in primary dentition has been recognised as the single best predictor of caries in future ⁽⁹⁹⁾. evidence showed that caries experience during childhood is highly correlated with developing dental caries later in life ^(100, 101). In addition, epidemiological data and evidence from longitudinal studies show that dental caries is more likely to develop within the first few years after eruption ^(100, 101), particularly among those who high risk groups of dental caries ⁽¹⁰²⁾.

The data analysis showed that 60.3% of children had dmft ≥ 1 , mean dmft of 2.35 ± 2.78 . This is lower than that reported in recent studies that investigated caries experience in primary teeth among Libyan children in Benghazi (71.1%, 3.12)⁽⁹¹⁾ and Tripoli (78%, dmft=3.7)⁽⁹²⁾. It is not clear why the prevalence is lower than other Libyan studies but it could be that the two other studies recruited older preschool children. This explanation can be supported by the fact that older libyan study in Benghazi in the year 2003⁽⁹⁰⁾, on sample of 685 preschool children in Benghazi and found that 58% of children had carious primary teeth with a mean dmft of 2.58.

The international conference of ECC in Bangkok 2018 concluded that ECC increases with age⁽³³⁾. Another possibility could be that the other study in Benghazi collected data in dental clinical setting using artificial light which could improve their diagnosis but both studies used WHO criteria which include cavities dentine caries only⁽⁹³⁾.

On the other hand, ECC in Libyan children is comparable to the global prevalence of ECC in Children aged more than 3 years (57.3%)⁽¹⁰³⁾, although the average dmft of Libyan children is still lower than that reported in similar age groups in other Arab countries such as United Arab Emirates and Saudi Arabia⁽¹⁰⁴⁻¹⁰⁶⁾. However, the prevalence observed in our study is higher than pooled prevalence of Africa (30%); and confirm in-between-country differences⁽⁸⁵⁾. For example, caries prevalence in the present study was

higher than that reported in European countries such as Sweden (16%)⁽¹⁰⁷⁾ and Italy 35.2⁽¹⁰⁸⁾.

The proportion of children who had filling was as low as 4.3% of total participants. Similar findings were observed in the previous studies carried out in Libya⁽⁹¹⁾ where untreated dental caries was the main component of dmf and very small proportions of participants had filled surfaces or missing teeth. A similar pattern has been observed in previous studies on dental caries in Libyan children^(109, 110). Similar findings have been reported in several international studies and systematic reviews⁽³³⁾.

This while reflect weakness in dental service in Libya, other authors suggested some explanations. For example, dentists lack the appropriate competence to communicate and manage the behaviour of children⁽¹¹¹⁾ or that the parents consider primary teeth as not important and so no worth treating⁽¹¹²⁾.

The present study investigated parental attitude towards primary dentition. The data analysis showed that most of participants consider primary teeth as important (88%) and the majority of them (75.3%) agree that primary teeth should be treated rather than extracted. Given this, it seems possible that the cause of untreated decay in Libyan children is attributed to poor dental services rather than parental attitude toward primary dentition. However, positive attitudes are not, necessarily, always result in

favourable behaviours ⁽¹¹³⁾. Many factors contribute to the health-related behaviours. These can range from individual and family factors to wider environmental and societal determinants. Further research is required to understand the causes of untreated dental caries among Libyan preschool children. Exploring the competence of dentists and availability of services is needed.

The majority of parents believe the consumption of sweets to be the only cause of dental decay (56%). Small proportion of participants blamed poor oral hygiene only (6.1%) and 28% attributed caries to multiple factors including sweets and poor oral hygiene. Few respondents believed caries is cause by vitamin deficiency and bacterial infection. Although sugar consumption is well known primary cause of dental caries and their presence is essential for the initiation of caries process, caries is a multifactorial disease process for which many other factors can contribute to its progression ⁽⁸⁴⁾.

Interestingly, in the present study, the majority of mothers reported providing between meal sugary snacks and giving sugary snacks as rewards but they do not add sugar to milk formula. This observation might suggest unawareness of sugar content of many foods or that they consider the table sugar only as risk factor. Hidden sugars are well documented as sources of sugar exposure that patients may not aware of their harmful effect as they

can result in a considerable number of sugar exposures ⁽¹¹⁴⁾. One of the reasons for the failure in combating a high prevalence of dental caries in some populations, is that insufficient attention has been paid to its primary cause-namely high sugar consumption ⁽¹¹⁵⁾. Therefore, future research should focus on exploring parents' awareness of different types of sugars and their harmful impact. The oral health promotion programs should be directed to increase the awareness of dental caries causes, risk factors and preventive factors.

The results of this study indicate social disparities in the distribution of dental caries according to the comparisons of dmft index and its components. In the present study, children of highly university educated mothers and fathers had significantly higher number of filled teeth. In addition, a statistically significant but weak positive correlation is observed between family size of number of decayed teeth and dmft score. These findings, together, corroborate great deal the vast literature that support the view socioeconomically deprived individuals tend to have poor oral health and more dental treatment needs. In line with this, previous studies among Libyan children showed that higher SES children had lower dmft ^(91, 116).

Seemingly, educated families have the financial resources and to afford dental care and more aware of the importance of maintain primary dentition and apply oral hygiene measures to their children. It is well

documented that poor oral hygiene and limited access to dental service is higher among low SES groups ⁽⁶⁸⁾. Previous published comprehensive reviews from Europe, Africa, Asia, the Middle East and North America reported that there are many risk factors associated with ECC; however, the main factor is low socioeconomic status of the parents ⁽⁴¹⁾.

Several studies demonstrate that socioeconomic status is the fundamental factor related to dental caries. The significant association between social class (household employment) and caries experience proved to be twice that of the association between tooth brushing and caries, and nearly three times that of relationship between sugar confection and caries⁽¹¹⁷⁾.

This may explain the observation in our work larger families have significantly higher dmft scores. This can be attributed to the limited financial resources of parents to offer oral hygiene measures or dental care. However, this assumption needs additional research to be confirmed.

Many studies found that statistically there is no significant difference in the prevalence of caries between male and female children ^(118, 119). In line with this, the present study did not find any statistically significant differences between males and females in caries experience. gender does not appear to be a determinants of caries prevalence in preschool children. This can be easily understood in the light of the behavioural nature of ECC

aetiology. For example, many studies who did not find statistically significant difference by gender in terms of ECC, found an association between dental caries and their early childhood behaviours such as bottle fed and used dummy/pacifier⁽¹²⁰⁾.

In line with this, the present study found statistically significant differences in relation to feeding practices and sugar consumption habits. children whose mothers reported mixed feeding practices and less than one-year feeding had lower number of decayed teeth and dmft score than those reported exclusive breast-feeding or bottle feeding. Adding sugar to milk formula and frequent snacking of sugar snack between meals were associated with higher numbers of decayed teeth and dmft score. These findings are in agreement with previous systematic review and metanalysis^(29, 43), which found that children breastfed >12 months had an increased risk of caries when compared with children breastfed <12 months, and that children fed nocturnally or more frequently had a further increased caries risk.

In line with previous study conducted in Benghazi⁽⁹¹⁾, the current study found that bottle feeding was uncommon. together, these observations indicate that there is an increased awareness among Libyan mothers on the importance of breastfeeding for their children's health. The WHO placed much emphasis on the benefits of breastfeeding for systemic health, such as

reducing morbidity, infectious disease and low weight in new-borns , including dental caries⁽⁴³⁾.

Another interesting finding in this study was that 83% reported regularly brushing their teeth with tooth paste. This is much higher than that reported (22%) in a very recent study among pre-school children in Benghazi ⁽⁹¹⁾. It is difficult to explain this huge discrepancy. However, both studies used self-reported questionnaires which has its own limitation and can overestimate or underestimate the actual findings ⁽⁹⁴⁾.

However, the issue remains that the maintenance of good oral hygiene is necessary for optimum oral health and caries prevention. Efforts should be directed to emphasize health promotion programmes that raise awareness about the importance of maintaining good oral hygiene and appropriate dietary habits among children in order to prevent the lifelong impacts of early childhood dental caries .This will also help in reducing the cost of caries treatment. Caries is one of the most expensive chronic disease to treat according to the WHO ⁽¹²¹⁾. Furthermore, if left untreated, caries may cause severe pain and mouth infection ⁽⁵⁾, which affects children's school attendance and performance ⁽¹²²⁾.

6.2 Conclusions

- The prevalence of dental caries among Libyan preschool children in Benghazi is relatively high compared to other areas in the world .
- Most of dental caries is untreated and only small proportion of children received dental care needed.
- Parents' education is associated with better dental care
- Children from larger families appeared to be higher risk of dental caries
- Prolonged feeding and increasing sugar consumption are strongly associated with dental caries in preschool children
- Although parents showed positive attitude toward oral health of their children, their knowledge seems insufficient
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6.3 Recommendations

- Future studies are required to understand the reasons of untreated dental caries among Libyan preschool children
- Oral health promotion programs are needed to increase oral health related awareness and provide appropriate knowledge

- Additional research using representative study sample and including more variable such as age is required
- Future research should assess the preparedness of Libyan dentists to manage the preschool children.

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Appendices

الموافق 30 / 12 / 2020
الرقم الإشاري: ق.ش.ت.1.317

السيدة المحترمة / مدير روضة البيلسان
عن طريق السيدة المحترمة / مدير مكتب التعليم المبكر بالمراقبة

تحية طيبة وبعد ..

بناءً على تعليمات السيد / مراقب شؤون التربية والتعليم بنغازي؛

وبالإشارة إلى كتاب عميد كلية طب وجراحة الفم والأسنان ذي الرقم

الإشاري ش/300 المؤرخ في 2020/12/30م بخصوص الموافقة على إجراء

كشف وتوزيع الاستبيان.

عليه ،، نأمل منكم التعاون مع السيدة/ د. ريماء فرج حويل،

بالخصوص خدمة المصلحة العامة.

تفضلوا بالتسلم مع فائق الشكر والاحترام
والسلام عليكم ولاد

أحمد إبراهيم المغربي
رئيس قسم شؤون التربية والتعليم بنغازي



تفضلوا بالتسلم مع فائق الشكر والاحترام
والسلام عليكم ولاد

استبيان

1. ماذا كانت نوع الرضاعة ؟
 - رضاعة طبيعية (الثدي فقط)
 - حليب صناعي فقط
 - رضاعة مختلطة (طبيعي + حليب صناعي)
2. كم كانت مدة الرضاعة ؟
 - أقل من سنة
 - أكثر من سنة
3. هل كان طفلك يرضع على فترات قصيرة و متكررة او منتظمة ؟
 - رضاعة متكررة
 - رضاعة منتظمة
4. هل يتم إضافة السكر او المحليات مع الحليب الصناعي في الرضاعة ؟
 - نعم
 - لا
5. هل يتناول الطفل وجبات إضافية بين الوجبات الأساسية (البسكويت - الكيك - تشببس - الحلويات - العصائر وغيرها) ؟
 - نعم
 - لا
6. هل تستخدم الحلويات والشوكولاتة كأسلوب مكافئة وتشجيع للطفل ؟
 - نعم
 - لا
7. هل يقوم الطفل بتنظيف أسنانه ؟
 - نعم
 - لا
8. هل يستخدم معجون الأسنان في تنظيف أسنانه ؟
 - نعم
 - لا
9. هل يتم مساعدة الطفل لتنظيف أسنانه ؟
 - نعم
 - لا
10. المستوى التعليمي للام ؟
ابتدائي - إعدادي - ثانوي - جامعي
11. المستوى التعليمي للأب ؟

ابتدائي - إعدادي - ثانوي - جامعي

12. هل الأم تعمل ؟

نعم

لا

13. ما هي وظيفة الأب ؟

.....

14. مع من يعيش الطفل ؟

(الأم والأب) (الأم فقط) (الأب فقط) (جده جدته او إي شخص آخر)

15. كم عدد أفراد الأسرة ؟

()

16. مكان السكن ؟

.....

17. هل الأسنان اللبنية (أسنان الحليب) مهمة ؟

نعم

لا

18. في حالة تسوس الأسنان اللبنية ؟

علاجها والمحافظة عليها

خلعها

19. ما هو سبب تسوس الأسنان ؟

.....

0 - لا اعرف

1- تناول الحلويات

2- الإهمال وعدم التنظيف

3- نقص الفيتامينات

4- البكتيريا

التوزيع السكاني للأطفال

النسبة %	عدد الأطفال	اسم المنطقة	ت
0.40%	2	شارع بيروت	1
1.19%	6	بلعون	2
0.40%	2	شارع جمال	3
3.36%	17	طريق النهر	4
0.20%	1	ارض عصمان	5
0.40%	2	بوهادي	6
1.38%	7	سيدي حسين	7
0.79%	4	قاريونس	8
0.79%	4	الحميضة	9
0.99%	5	السبالة	10
0.40%	2	حي الفاتح	11
3.16%	16	القوارشة	12
6.13%	31	الهوري	13
2.77%	14	حي السلام	14
3.36%	17	الحدائق	15
1.78%	9	شارع عشرين	16
0.20%	1	رأس أعبيدة	17
0.59%	3	طلحية	18
1.98%	10	أرض شبنة	19
1.19%	6	شارع فينسيا	20
0.59%	3	وسط البلاد	21
0.59%	3	حي الدولار	22
0.79%	4	أرض الشريف	23
0.20%	1	السرتي	24
0.20%	1	شارع العراق	25
0.20%	1	البركة	26
1.19%	6	الدقاتوستا	27
0.40%	2	الرحبة	28
0.59%	3	النواقية	29

النسبة %	عدد الأطفال	اسم المنطقة	ت
0.79%	4	سيدي يونس	30
0.20%	1	الوحيشي	31
0.20%	1	شارع دبي	32
0.40%	2	حي قطر	33
0.79%	4	بنغازي الجديدة	34
0.79%	4	سيدي فرج	35
0.79%	4	شارع الخليج	36
0.99%	5	أرض أزواوة	37
0.40%	2	أرض أقريش	38
0.40%	2	الرويسات	39
0.40%	2	ارض لموم	40
0.99%	5	الكوفية	41
0.59%	3	أرض الحراسة	42
0.99%	5	الصابري	43
12.45%	63	الليثي	44
0.20%	1	بن يونس	45
4.74%	24	بوعطني	46
0.40%	2	قنفودة	47
0.20%	1	الفعكات	48
0.79%	4	شارع سوريا	49
2.96%	15	السيدة عائشة	50
0.79%	4	المساكن	51
2.37%	12	الماجوري	52
6.72%	34	الفويحات	53
5.34%	27	السلماي	54
10.28%	52	بوهديمة	55
0.40%	2	حي الزيتون	56
7.51%	38	الكيش	57
100%	506	الاجمالي	

معدل التسوس المبكر وأسبابه لدى الأطفال قبل السن المدرسية

(دراسة سريرية)

اعداد

ريما فرج حويل

تحت اشراف

د. مرعي حمد حسن المغربي

الملخص العربي

أجريت هذه الدراسة لمعرفة معدل التسوس المبكر والعوامل المساعدة في هذا

التسوس علي عينه من الأطفال في السن ما قبل المدرسية

وتناول هذا البحث عينه من الأطفال ما بين السن (3 - 5) سنوات ذكوراً وإناثاً في

عينه تجاوزت 500 طفلاً

وقد تم توزيع استبيان علي أولياء الأمور بعد شرح الغرض من هذه الدراسة وموافقتهم

علي المشاركة في تعبئه الاستبيان الذي يحتوي علي أسئلة تتعلق بالسلوكيات الغذائية

وأنواع الرضاعة ومدي اهتمام الوالدين بنظافة الفم والأسنان وكذلك استكشاف

المستوي المعرفي لأولياء الأمور لتسوس الأسنان , أهميه الأسنان اللبنية , وأهميه

علاج هذه الأسنان وتناول الاستبيان عوامل مثل المستوي التعليمي والثقافي والجوانب

الاجتماعيه و الأقتصادييه للأسرة وما مدي ارتباطها بمعدل التسوس عند الأطفال .

وأظهرت نتائج هذا البحث ارتفاع معدل التسوس عند الأطفال وكذلك ارتباط هذا الارتفاع بالسلوكيات الغذائية والعوامل الاجتماعية والاقتصادية والمستوي التعليمي عند أولياء الأمور .

ومن خلال النتائج تم استبيان الحاجة الماسة إلي البرامج التوعوية من خلال وسائل التوعية المحلية وكذلك وضع خطط للعلاج والكشف المبكر لصحة الفم والأسنان وتحسين المستوي وقبل هذا التركيز علي الوسائل الوقائية الفاعلة والمتابعة الدورية المستمرة , وكذلك الحاجة إلي إجراء دراسات علي نطاق اشمل وأوسع يشمل كل مناطق البلاد ووضع السياسات الناجحة علي المدى القريب والبعيد للحفاظ علي صحة الفم والأسنان عند الأطفال بشكل عام .



معدل التسوس المبكر وأسبابه لدى الأطفال قبل السن

المدرسية

(دراسة سريرية)

اعداد

ريما فرج حويل

تحت اشراف

د. مرعي حمد حسن المغربي

قدمت هذه الرسالة استكمالاً لمتطلبات الحصول على درجة الماجستير في طب

أسنان الأطفال

جامعة بنغازي

كلية طب وجراحة الفم والاسنان

2021