

**FACTORS ASSOCIATED WITH EARLY CHILDHOOD CARIES IN 2-5
YEAR OLD CHILDREN ATTENDING DENTAL TREATMENT AT
MUHIMBILI UNIVERSITY DENTAL CLINIC.**

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**MDent (Paediatric Dentistry) Dissertation
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By

Mselle Mohamed Hatib, DDS

**A dissertation Submitted in (partial) Fulfillment of the Requirements for
the Degree of Master of Dentistry (Paediatrics Dentistry) of
Muhimbili University of Health and Allied Sciences**

**Muhimbili University of Health and Allied Sciences
October, 2013**

CERTIFICATION

The undersigned certify that he has read and hereby recommend for acceptance by Muhimbili University of Health and Allied Sciences a dissertation entitled “**Factors associated with early childhood caries in 2-5 year old children attending dental treatment at Muhimbili University dental clinic.**” in (Partial) fulfillment of the requirements for the degree of Master of Dentistry (Paediatrics Dentistry) of Muhimbili University of Health and Allied Sciences.

Prof. EN Kikwilu

(Supervisor)

Date

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AND

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ABSTRACT

Background: Dental caries is an infectious disease resulting in demineralization of tooth hard tissues by acid produced as a result of fermentation of carbohydrates by specific adherent bacteria, primarily *mutans streptococci* (MS) in a given period of time. Dental caries occurring in children under five years of age is termed early childhood caries (ECC). The 2008/2009 epidemiological reports indicate that close to 50% of children below the age of five years in Dar es Salaam had ECC, and 80% of children who sought care due to oral diseases at the School of Dentistry, Muhimbili University of Health and Allied Sciences (MUHAS) between January–June 2012 had ECC. This information indicates that ECC is a public health problem in Dar es Salaam that needs to be addressed by suitable interventions which require thorough understanding of factors associated with the development and progression of dental caries in children.

Aim of the study: To investigate factors associated with ECC.

Material and Methods: This was a descriptive cross sectional hospital based study conducted in children aged 2- 5 years who attended dental treatment at pediatrics dental clinic School of Dentistry, MUHAS from September 2012 to March 2013. A total of 182 children and their parents/caregivers were recruited. Children were examined for dental caries using WHO criteria (1997) and oral hygiene status was recorded using modified Silness and Loe Oral Hygiene Index (1964). A structured questionnaire inquired about socio-demographic characteristics of the parents/caregiver and the child, oral hygiene practices of the child, use of toothpaste, feeding practices and use of sugary snacks was used to collect data.

Results: Fifty one percent of the examined children were girls. The mean age and dmft were 3.78 (SD 0.91) and 6.79 (SD 4.68) respectively. At the level of bivariate analysis, *older children (4-5 years); children reared by single mothers and children with poor oral hygiene* had statistically significantly higher dmft than their counterpart ($\chi^2 = 6.71, p = 0.01; \chi^2 =$

3.99, $p = 0.05$; $\chi^2 = 3.85$, $p = 0.05$) for overall dmft respectively; and ($\chi^2 = 3.70$, $p = 0.04$; $\chi^2 = 7.47$, $p < 0.01$; $\chi^2 = 5.27$, $p = 0.02$) for anterior dmft respectively. In logistic regression model *children aged 4-5 years* had higher Odds of having higher overall dmft than those aged 2-3 years [OR=2.77 (1.18-6.45), $p=0.02$], while *children with poor oral hygiene* had higher Odds of having higher dmft for anterior teeth than their counterparts with good oral hygiene [OR=2.51 (1.20 5.28), $p=0.01$]. “*Infants feeding practices*”; “*assistance in tooth brushing*”, “*frequency of tooth brushing*” and “*use of tooth paste*” had no significant association of having high/low caries experience.

Conclusion: Poor oral hygiene, Child’s old age, and child being raised by a single mother were associated with higher caries experience. Infant feeding practices, assistance in tooth brushing, frequency of tooth brushing and use of toothpaste were not associated with having high/low caries experience.

TABLE OF CONTENTS

CERTIFICATION	II
DATED DECLARATION.....	II
DECLARATION AND COPYRIGHT.....	III
ACKNOWLEDGEMENT	IV
ABSTRACT.....	V
LIST OF TABLES.....	X
LIST OF ABBREVIATION	XI
DEFINITION OF KEY TERMS.....	XII
CHAPTER ONE.....	1
1. INTRODUCTION.....	1
1.2. PROBLEM STATEMENT	9
1.3. RATIONALE	10
1.4. CONCEPTUAL FRAMEWORK OF THE STUDY	11
1.5. STUDY OBJECTIVES.....	12
1.5.1. Broad Objective	12
1.5.2. Specific Objectives	12
CHAPTER TWO.....	13
2. MATERIAL AND METHODS.....	13
2.1. Study area.....	13
2.2. Study design	13
2.3. Study population.....	13

2.4. Sample size determination.....	13
2.5. Procedure for enrolling children in the study.....	14
2.6. Questionnaire.....	14
2.7. Clinical Examination.....	14
2.8. Validity and Reliability.....	15
2.9. Inclusion criteria.....	15
2.10. Exclusion criteria.....	15
2.11. Ethical consideration.....	15
2.12. Dissemination of Results.....	16
2.13. Data management and analysis.....	16
2.14. Data analysis.....	17
CHAPTER THREE.....	18
3. RESULTS.....	18
CHAPTER FOUR.....	25
4. DISCUSSION.....	25
CHAPTER FIVE.....	29
5.0 CONCLUSION.....	29
5.1 RECOMMENDATION.....	30
REFERENCES.....	31
APPENDICES.....	38
APPENDIX I: QUESTIONNAIRE (ENGLISH VERSION).....	38
APPENDIX II: QUESTIONNAIRES (SWAHILI VERSION).....	40

APPENDIX III: ORAL HYGIENE AND DENTAL CARIOUS STATUS CLINICAL FORMS..... 43
APPENDIX IV: CONSENT FORM (ENGLISH VERSION)..... 44
APPENDIX V: CONSENT FORM (SWAHILI VERSION) 46

LIST OF TABLES

Table 1:	Distribution of the study participants by demographic characteristics.....	18
Table 2:	Distribution of study participants by demographic characteristics and dental caries experience.....	19
Table 3:	Distribution of parents by responses to specific questions on feeding practices and their children's dmft.....	21
Table 4:	Distribution of children by oral health behavior and occurrence of dental caries.....	22
Table 5:	Distribution of children by reported frequency of intake of snack and dental caries experience (dmft).....	23
Table 6:	Odds ratio (95% confidence interval) for logistic regression between age of children, exposure of nipple/bed sharing, child oral hygiene and marital status by dmft.....	24

LIST OF ABBREVIATION

AAPD	American Association of Pediatric Dentistry
Dmft	Decay missing filled deciduous teeth
Deft	Decay extracted and filled deciduous teeth
ECC	Early Childhood Caries
WHO	World Health Organization
MDENT	Master of Dentistry
MUHAS	Muhimbili University of Health and Allied Sciences
SPSS	Statistical Package for Social Sciences
RCH	Reproductive and Child Health

DEFINITION OF KEY TERMS

Dental caries;Is an infectious disease resulting in demineralization of tooth hard tissues by acid produced as a result of fermentation of carbohydrates by specific adherent bacteria, primarily *mutans streptococci* (MS) in a given period of time (Tanzer et al 2001, Heyman et al 2002, Fejerskov et al 2008).

Early Childhood Caries (ECC) is a term used to describe dental caries presenting in the primary dentition of young children below 6 years old (Welbury 1977).

Severe childhood caries(S-ECC) is defined as “any sign of decay on smooth tooth surfaces in children younger than 3 years of age, or, in children aged 3 to 5 years, carious involvement of one or more smooth surfaces of the upper front teeth”(AAPD adopted 2003, revised 2008).

CHAPTER ONE

1. INTRODUCTION

1.1.1 Background

Dental caries is an infectious disease resulting from demineralization of tooth hard tissues by acid produced as a result of fermentation of carbohydrates by specific adherent bacteria, primarily *mutans streptococci* (MS) (Tanzer *et al* 2001, Heyman *et al* 2002, Fejerskov *et al* 2008). Dental caries is a multi-factorial disease, resulting from the interplay between environmental, behavioral and genetic factors (Armfield 2005). It is a chronic disease which afflicts humans of all ages and in all regions of the world (WHO 2003).

Over the past years different names have been used to describe dental caries in young children. Using Pub Med search engine the following terms can be retrieved: black teeth of the very young (Belterami 1952); nursing bottle mouth (Fass 1962); caries of incisors (Sutcliffe 1965); Rampant caries (1966); nursing bottle syndrome (Golnick *et al.*1967); bottle-mouth caries (Michel *et al* 1970); night-bottle syndrome (Castano 1972); baby-bottle caries (Berman 1973); nursing-bottle caries (Shelton *et al* 1973); nursing caries (Kammerman *et al* 1981); and bottle-caries (Allen *et al* 1981). These terms suggest that the prime cause of caries in young children is inappropriate bottle and breast feeding practices. Current evidence suggests that use of a sugar-containing liquid in a bottle at night may be an important etiological factor, although it is not necessarily the only factor. Therefore, to avoid misunderstanding the term “early childhood caries (ECC)” was recommended to be used when describing any form of caries in infants and preschool children (Harris *et al* 2004, Narvey and Shwart 2007).

Epidemiological studies conducted in different parts in Dar es Salaam reported the prevalence of ECC ranging from 16.7% to 49.6% among 13 to 72 months old children (Mziary *et al* 2006, Maro *et al* 2007 and Savani *et al* 2008). In addition, the clinic data from the School of Dentistry indicates that from January to June 2012 a total 1920 children were attended out of whom 1536 (80%) sought care due to dental caries problem. Therefore, dental caries in young children is a public health problem in Dar es Salaam city Tanzania.

Dental caries has adverse effects at individual and community level (Vachirarojpisan et al 2004). At an individual level dental caries destroys the tooth structure therefore impairs the function of the involved tooth. For anterior teeth esthetics and speech are compromised while for posterior teeth masticatory function is compromised. In addition, as the dental caries involve inner tissues an individual starts to experience toothache (http://painresourcecenter.com/en_int_baa_symptoms.asp). If the process is not intervened dental caries may lead to infection of the dental pulp and subsequently, infection spread to adjacent periapical tissues. When the infection is localized dental abscess is formed, sometimes inflammation may spread to the soft tissues of the oral facial region leading to the life threatening conditions like Ludwig's Angina. Toothache is the commonest symptom of dental caries. It starts with sharp pain when the carious process affects the dentine, as the carious processes progress to the pulp pain becomes prolonged and pulsating which leads to sleepless nights, causing the patient not able to socialize and results into loss of working hours.

All these adverse effects of dental caries have negative impact on the quality of life of an individual (Petersen 2005, Gradella et al 2011 and Wong et al 2011). In children, the effects of dental caries is more pronounced because untreated dental caries prevents the child from eating adequate quantity and variety of foods that require chewing, hence making a child prone to malnutrition (White 1976). The effects of malnutrition to a child include; impaired physical and mental growth (Galler et al 2012). Furthermore, malnutrition makes a child susceptible to infectious diseases due to lowered body immunity (Musoke et al 2011). Chronic inflammation from caries related to pulpitis and abscesses have been postulated to suppress growth (Acs et al 1992, Sheiham 2006 and Gaur et al 2011). In addition, studies have shown that a predictor of caries in permanent dentition is caries in primary dentition; therefore young children with dental caries are more likely to suffer from dental caries in adulthood (van Palenstein et al 1990, Wesal 2006 and Alm et al 2012).

At community level, dental caries increases the burden to the health care delivery system because more resources will be required to manage patients with dental caries. In addition, dental caries has a negative impact on the economy of community because; firstly as more people suffer from dental disease the productivity of the community is affected and secondly,

the community will have to deviate resources from economic viable activities to management of dental caries. In children, toothache affects the quality of life of family members (Acharya et al 2011, Abanto et al 2012). In addition, treatment of dental caries to children pose a big challenge to dentistry due to the fact that affected children are usually young to withstand dental treatment, they lack co-operation during treatment and the inability of the children to adhere to proper dental care. In Tanzania there are more challenges due to limited availability of skilled manpower, unfriendly clinic setting for children and inadequate supply of dental materials at most dental clinics.

Due to the adverse outcomes of dental caries discussed in preceding paragraphs and the difficulties dentists experience during management of dental caries in young children by tooth extraction and/or restoration, calls for a primary prevention approach. In order to manage dental caries through primary prevention, one need to have a thorough understanding of the factors associated with the development of dental caries in children.

In Tanzania, dental caries preventive programs are not well established. In addition, there is scant information on factors associated with the dental caries in children that can be used to formulate a meaningful preventive intervention. Therefore, there is a need to study factors associated with dental caries in children.

1.1.2. Literature review on factors associated with Early Childhood Caries (ECC)

1.1.2.1. Social factors

Child's age and sex, and mother's age, marital status and education level are among the social factors that have been reported to be associated with the occurrence of with ECC in children under 6 years of age (Hallett and O'Rourke 2003, Schroth and Moffatt 2005, Maro and Kahabuka 2007, Du et al 2007, Ismail et al 2008, 2009, Abiola et al 2009, Traebert et al 2009, Al- Jewair and Leake 2010, Niji et al 2010, Mandeep et al 2010, Tusek et al 2011, Yang et al 2011, Prakash et al 2012, Subramaniau and Prashanth 2012, Soew 2012, Retnakumari and Gibi 2012, and Perera et al.2012).

Consistently, numerous studies in different communities have reported older children to have more caries compare to younger ones. This finding has been reported in Dar es Salaam Tanzania among 2-6 years old children (Maro and Kahabuka 2007), Detroit-USA among 0-5 years olds (Ismail et al 2008, 2009), Nigeria among 18 months to 5 years old children (Abiola et al 2009), Canada among children aged less than 71 months old (Al-Jewair and Leake 2010, Schroth et al 2013), China among 3-6 years old (Yang et al 2011), in Korea among under 6 years old children (Han et 2013), India (Mandeep et al 2010, Prakash et al 2012, Retnakumari and Gibi 2012, Subramaniau and Prashanth 2012) and in Turkey among toddlers (Doğan et al 2013). However, Berkowitz et al 2011 in USA reported no age difference in the occurrence of ECC among preschool children in one year cohort study.

No study was found in the current review of the literature that reported younger children to have more ECC than older ones. The most frequent explanation ascribed to age differences is the cumulative nature of dental caries experience during the lifetime of a given dentition. Time exposure for cariogenic oral environment has also been mentioned as reason for these differences. Since different exposures for cariogenic oral environment differ from one community to another, studying age differences in communities in Tanzania is justified.

The association between sex of the child and the occurrence of ECC in children has not been consistent. Several studies have reported more caries among girls than boys (Maro and Kahabuka 2007, Mandeep et al 2010, Retnakumari and Gibi 2012 and Perera et al 2012). Other studies have reported more dental caries among boys than girls (Hallett and O'Rourke 2003, Peressini et al 2004 and Tusek et al 2011). On the other hand, Berkowitz et al 2011 reported no sex difference among one year cohort of children treated for severe early childhood caries (S-ECC) in School of Dentistry, Rochester, NY, USA. These controversies may indicate that the reported differences were due to chance only or due to methodological errors. Due to the existing controversies, there is a need to have more studies on sex differences among children. This is important because if sex is a factor, then scientists would be compelled to identify causes of such differences to eliminate possibilities of sex inequality in oral health.

Maternal age at birth have been reported to be associated with ECC in their children, where children of young mothers aged less than 25 years had more dental caries compared to older mothers in Australia (Hallett and O'Rourke 2003) and in Tokushima, Japan (Niji et al 2010). However, Han et al 2013 in Korea reported more ECC in children born by older mothers. Children raised in single parent families have been reported to have a 2.3 times higher incidence of ECC than children from two-parent families (Schroth et al 2007, Plutzer and Keirse 2011). In Tanzania, there is an increase of child bearing by young mothers, as well as single parenting. This may raise the occurrence of ECC among children in Tanzania. However, at the time of literature search, we could not find a published report on the association of ECC among children reared by young or single mothers. Therefore there was a need to study the possible association in Tanzanian settings.

Several studies in different communities have reported low level of education of mothers to be associated with high prevalence and severe form of ECC (Schroth and Moffatt 2005, Du et al 2007, Traebert et al 2009, Li et al 2011, Prakash et al 2012, Zhou et al 2012, Ozer et al 2012, Congiu et al 2013 and Schroth et al 2013). The World Bank Indicators for Tanzania reveal that the literacy rate for adult females in 2009 was 66.3%

(www.tradingeconomics.com/tanzania/literacy-rate-adult-total-percent).

This indicates that majority of mothers in Tanzania would have low level of education. It is not known if the relationship between ECC and maternal education reported in other countries would exist in Tanzania.

1.1.1.2. Infant feeding practices

Early childhood caries for many years been related to improper child feeding practices evidenced by a number of names assigned to it in the second paragraph of the background section above. Hallett and O'Rourke (2006) reported that infant bottle-feeding habits (either by allowing a child to sip from a bottle during the day or bottle feeding to put the child to sleep at night) to be a significant determinant of ECC. Frequent consumption of fruit juices from feeding bottles (Zeng et al 2005, Du et al 2007, Schroth et al 2013); night time bottle feeding with juice, repeated use of a sippy or no-spill cup and frequent in- between -meal consumption of sugar-containing snacks, candy, commercial juices, formula and carbonated drinks have been reported to increase the risk of developing caries (Tinanoff 2002, Tinanoff and Palmer 2003, Jose and King 2003, Li et al 2011, Retnakumari and Gibi 2012, Qadri et al 2012, Congiu et al 2013, Schroth et al 2013, Han et al 2013, Evans et al 2013). Begzati (2010), reported a strong correlation between daily sweets consumption, duration of bottle feeding and dmft in children with ECC.

In late 1970s reports associating ECC with breast feeding started appearing in dental literature. The first reports that associated breast-feeding and ECC were those reported by Gardner et al 1977, Kotlow 1977 and Brams et al 1983. All of these studies were case reports. Studies that indicated some associations between ECC and breast feeding grew in number that necessitated reviews (Valaitis et al 2000, Harris et al 2004, Ribeiro and Ribeiro, 2004). Valaitis and colleagues reviewed 151 articles that associated ECC with breast feeding. The reviewers noted a lack of methodological consistency related to the studies of the association of ECC and breastfeeding, and inconsistent definitions of ECC and breastfeeding. This made it difficult to draw conclusions.

In another systematic review involving 73 studies, Harris et al, 2004 identified 106 risk factors significantly associated with the prevalence or incidence of ECC. Among these, only three factors were related to breastfeeding (duration, frequency and breastfeeding at night) and three to breastfeeding and/or bottle-feeding (when used to feed or to stop the infant from crying at night, to put him/her to sleep and duration of breastfeeding longer than 18 months). Few articles showed a high methodological quality and used validation measures for oral hygiene and eating habits. Most of these studies showed that variables should be treated as risk indicators, as they are only probable or putative risk factors and were not able to clearly establish a relation between exposure and caries. The most consistent associations with caries were early streptococcal infection acquisition, highly cariogenic diet, poor tooth brushing routines and enamel hypoplasia.

In 2003 Ribeiro and Ribeiro undertook an extensive review on ECC and breast feeding (Ribeiro and Ribeiro 2004). They elucidated that the relationship between ECC and breast feeding was complex and contained several confounding variables, mainly infection caused by mutans streptococci, enamel hypoplasia, intake of sugars in varied forms and social conditions represented by parental educational and socioeconomic level. The authors concluded that there was no scientific evidence that confirms that breast milk is associated with caries development.

Following these reviews, more studies have been undertaken focusing on ECC and breast feeding. Prolonged breast feeding for longer than 1 year, breast feeding at will or breastfeeding 7 or more times a day and breast feeding at night have been reported to have positive association with ECC (Aida et al 2006, Tiano et al 2009, Feldens et al 2010, Retnakumari and Gibi 2012, Tanaka et al 2013). The habit of allowing infants to sleep with the breast nipple in their mouth has also been reported to be associated with ECC (Hallett and O'Rourke 2003, van Palenstein et al 2006, Savani and Kahabuka 2008 and Targino 2011, Retnakumari and Gibi 2012). In an extensive randomized clinical trial involving 17064 children followed up for 6.5 years Kramer et al (2007) found no evidence of beneficial or harmful effects of prolonged and exclusive breastfeeding on dental caries at early school age. Other studies have shown no association between ECC and breast feeding (Vachirarojpsan et

al 2004, Mohebbi et al 2008, Sugito et al 2008, Nunes et al 2012). Masumo and colleagues on the other hand revealed a protective role of breast feeding in ECC occurrence (Masumo et al 2012). This review of literature indicates that there are still controversies on the relationship between ECC and breast feeding, and therefore a need for further studies on this topic.

1.1.1.3. Tooth brushing habit

Tooth brushing is an important oral health habit that affects oral health of a person. In children poor oral hygiene has been reported to be a risk factor for development of ECC (Jose et al 2003, Kiwanuka et al 2004, Schroth et al 2005, Sowole et al 2007, Mohamed and Barnes 2008, Abiola et al 2009, Li et al 2011, Zhou et al 2011, Masumo et al 2012, Retnakumari and Gibi 2012, Zhou et al 2012). Jose et al and Sowole et al both reported a 4 fold odds of having ECC for every increase in the score of oral hygiene status (Jose et al 2003 and Sowole et al 2007). In addition, low-frequency of tooth brushing and improper tooth brushing methods of children was associated with S-ECC (Hsieh et al 2012, Retnakumari and Gibi 2012). A review study that was conducted to determine the effectiveness and safety of fluoridated toothpaste, established firm evidence that fluoride toothpaste is efficacious in preventing dental caries (Marinho et al 2003). Van Loveren in his extensive review of literature on the role of diet in dental caries prevention did show that good oral hygiene coupled with exposure to adequate topical fluoride was the best intervention to consider first in dental caries prevention (van Loveren 2001). This indicates that advocating oral hygiene practices coupled with routine use of fluoridated toothpaste is an important oral health behavior for the maintenance of good oral health.

The current review of literature reveal that there is still scant information on factors associated with ECC in Tanzania. Therefore it is difficult to design and institute an effective intervention against ECC in Tanzania with the current information on factors associated with ECC.

1.2. PROBLEM STATEMENT

Early childhood caries (ECC) among children in Dar es Salaam city in Tanzania is a significant oral health problem. The current literature from Dar es Salaam city show that the prevalence of ECC among children aged 13-72 months ranges from 16.7%-49.6% indicating that it is a public health problem. The clinic data from MUHAS School of Dentistry dental clinics assert this fact whereby out of 1920 children who sought dental care during the month of January to June 2012, 1,536 (80%) had dental caries. Dental caries has many adverse effects on individual and community that if not addressed may affect the quality of life of individuals and compromise the economy of families and communities. Management of dental caries in children therapeutically is difficult. In Tanzania, limited availability of skilled manpower, unfriendly clinic setting for children and inadequate supply of dental materials at most dental clinics pose added challenges.

Due to the adverse outcomes of dental caries and the difficulties dentists experience during management of dental caries in young children by tooth extraction and/or restoration, calls for a primary prevention approach. In order to manage dental caries through primary prevention, one needs to have a thorough understanding of the factors associated with the development of dental caries in children.

In Tanzania, dental caries preventive programs are not well established. In addition, there is scant information on factors associated with ECC in children that can be used to formulate a meaningful preventive intervention. Therefore, this study was designed to identify factors associated with ECC among the children seeking treatment at MUHAS- School of Dentistry dental clinic.

1.3. RATIONALE

This study will reveal the factors that are associated with dental caries in children in Dar es Salaam, and therefore add knowledge to the data bank. The results generated from this study can also be used by relevant authorities to plan interventions against dental caries in children. In addition, this research work was designed as partial fulfillment of MDent Paediatric Dentistry degree of the Muhimbili University of Health and Allied Sciences.

1.4. CONCEPTUAL FRAMEWORK OF THE STUDY

Figure 1 below depicts the conceptual framework upon which this study is based. This framework is derived from the social behavioral factors that predict the development of dental caries in children below age of five years as applied by Hallert and O'Rourke, (2003). According to this framework infant feeding practices, social factors and oral health behaviors influence the development and progression of dental caries in children below the age of five years.

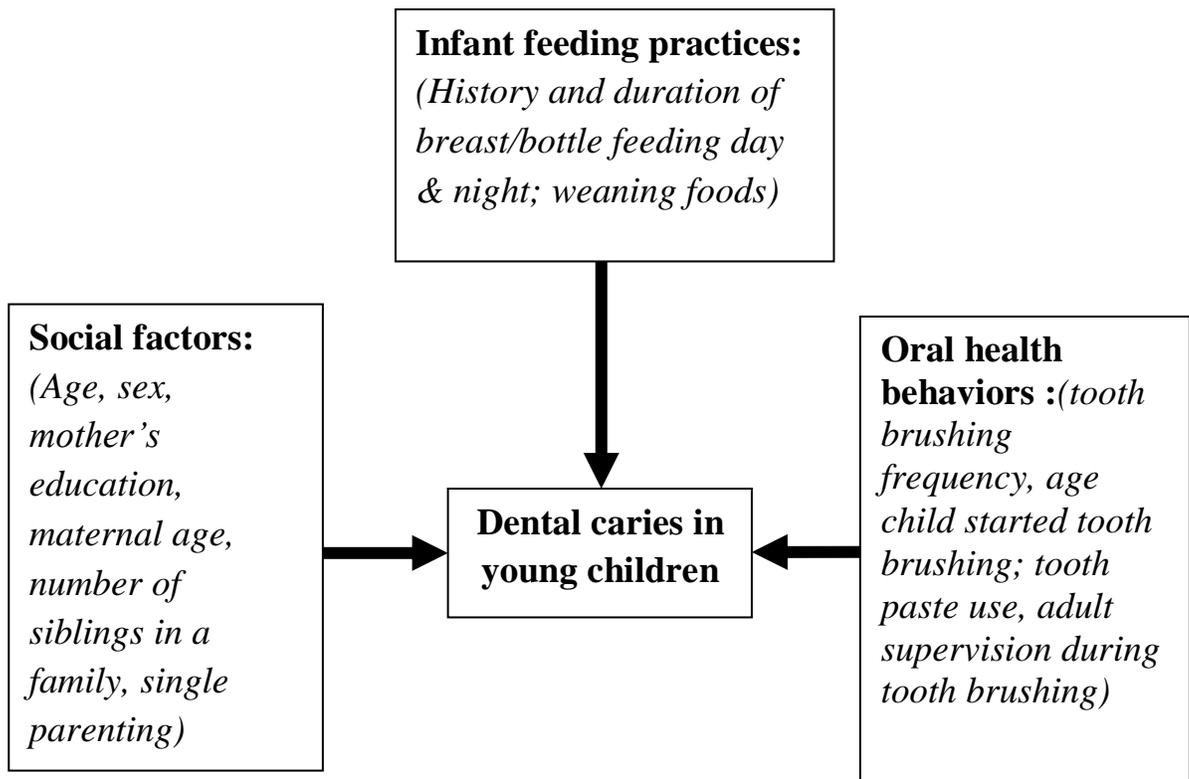


Figure 1 Conceptual framework of the study

1.5. STUDY OBJECTIVES

1.5.1. Broad Objective

To investigate factors associated with Early Childhood Caries (ECC) among 2-5 year old children attending dental treatment at Muhimbili University dental clinic.

1.5.2. Specific Objectives

1. To determine influence of social factors on early childhood caries
2. To determine influence of infant feeding practices on early childhood caries
3. To determine influence of oral health behaviour on early childhood caries

CHAPTER TWO

2. MATERIAL AND METHODS

2.1. Study area

The study was conducted at pediatrics dental clinic of School of Dentistry, Muhimbili University of Health and Allied Sciences in Dar es Salaam region. Dar es Salaam is the largest commercial city of the United Republic of Tanzania with the population of about 4.5 million people, 42% are children aged 0-14years (Census 2012). Administratively, Dar es Salaam region is divided into three municipalities namely Temeke, Ilala and Kinondoni. Children who sort dental treatment clinic came from all parts of the city.

2.2. Study design

Descriptive analytical cross sectional hospital based study

2.3. Study population

Children aged 2- 5 year old seeking dental treatment at Paediatric dental clinic of School of Dentistry (MUHAS) from September 2012 to March 2013 were eligible to take part in the study.

2.4. Sample size determination

Due to the fact that poor oral hygiene of a child has been significantly associated with dental caries, the sample size determination was based on the proportion of children with ECC that had poor oral hygiene in Manyara region, Tanzania (Masumo et al 2012). In Masumo's report 55% (n=40) and 1% (n=4) of children with ECC belonged to poor and good oral hygiene-groups respectively, indicating that about 89% of the children with dental caries had poor oral hygiene. To pick similar proportions in our study, a minimum sample size of 150 children with dental caries was required. This sample size was obtained using the formula: $n = z^2 p (1-p)/e^2$, where n = sample size; z = 95% confidence interval = 1.96; p = the proportion of children with dental caries and belonged to poor oral hygiene-group = 89%; and e = maximum error allowed = 5%.

2.5. Procedure for enrolling children in the study

The researcher attended child dental patients in the clinic during the period of the study. Clinic nurse in-charge was instructed to channel all eligible children to the researcher's treatment cubicle as they came to the clinic. All eligible child patients whose parents consented to participate in the study were clinically examined for caries and oral hygiene status after the administration of the questionnaire. This process was undertaken for all the period of the study. Only three parents did not consent to join the study. Assumption was made that all children who attended dental treatment were accompanied by their mothers, guardian or any other close person who raised the child. When this condition was not fulfilled the child was treated and an appointment was made to meet the parent/ guardian for interview.

2.6. Questionnaire

The questionnaire inquired about *social demographic factors* (age, sex, residence, marital status, education levels and parenting as well as the age and sex of the children); *infant feeding practices* (breast feeding practices namely: frequency, duration, age at which the child stopped breast feeding, practice of using nipple to induce sleep and leaving a nipple in the child's mouth at night as well as bottle feeding practices which included the duration, frequency and night time bottle feeding); and *oral health behavior* (oral hygiene practices of the child, age at which the child started tooth brushing, time and frequency of tooth brushing, tooth brushing assistance and the use of toothpaste)

2.7. Clinical Examination

All eligible children whose parents/caregivers gave informed written consent were examined for their oral cavity to determine oral hygiene and dental caries status. Caries was scored in accordance to the World Health Organization criteria (WHO, 1997). Caries was recorded as present when a lesion in pit or fissure, or on a smooth tooth surface, has an unmistakable cavity, undermined enamel, or a detectably softened floor or wall. A tooth with a temporary filling or decayed recorded as caries. The CPI probe was used to confirm visual evidence of caries on occlusal, buccal and lingual surface. Where any doubt existed, caries tooth was recorded as sound. In the current study caries was scored 0 = sound tooth, 1 = caries, 2 = filled with decay, 3 = filled with no decay and 4 = missing due to caries. Oral hygiene status was

recorded using modified Silness and L e, (1964) Oral Hygiene Index. Where plaque visible with naked eye was scored as present and recorded as 1, and not visible plaque as no plaque and recorded as 0.

2.8. Validity and Reliability

In determining the validity of the questionnaires, 10 questionnaires were administered to parents/ caregivers prior to study to check for meaning and clarity of the questions. Questions which were not clearly understood were re-phrased.

To determine the reliability of study instruments thirteen children were re-examined and their parents/caregiver interviewed twice at an interval of 2 weeks. Kappa coefficients were calculated using the re-examined set of data for both questionnaire and clinical data. The values for Kappa coefficients were 0.576, 0.755, 0.781 and 1 for dietary behaviors, caries status, feeding practices, and oral hygiene practices respectively. Reliability for oral hygiene status was not computed because of the great variability of dental plaque measurement because dental plaques continue growing with time.

2.9. Inclusion criteria

Children aged 2 to 5 years

2.10. Exclusion criteria

A child with severe condition and or chronic systemic conditions that adversely affect normal oral functions such as Sj gren's syndrome and mental retardation

2.11. Ethical consideration

Permission to conduct this research was provided by MUHAS Ethical Committee with Ref. No.MU/PGS/SAEC/VOI. IV/320. Permission to conduct study in the dental clinic was requested from the Executive Director of Muhimbili National Hospital. The aims, possible risks and benefit of the study were explained to all participants and written consent was obtained from each of the parents/guardian in advance of recruitment to the study. Participation was voluntary that participating or not participating on the study would have no influence on the treatment of her/his child

2.12. Dissemination of Results

After submission of the dissertation as part of the requirement for the award of M. Dent (Paediatric dentistry) Degree of the Muhimbili University of Health and Allied Sciences, the results will be presented at scientific forum and published in scientific journals

2.13. Data management and analysis

Data entry and processing

All filled questionnaires were coded. Data was entered into the computer using SPSS software version 13. After checking for accuracy (data cleaning), the data were then analyzed.

Statistical analysis

Constructing variables and coding for analysis

Independent social demographic variables were coded as follows: *Sex of the child* (0 = male, 1 = Female), *age of the child* was dichotomized (0 = 2-3 years, 1= 4- 5 years); *age of the mother* (0 = young mother (20-29 yrs), older mothers (30+yrs); educational levels (0 = less or equal to primary education, 1 = greater to secondary education); marital status (0 = married, 1 = not married).

Independent feeding practices variables were coded as follows: *Method of feeding* (0 = breast feeding only, 1 = bottle only or mixed breast and bottle feeding); *day breast feeding at the age of 7-12 months* (0 = 1-4 times, 1 = 5-10 times), *day breast feeding at the age of 13-24 months* (0 = 1-4 times, 1 = 5-11 times), *night breast feeding at the age of 7-12 months* (0 = 1-3times , 1 = 4-7 times), *night breast feeding at the age of 13-24 months* (0 = 1-3 times, 1 = 4-7 times); *age stopped breast feeding* (0 = less or equal to 24 months, 1 = greater or equal to 25 months); *mode of inducing sleep* (0= non nutritive method, 1 = breast feeding); *leaving of the breast nipple in the child's mouth at night* (0 = no, 1 = yes); *share a bed with a child in circumstances that allow the baby to wake up and start sucking the nipple without the mother being aware* (0 = no and 1 = yes); *sugar moments* (0 = 1-4 times, 1 = 5+times).

Independent oral health behaviors variables were coded as follows: *assistance in tooth brushing* (0 = assisted, 1 = self brushing), *use of toothpaste* (0 = yes, 1 = no). Oral hygiene status was computed by counting the values of 1 for all sextants. The values were then

dichotomized as 0 = good oral hygiene (0 - 3 sextants with plaque score of 1), 1 = poor oral hygiene (4 - 6 sextants with plaque score of 1).

The dependent variable ECC was summarized as follows: The total dmft was computed by counting the values of dental caries scores 1 = decay, 2 = filled with decay, 3 = filled with no decay and 4 = missing due to caries. The total dmft was then dichotomized into (0 = 1-2 dmft, and 1 = 3+ dmft) for overall caries status to denote *low* and *high risk* caries children respectively. Then dmft for anterior teeth was dichotomized into (0 = 0 dmft, 1= 1+ dmft) to denote “*no severe ECC*” and “*severe ECC*” respectively.

2.14. Data analysis

Frequency distributions were generated to study the way the subjects were distributed over the scale of variables studied. Cross tabulations between background variables: age and sex of child, mothers/caregivers age, education levels and marital status and residence were generated to discern any differences between the three districts constituting residence of subjects. Associations between *social factors* (sex of the child, age of the parent and the child, marital status and educational level of the mother), *infant feeding practices* (method of feeding, frequency of breast feeding at the age of 7 - 12 months and 13 - 24 months during the day , frequency breast feeding at the age of 7 - 12 months and 13 - 24 months at night, age stopped breast feeding, mode of induce sleep and share a bed with a child in circumstances that allow the baby to wake up and start sucking the nipple without the mother being aware), and *oral health behaviors* (assistance in tooth brushing, frequency of tooth brushing, oral hygiene status and use of tooth paste); sugar moment at the age of 2 - 3 yrs and 4 - 5yrs (1 - 4 times, 5+ times) and *ECC* were studied using cross tabulations and Chi square tests. Variables that showed significant associations with ECC with chi-square tests were entered in logistic regression model to identify their relative importance in explaining the occurrence of ECC in children. The significance level was set at $p < 0.05$.

CHAPTER THREE

3. RESULTS

A total of 182 children 51 % girls were examined by the researcher during the whole period of the study. Mother's level of education varied statistically significantly with the residency ($\chi^2 = 8.567$; p -value = 0.014). Temeke district had more mothers with primary or less education (66.7%) than Ilala and Kinondoni, while Kinondoni had more mothers with secondary education or higher (66.7%) than other districts. The distribution of other demographic variables: sex, marital status, age of the child and parent/caretaker was similar in all the three studied districts. The mean age and dmft were 3.78 (SD 0.91) and 6.79 (SD 4.68) respectively. Thirteen children were caries free, and were not included in analysis for association.

Table 1 Distribution of the study participants by socio-demographic variables and residence

Socio-demographic variables	Residence (%)			χ^2	p -value
	Temeke	Kinondoni	Ilala		
Sex of the Child					
Male	18(46.2)	52(48.6)	19(52.8)	0.34	0.84
Female	21(53.8)	55(51.4)	17(47.2)		
Age of the child					
2-3 years	11(28.2)	32(29.9)	13(36.1)	0.64	0.73
4-5 years	28(71.8)	75(70)	23(63.9)		
Age of the mother					
20-29 years	17(43.6)	31(29)	16(44.4)	4.37	0.11
30+ years	22(56.4)	76(71)	20(55.6)		
Marital status					
Married	30(76.9)	90(84.1)	32(88.9)	2.01	0.36
Single/Widow/divorced	9(23.1)	17(15.9)	4(11.1)		
Mother's education level					
≤Primary education	26(66.7)	58(54.2)	12(33.3)	8.57	0.01
≥Secondary education	13(33.3)	49(45.9)	24(66.7)		

Table 2 Distribution of study participants by socio-demographic characteristics and dental caries experience

Socio-demographic characteristics	Caries experience(dmft)			
	Overall dmft		dmft for anterior teeth	
	1-2	3+	0	1+
Sex of the Child				
Male	14(17.3)	67(82.7)	21(25.9)	60(74.1)
Female	14(15.9)	74 (84.1)	29(33)	59(67)
	$\chi^2 = 0.06$	$P = 0.80$	$\chi^2 = 1.00$	$P = 0.32$
Age of the child				
2-3 years	14(28)	36(72)	20(40)	30(60)
4-5 years	14(11.8)	105 (88.2)	30(25.2)	89(74.8)
	$\chi^2 = 6.71$	$P = 0.01$	$\chi^2 = 3.70$	$P = 0.04$
Age of the mother				
20-29 years	10 (16.7)	50 (83.3)	21(35)	39(65)
30+ years	18 (16.5)	91 (83.5)	29(26.6)	80(73.4)
	$\chi^2 = 0.001$	$P = 0.98$	$\chi^2 = 1.34$	$P = 0.25$
Marital status				
Married	27(19)	115(81)	47(33.1)	95(66.9)
Single/Widow/divorced	1(3.7)	26(96.3)	3(11.1)	24(88.9)
	$\chi^2 = 3.85$	$P = 0.05$	$\chi^2 = 5.26$	$P = 0.02$
Mother's education				
≤Primary education	15(16.1)	78(83.9)	28(30.1)	65(69.9)
≥Secondary education	13(17.1)	63(82.9)	22(28.9)	54(71.1)
	$\chi^2 = 0.03$	$P = 0.86$	$\chi^2 = 0.03$	$P = 0.87$
Residency				
Temeke	4(10.8)	33(89.2)	14(22.2)	25(21)
Kinondoni	17(17)	83(83)	36(57.1)	71(59.7)
Ilala	7(21.9)	25(78.1)	13(20.6)	23(19.3)
	$\chi^2 = 1.55$	$P = 0.46$	$\chi^2 = 0.11$	$P = 0.95$

Table 2 shows the distribution of study participants by demographic characteristics and dental caries experience. Children aged 4 - 5 years and those raised with single mothers had higher overall and upper anterior dmft than children aged 2 - 3 years and those reared by married

mothers. The differences were statistically significant ($\chi^2 = 6.71$; $p = 0.01$ and $\chi^2 = 3.70$, $p = 0.04$) for overall dmft and ($\chi^2 = 3.85$, $p = 0.05$ and $\chi^2 = 5.26$, $p = 0.02$) for anterior dmft. Sex of the child, age and education level of the mother and residency had no statistically significant association with ECC.

Table 3 Distribution of parents by responses to specific questions on feeding practices and their children's dmft

Feeding practices	Caries experience (dmft)			
	Overall dmft		dmft for anterior teeth	
	1-2	3+	0	1+
Method of feeding				
Breast feeding only	24(17.6)	112(82.4)	42(30.9)	94(69.1)
Bottle alone/breast and bottle	4(12.1)	29(87.9)	8(24.2)	25(75.8)
	$\chi^2 = 0.59$	$P = 0.44$	$\chi^2 = 0.56$	$P = 0.45$
Day breastfeeding at the age of 7 to 12 month				
1-4 times/ day	8(12.7)	55(87.3)	16(25.4)	47(74.6)
5-10 times/day	16(21.3)	59(78.7)	28(37.3)	47(62.7)
	$\chi^2 = 1.78$	$P = 0.18$	$\chi^2 = 2.25$	$P = 0.13$
Day breastfeeding at the age of 13 to 24 month				
1-4 times/day	20(19.8)	81(80.2)	34(33.7)	67(66.3)
5-11 times/ day	3(9.7)	28(90.3)	9(29)	22(71)
	$\chi^2 = 1.69$	$P = 0.19$	$\chi^2 = 0.23$	$P = 0.63$
Night breastfeeding at the age of 7 to 12 month				
1 - 3 times/night	13(15.1)	73(84.9)	26(30.2)	60(68.8)
4 - 7 times/night	11(18.6)	48(81.4)	19(32.2)	40(67.8)
	$\chi^2 = 0.31$	$P = 0.57$	$\chi^2 = 0.06$	$P = 0.80$
Night breastfeeding at the age of 13 to 24 month				
1-3 times/night	21(18.1)	95(81.9)	39(33.6)	77(66.4)
4 -7 times/night	3(12)	22(88)	6(24)	19(76)
	$\chi^2 = 0.54$	$P = 0.46$	$\chi^2 = 0.88$	$P = 0.35$
Age stopped breastfeeding				
$0 \leq 24$ months	23(17.2)	111(82.8)	40(29.9)	94(70.1)
$1 \geq 25$ months	3(9.4)	28(90.3)	8(25.8)	23(74.2)
	$\chi^2 = 1.06$	$P = 0.30$	$\chi^2 = 0.20$	$P = 0.65$
Mode of induce sleep				
Non nutritive methods	11(13.8)	69(86.3)	24(30)	56(70)
Brest feeding	17(19.1)	72(80.9)	26(29.2)	63(70.8)
	$\chi^2 = 0.87$	$P = 0.35$	$\chi^2 = 0.01$	$P = 0.91$
Exposing nipple child suckling without mother being aware				
No	18(18.9)	77(81.1)	33(34.7)	62(65.3)
Yes	10(13.9)	62(86.1)	17(23.6)	55(76.4)
	$\chi^2 = 0.75$	$P = 0.39$	$\chi^2 = 2.42$	$P = 0.12$

Table 3 shows the distribution of parents by responses to specific questions on feeding practices and their children's dmft. Method of feeding, frequency of breast feeding during the day and night, age stopped breast feeding, mode of inducing sleep and the exposure of the breast nipple in such a way the child could wake at night and suck the breast had no association with ECC.

Table 4 Distribution of children by oral health behavior and occurrence of dental caries

	Caries experience (dmft)			
	Overall dmft		dmft for anterior teeth	
Oral health behavior	1-2	3+	0	1+
Assistance in tooth brushing				
Yes	13(19.4)	54(80.6)	22(32.8)	45(67.2)
No	14(14.3)	84(85.7)	27(27.6)	71(72.4)
	$\chi^2 = 0.76$	$P = 0.39$	$\chi^2 = 0.53$	$P = 0.47$
Frequency of tooth brushing				
Once or more times /day	21(16.2)	109(83.8)	42(32.3)	88(67.7)
No or occasionally	7(18.9)	30(81.1)	8(21.6)	29(78.4)
	$\chi^2 = 0.16$	$P = 0.69$	$\chi^2 = 1.57$	$P = 0.21$
Oral hygiene status				
Good (0-3 sites with plaque)	21(21.4)	77(78.6)	37(37.8)	61(62.2)
Poor (4-6 sites with plaque)	7(9.9)	64(90.1)	13(18.3)	58(81.7)
	$\chi^2 = 3.99$	$P = 0.05$	$\chi^2 = 7.47$	$P = 0.006$
Use of toothpaste				
Yes	26(16.9)	128(83.10)	46(29.9)	108(70.1)
No	2(15.4)	11(84.6)	4(30.8)	9(69.2)
	$\chi^2 = 0.02$	$P = 0.89$	$\chi^2 = 0.005$	$P = 0.95$

Table 4 shows the distribution of children by oral health behavior and occurrence of dental caries. Proportionally more children with poor oral hygiene had higher overall and anterior teeth dmft than their counter parts with good oral hygiene ($\chi^2 = 3.99, p = 0.05$ and $\chi^2 = 7.47, p = 0.006$) respectively. Assistance in tooth brush, frequency of tooth brush and use of toothpaste had no association with the occurrence and severity of ECC.

Table 5 Distribution of children by reported snacking frequency and dental caries experience (dmft)

	Caries experience (dmft)			
	Overall dmft		dmft for anterior teeth	
Reported snacking frequency	1 - 2	3+	0	1+
Reported snacking frequency at age of 2-3 years				
1 - 4 times	12(14)	74(86)	28(32.6)	58(67.4)
5+ times	16(19.3)	67(80.7)	22(26.5)	61(73.5)
	$\chi^2 = 0.89$	$P = 0.35$	$\chi^2 = 0.74$	$P = 0.39$
Reported snacking frequency at age of 4- 5 years				
1- 4 times	9(12)	66(88)	20(26.7)	55(73.3)
5+ times	7(12.1)	51(87.9)	13(22.4)	45(77.6)
	$\chi^2 = 0.00$	$P = 0.99$	$\chi^2 = 0.32$	$P = 0.57$

Table 5 shows the distribution of children by frequency recorded snacking and dental caries experience (dmft). Reported snacking frequency at the age of 2- 3 and 4 - 5 had no association with occurrence and severity of ECC.

Table 6: Odds ratio (95% confidence interval) for logistic regression for age of children, child oral hygiene and marital status of the mother on caries experience

Variable	Caries experience(dmft)			
	Overall dmft		dmft for anterior teeth	
	OR (95% CI)	p- value	OR (95% CI)	p- value
Age of the child (4-5yrs)	2.77(1.18-6.50)	0.02	1.87(0.90-3.87)	0.09
Child oral hygiene status (poor oral hygiene)	2.27(0.88-5.82)	0.09	2.51(1.20-5.28)	0.01
Marital status(not married)	5.21(0.66-40.96)	0.12	3.44(0.96-2.29)	0.06

Table 6 shows Odds ratio (95% Confidence Interval) for logistic regression for age of child, child oral hygiene and marital status of the mother on dmft. *Order children* (4-5 years) had a higher odds of having caries experience ≥ 1 dmft for overall caries experience than their younger counter parts [OR = 2.72(1.18-6.50), p = 0.02], while *children with poor oral hygiene* had higher odds of having caries experience \geq for dmft in anterior teeth [OR = 2.51(1.17-4.56), p = 0.01]

CHAPTER FOUR

4. DISCUSSION

This study reports factors associated with early childhood caries among 2 -5 year old children who were attending dental treatment at School of Dentistry dental clinic, MUHAS. The researcher (MH) who was treating the children also conducted interview to the parents/caretakers. Mothers who might have been aware that frequency snacking is the cause of dental caries and had their children with high caries score, might have under reported the frequency of snacking and breast feeding due to guilty consciousness. In addition, breast feeding practices and snacking frequencies were based on recalling of past events of over up to 3 years back. Therefore, the strength of association between ECC and the studied factors may have been affected in the current study.

In the current study, the distribution of demographic variables: sex, marital status, age of the child and parent/caretaker was similar in all the three studied districts, except for mothers' level of education. Therefore, the difference in dmft that may be observed between districts could be due to the differences in the mothers' education level or actual differences between the districts.

In the present study, children aged 4 - 5 years had higher overall dmft as well as anterior dmft compared to children aged 2 - 3 years. Older children were more affected by dental caries than the younger children. The possible explanation for this finding is likely to be due to: First, the cumulative effects of dental caries by age, carious lesions that were not clinically detected at early age would be detected at old age then adding to the total dmft. Secondly, as a child grows up becomes more independent and therefore interacts more with other children hence there is a possibility of consuming more snacking than younger ones. Thirdly, open cavities are good sites for multiplication of *s. mutans*, that would cause infection to other teeth in the mouth which may lead to more decayed teeth. Similar results on occurrence of ECC with increase in age have been reported (Maro and Kahabuka 2007, Ismail et al 2008, 2009, Abiola et al 2009, Al- Jewair and Leake 2010, Mandeep et al 2010, Yang et al 2011, Prakash et al

2012, Subramaniau and Prashanth 2012, Retnakumari and Gibi 2012, Doğan et al 2013, Schroth et al 2013, Han et al 2013). However, in USA Berkowitz et al (2011) had reported no age difference in the occurrence of ECC. From this finding we can recommend that, oral health prevention programs should be instituted in children as soon as teeth erupt.

Sex of the child in the current study had no association with ECC. This finding is similar to other studies (Rwakatema and Ng'ang'a 2010, Yang et al 2011 and Berkowitz et al 2011). However, our finding differ from several other studies which have reported ECC more among girls than boys (Maro and Kahabuka 2007, Mandeep et al 2010, Retnakumari and Gibi 2012 and Perera et al 2012). On the contrary, other studies have reported more ECC among boys than girls (Hallett and O'Rourke 2003, Peressini et al 2004, Tusek et al 2011). The sex difference in ECC occurrence could be influenced by early eruption of deciduous teeth between sexes.

Age of the mother had no association with caries experience in their children in the current study. This finding differ from that of Hallett and O'Rourke (2003) in Australia, and Niji et al (2010) in Japan who reported that children of young mothers aged less than 25 years had more ECC than children who were born by older mothers. However, Han et al 2013 reported more ECC in children born by older mothers. Young mothers are more likely to have no enough experience in providing oral health care to their children especially if the child is a first born in the family. On the other hand, older mothers may have many responsibilities of taking care of the family and therefore lose concentration to young children.

In the current study, children raised by single mothers had higher overall and anterior dmft than children reared by both parents. Our finding implies that, being a single mother may predispose a child to risk factors for the development of dental caries. The possible explanation may be due to the fact that single mothers are more likely to be pre-occupied with many routine works hence pay less attention to their children which could lead to poor oral hygiene and hence dental diseases. Similar results have been reported with other studies (Hallett and O'Rourke 2003, Schroth et al 2007, Plutzer and Keirse 2011 and Kim 2012).

Mother's level of education had no association with ECC in our study. These findings are similar to those supported by Ramos-Gomez et al (2002) in Hispania. However, our findings differ from several other studies (Kiwanuka et al 2004, Schroth and Moffatt 2005, Du et al, 2007, Qin et al 2008, Traebert et al 2009, Prakash et al 2012, Kim 2012, Zhou et al 2012, Subramaniam and Prashanth 2012) which reported that mothers low level of education was associated with the occurrence of ECC. From this finding it's evident that, all mothers should be imparted with knowledge and skills on oral health care of their children and the family as whole regardless of their education levels.

Method of feeding, frequency of breast feeding during the day and night, age at which the child stopped breast feeding, mode of inducing sleep and the exposure of the breast nipple in a way that the child could wake up and suck had no association with ECC in our study. The reasons for this observation could be due to the fact that the responses of feeding practices were more likely to be subjective as they relied on parents/caregivers to remember their children's past experience and behavior related to feeding. Findings from our study are similar to several other studies in different countries (Rosenblatt and Zarzar 2004 and Ribeiro and Ribeiro 2004, Vachirarojpisan et al 2004, Mziray and Kahabuka 2006, Hiroko et al 2007, Mohebbi et al 2008, Sugito et al 2008, Nunes et al 2012). In contrary, our findings differ from Matee 1993, Reisine and Douglass 1998, Hallett and O'Rourke 2003, Aida et al 2006, van Palenstein et al 2006, Savani and Kahabuka 2008, Mohamed and Barnes 2008, Tiano et al 2009, Feldens et al 2010, Rwakatema and Ng'ang'a 2010, Targino 2011, Retnakumari and Gibi 2012 and Tanaka et al 2013 who reported breast feeding at will or breast feeding 7 or more times a day, breast feeding at night, and the practice of leaving nipple in child's mouth at night to be associated with ECC. Cohort studies are recommended to study the relationship between breast feeding and ECC to reduce recall bias in breast feeding practices that may have been encountered in the current study.

Frequency of sugary snacks consumption at the age of 2 - 3 and 4 - 5 years old had no association with the occurrence of ECC in the current study. The positive association between caries and sugar consumption is well established. Lack of association seen in the current study point possible methodological errors such as recall bias that may have been introduced during the study by expecting mothers to remember the frequency of snacking. van Loveren

and Duggal (2001) and Bert and Pai (2001) had reported that, diet has become a lesser factor in caries prevention when exposure to fluorides and oral hygiene is sufficient. This fact may have exerted some influence on the association studied. Similar findings by Gibson et al (1992) amongst British children aged 2 - 5 years and Sayegh et al (2002) amongst 4 - 5 years old children were reported in their study frequency snacks consumption particularly cakes had no influence on the occurrence of ECC. On contrary to our findings, high frequency of snacks consumption among children have been reported to have influence on occurrence of ECC (Prakash et al 2012, Rwakatema and Ng'ang'a 2010, Niji et al 2010, Qin et al 2008, Ismail et al 2008, Retnakumari and Gibi 2007, Du et al 2007, Jigjid et al 2005).

Children with poor oral hygiene had higher dmft as compared with children who had a good oral hygiene in the present study. This finding is consistent with other studies (Masumo et al 2012, Li et al 2011, Kiwanuka et al 2004, Abiola et al 2009, Mohamed and Barnes 2008, Sowole et al 2007, Jose et al.2003, Adeniyi et al 1999).

Assistance in tooth brushing, frequency of tooth brushing and use of toothpaste had no association with the occurrence of ECC. In 2008 Kikwilu et al reported free fluoride concentrations below 400 ppm in all the toothpastes on the market manufactured in Tanzania. Therefore, lack of association between toothpaste use and ECC could be due to low fluoride concentration in toothpaste used in Tanzania. Our findings are in consistence with those reported by Abiola et al (2009) in Nigeria who found no difference in ECC between children who brush under supervision and those who are not supervised, but differ with that reported by where children not supervised in tooth brushing had more ECC. On the other hand, Chestnutt et al (1998) in Scotland, Hallett and O'Rourke (2003) in Australia and Subramaniau and Prashanth (2012) in India reported increased frequency of tooth-brushing, parental supervision and use of fluoridated toothpaste to be important determinant in decreasing the prevalence of dental caries in children. This current study has demonstrated the importance of oral hygiene in prevention of ECC in children.

CHAPTER FIVE

5.0 CONCLUSION

From this study we can conclude that;

1. Children aged 4 - 5years had higher caries experience than children aged 2 - 3 years.
2. Children raised by a single mother had higher caries experience than children raised by married mothers.
3. Children with poor oral hygiene had higher caries experience than children with good oral hygiene.
4. Frequency, duration and at night breast feeding could not differentiate between low and high risk children in the current study.

5.1 RECOMMENDATION

Early childhood caries is a public health problem in Dar es Salaam Tanzania. Therefore, there is a need for intervention among preschool children so as to prevent its occurrence and associated complications. Feasible interventions may include:

1. Instituting and maintaining prevention programs to young children as soon as their primary teeth erupt.
2. Discouraging divorces and child bearing before marriage to give young children the opportunity to be reared by both parents.
3. Inculcating skills and knowledge to parents/caregivers on the maintenance of good oral hygiene in young children.
4. Further studies on the association between breast feeding and ECC in our setting is required.

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APPENDICES

Appendix I: Questionnaire (English Version)

Factors associated with early childhood caries among 2-5 year olds attending dental treatment at Muhimbili University dental clinic.

1. Questionnaire Number:
2. Child's date of Birth:/...../.....
3. Sex of the child: 1=Male; 2=Female
4. Age of the parent/ caregiver (yrs).....
5. Residency: 1= Temeke; 2= Kinondoni; 3= Ilala
6. Marital status : 1= Married; 2= Widow; 3= Divorced;
7. Education: 1=No formal education; 2=Primary education; 3=Secondary education; 4= College/University.
8. Position of the child in the family.....
9. What method do/did you use to feed your child when she/he was 6month old and above?
 1. Breast feeding only. If yes go to question 11
 2. Both breast feeding and bottle feeding
 3. Bottle feeding only .If yes go to question 19
 4. Cup and spoon
10. How frequent do/did you breast feed your child during the day time (from 6 am to 6pm)?
 1. 7- 12 months, (frequency per day.....); I don't remember
 2. 13- 24 months, (frequency per day.....); I don't remember
11. How frequently do you breast feed your child during the night time (from 6 pm to 6 am)?
 1. 7- 12 months,(frequency per night);I don't remember
 2. 13- 24 months, (frequency per night); I don't remember
12. At what age in months did your child stop breast feeding still breastfeeding?Still breast feeding
13. How do/ did you induce sleep to your child?

1= breast nipple; 2= bottle nipple; 3= both breast and bottle nipple; 4=others, mention
14. Do / did you share a bed with your child in circumstances that allow the baby to wake up and start sucking the nipple without you being aware?

1= Yes 2= No
15. Do /did you used to leave breast/bottle nipple in child's mouth when the child is asleep?
 1. Yes, 2.No

16. Who brushes the child's teeth?
1. The child brushes himself/herself
 2. The child is assisted by a parent/caretaker.
17. How many times in a day does your child brush his/her teeth?
1. Once a day
 2. Twice a day
 3. Brushes occasionally
18. Is toothpaste used for toothbrush?
1. Yes
 2. No

In the following couple of questions kindly try to recall what your child often consumed when she/he was 2-3 years old.

No	Type of food/snacks	Has never used	Used once a week or few times	Once a day	Twice a day	3 times or than 3 times a day
25	Biscuits, candy ,cake, chocolate, buns					
26	Juices ,soda, ice creams					
27	Uji,tea,milk with sugar					

In the following couple of questions kindly try to recall what your child often consumed when she/he was 4-5 years old.

No	Type of food/snacks	Has never used	Used once a week or few times	Once a day	Twice a day	3 times or than 3 times a day
28	Biscuits, candy ,cake, chocolate, buns					
29	Juices ,soda, ice creams					
30	Uji,tea,milk with sugar					

Appendix II: Questionnaires (Swahili Version)

Dodoso kuhusu sababu zinazoweza kupelekea mtoto kuonza meno

Namba ya dodoso..... Hosp R/N :.....

1. Tarehe ya kuzaliwa mtoto: Umri.....
2. Jinsia ya mtoto: 1=wa kiume, 2= wa kike
3. Jinsia ya Mzazi/ mlezi: 1= Baba, 2=Mama
4. Umri wa Mzazi/Mlezi (miaka)
5. Hali ya ndoa : 1=Nimeolewa/nimeowa, 2= Mjane/mgane 3= Nimeachana
6. Kiwango cha juu cha elimu:
 - 1=Elimu ya jadi, 2= Elimu ya Msingi
 - 3=Elimu ya sekondari, 4= Chuo/Chuo kikuu
7. Mahali unapoishi: 1=Temeke, 2= Kinondoni, 3= Ilala
8. Nafasi ya watoto kwenye familia(mtoto wa ngapi)
9. Njia zipi ulizotumia/unazotumia kumlisha mtoto wako alipokuwa na umri wa miezi 6 na kuendelea?
 1. Maziwa ya mama pekee. Kama NDIYO nenda swali la 11
 2. Maziwa ya mama pamoja na kumnyonyesha kwa chupa
 3. Kunyonyesha mtoto kwa chupa .Kama NDIYO nenda swali la 19
 4. kutumia kikombe na kijiko
10. Kwa wastani, mara ngapi kwa siku ulikuwa/umekuwa ukinyonyesha mtoto wakati wa mchana (saa 12 asubuhi hadi saa 12 jioni) alipokuwa na;
 1. Umri wa miezi 7- 12? (idadi kwa siku.....); sikumbuki
 2. Umri wa miezi 13- 24? (idadi kwa siku.....); sikumbuki
11. Kwa wastani, mara ngapi kwa siku ulikuwa/umekuwa ukinyonyesha mtoto usiku (saa12 jioni hadi saa 12 asubuhi)?
 1. Umri wa miezi 7- 12? (idadi kwa usiku.....); sikumbuki
 2. Umri wa miezi 13- 24? (idadi kwa usiku.....); sikumbuki
13. Mtoto aliacha kunyonya ziwa akiwa na umri gani?.....(miezi). Bado ananyonya.
14. Huwa unatumia mbinu gani kumlaza mtoto?
 1. Namnyonyesha ziwa
 2. Namnyonyesha maziwa kwa chupa
 3. Huwa namnyonyesha ziwa au kumpa maziwa kwa chupa.
 4. Mengineyo, taja.....

15. Kama unamnyonyesha mtoto kwa chupa ili apate usingizi, ni kinywaji gani huwa unaweka kwenye chupa?
1. Maji yenye sukari
 2. Vinywaji aina ya soda
 3. Maziwa yenye sukari
 4. Juisi yenye sukari
 5. Juisi bila sukari
16. Je Ulikuwa/ umekuwa na mazoea ya kuacha chuchu kwenye kinywa cha mtoto wako wakati amelala.
1. Ndiyo,
 2. Hapana
17. Unalala/ulikuwa unalala na mtoto usiku namna ambayo anaweza kuamka na kunyonya ziwa mwenyewe bila wewe kufahamu. Mfano kulala kifua wazi?
1. Ndiyo
 2. Hapana
18. Kwa wastani, mara ngapi kwa siku ulikuwa/umekuwa ukinyonyesha mtoto kwa chupa mchana(saa12 asubuhi hadi saa 12 jioni)?
1. Umri wa miezi 7- 12? (idadi kwa siku.....); sikumbuki
 2. Umri wa miezi 13- 24? (idadi kwa siku.....); sikumbuki
19. Kwa wastani, mara ngapi kwa siku ulikuwa/umekuwa ukinyonyesha mtoto usiku mchana (saa12 jioni hadi saa 12 asubuhi)?
1. Umri wa miezi 7- 12? (idadi kwa usiku.....); sikumbuki
 2. Umri wa miezi 13- 24? (idadi kwa usiku.....); sikumbuki
20. Mtoto aliacha kunyonya kwa chupa akiwa na umri gani?.....(miezi). Bado ananyonya kwa chupa.
21. Mtoto anapiga mswaki mwenyewe au anasaidiwa?
1. Anapiaga mwenyewe
 2. Anasaidiwa kupiga mswaki na mzazi/mlezi
22. Mtoto alianza/ameanza kupiga mswaki akiwa na umri gani?
1. Miezi 6 hadi 12
 2. Miezi 13 hadi 24
 3. Miezi 25 hadi 36
 4. Miezi 37 hadi 48
 5. Miezi 49 hadi 60
 6. Hajaanza kupiga mswaki.
23. Mtoto anapiga mswaki mara ngapi kwa siku?
1. Hupiga mswaki mara chache
 2. Mara moja kwa siku
 3. Mara mbili kwa siku
24. Je, mtoto anapiga mswaki kwa kutumia dawa ya meno?
1. Ndiyo
 2. Hapana

Maswali yafuatayo yanahusu vyakula/ vinywaji alivyokuwa anatumia mtoto wakati akiwa na umri wa miaka 2 hadi 3.

No	Aina ya chakula/kinywaji	Hajawahi kutumia	Mara 1 kwa wiki au mara chache zaidi	Mara 1 kwa siku	Mara 2 kwa siku	Mara 3 au zaidi ya mara 3 kwa siku
25	Biskuti, Pipi ,keki, chocolate, maandazi/vitumbua					
26	Juisi ,soda, ice creams					
27	Uji,chai,maziwa wa sukari					

Maswali yafuatayo yanahusu vyakula/ vinywaji alivyokuwa anatumia mtoto wakati akiwa na umri wa miaka 4 hadi 5.

No	Aina ya chakula/kinywaji	Hajawahi kutumia	Mara 1 kwa wiki au mara chache zaidi	Mara 1 kwa siku	Mara 2 kwa siku	Mara 3 au Zaidi ya mara 3 kwa siku
28	Biskuti, Pipi ,keki, chocolate, maandazi/vitumbua					
29	Juisi ,soda, ice creams					
30	Uji,chai,maziwa wa sukari					

Appendix III: Oral Hygiene and Dental Carious Status Clinical Forms

a). Oral hygiene status

Dental Plaque: Absent =0 present =1

1 2 3

6 5 4

b) Dental caries status

16	55	54	53	52	51	61	62	63	64	65	26
46	85	84	83	82	81	71	72	73	74	75	36

Key: 0=Sound, 1=decay, 2=filled with decay, 3=filled with no decay, 4=missing due to caries, 9= Exfoliated.

Appendix IV: Consent Form (English Version)**DIRECTORATE OF RESEARCH AND PUBLICATIONS****INFORMED CONSENT FORM**ID. No. Clinic No **Consent to Participate in the Study**

Greetings

My name is Dr. Mselle M. Hatib, I am working on this research with the objective to determine lifestyle factors associated with Early Childhood Caries (ECC) among 2-5 year old children who are attending dental treatment at Muhimbili University dental clinic.

Purpose of the study

The study is conducted as a partial fulfillment of the requirements for the degree of Master of Dentistry in Paediatrics Dentistry (MDENT. PAEDIATRICS) of MUHAS

With all due respect, you are being asked to participate in this study that will facilitate the attainment of the above objective.

Kindly be honest and true for betterment of the results that will lead to better intervention plans and recommendations for future use.

What Participation involves

On agreeing to participate in the study, you will first be interviewed in order to answer a series of questions in the questionnaire prepared for the study. Secondly, I will perform an oral examination of your child and provide you with a summary of the findings and offer advice and reference for suitable treatment if necessary.

Confidentiality

All information collected on examination forms will be entered into computers with only the study identification number. Confidentiality will be observed and unauthorized persons will not have access to the data collected.

Risks

We do not expect any harm to happen to your child during participation in this study. Some questions may make you feel uncomfortable. In case that happens you may decide to discontinue.

Right to Withdraw and Alternatives

Your participation in this study is completely voluntary. You can stop participating in this study at anytime, even if you have already given your consent. Refusal to participate or withdrawal from the study will not result into any penalty.

Benefits

Upon agreeing to participate in this study, you will be given oral health education in accordance to the examination findings so as to prevent further dental decay to your child. The information that you will provide, will help to determine the factors which are associated with ECC. The result of the study will provide information that will form a basis of knowledge on ECC and factors associated with it.

The results will also serve as baseline information for the Ministry of Health and Social Welfare in developing plans of preventing dental decay among preschool children.

Who to Contact

If you have any question/worry about this study, you can contact the Supervisor of this study Professor Emil Kikwilu, mobile +255 715 893527, the Head of Department Dr. Emeria Mugonzibwa mobile +255 713 606 531 or Professor M. Aboud, Chairperson of the MUHAS Research and Publications Committee, P. O. Box 65001, Telephone : +255 22 2150302-6, Dar es Salaam.

Signature:

I,have read this form and agree to participate in the study and have given my consent / I do not agree for my child and myself to participate in the study. My questions/worries have been cleared.

Signature of participant

Signature of Researcher..... Date of signed consent

Appendix V: Consent Form (Swahili Version)**CHUO KIKUU CHA SAYANSI ZA AFYA MUHIMBILI****KURUGENZI YA TAFITI NA UCHAPISHAJI****FOMU YA RIDHAA**Namba ya usaili Namba ya Kiliniki **Ridhaa ya kushiriki kwenye utafiti**

Habari! Jina langu ni Mselle M. Hatib, nafanya utafiti wa kinywa wenye lengo la kutathmini sababu zinazochangia kuoza kwa meno kwa watoto wenye umri kati ya miaka 2 hadi 5 ambao wanahudhuria matibabu kwenye kliniki ya meno ya Chuo Kikuu cha Muhimbili.

Dhumuni la utafiti

Utafiti huu unafanyika ili kutimiza sehemu ya matakwa ya shahada ya uzamili ya matibabu ya kurekebisha na kutibu meno kwa watoto ya Chuo Kikuu cha Afya na Sayansi ya Tiba Muhimbili.

Tafadhali unaombwa kushiriki katika utafiti huu kutokana na upeo na ufahamu ulio nao ambavyo ni muhimu kwa utafiti huu. Kuwa muwazi na mkweli kwa vile matokeo ya utafiti huu yanaweza yakatoa maamuzi na mapendekezo ya huduma ya meno ndani ya taifa hili baadaye.

Jinsi ya kushiriki

Ukikubali kushiriki katika utafiti huu, kwanza utasaidia kujibu maswali yaliyopo kwenye dodoso lililoandaliwa kwa ajili ya utafiti huu. Pili nitafanya uchunguzi wa kinywa cha mtoto wako kisha atakufahamisha kuhusu afya yake ya kinywa, atakupatia ushauri wa kitaalamu na pia tampaia mtoto wako matibabu.

Usiri

Taarifa zote zitakazokusanywa kupitia maswali yaliyopo kwenye dodoso na uchunguzi wa kinywa cha mtoto wako zitaingizwa kwenye kopyuta kwa kutumia namba za utambulisho. Kutakuwepo na usiri na hakuna mtu yeyote ambaye hausiki atakayepata taarifa zilizokusanywa

Athari na kukitokea madhara

Hutegemewi wewe na mtoto wako kupata madhara yoyote kutokana na kushiriki kwenu katika utafiti huu. Hata hivyo baadhi ya maswali nitakayo kuuliza yanaweza yasikupendeze. Ikiwa hivyo na ikibidi unaweza kukataa kujibu swali lolote la aina hiyo na kujitoa katika utafiti huu.

Uhuru wa kushiriki na haki ya kujitoa

Kushiriki kwako kwenye utafiti huu ni kwa hiari. Unaweza kujitoa kwenye utafiti huu wakati wowote hata kama umeshajaza fomu ya ridhaa ya kushiriki utafiti huu na kujibu baadhi ya maswali. Kukataa kushiriki au kujitoa kwenye utafiti huu hakutaambatana na masharti yoyote, wala kukosa huduma uliyotarajia kuipata.

Faida

Ushiriki wako katika utafiti huu, utakusaidia katika kupata elimu ya kinywa na meno kwa mtoto wako kulingana na matatizo yatakayogundulika. Taarifa utakazotoa zitasaidia upatikanaji wa ufahamu kuhusu sababu zinazo changia kuonza kwa meno kwa watoto wadogo.

Matokeo ya utafiti huu yanaweza kuleta ufahamu na uelewa kwa umma kuhusu sababu zinazochangia kuoza kwa meno kwa watoto wenye umri mdogo na namna ya kujikinga na ugonjwa huu.

Nani wa kuwasiliana naye

Kama una maswali/wasiwasi wowote kuhusiana na utafiti huu unaweza kuwasiliana na msimamizi mkuu wa utafiti huu Profesa Emil Kikwilu, mobile +255 715 893527; Mkuu wa kitengo Dr. Emeria Mugonzibwa simu ya mkononi: +255 713 606531 au Profesa M. Aboud, Mwenyekiti wa kamati ya Utafiti na Uchapishaji, Chuo Kikuu cha Afya na Sayansi ya Tiba Muhimbili, S.L.P 65001, Simu ya mezani: +255 22 2150302-6 Dar es Salaam.

Mimi, nimesoma maelezo ya fomu hii na nakubali kushiriki kwenye utafiti huu / sikubali kushiriki kwenye utafiti mimi wala mtoto wangu.

Maswali yangu yamejibiwa. Nakubali kushiriki katika utafiti huu.

Sahihi ya mshiriki..... Sahihi ya mtafiti.....

Tarehe ya kutia sahihi ya idhini ya kushiriki.....