

## RISK FACTORS OF EARLY CHILDHOOD CARIES AMONG DAR ES SALAAM CHILDREN

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### Abstract

**Background:** Early childhood caries (ECC) describes caries experience on at least one primary tooth in children under six years of age. It is among the most common chronic diseases in young children and may develop as soon as the teeth erupt. Thus it presents a serious problem in pediatric dentistry not only because of its rapidity but also because of the age of the affected children.

**Broad objective:** To investigate the risk factors of early childhood caries (ECC) among Dar es Salaam children.

**Methodology:** A cross sectional study that was carried out at four hospitals in Dar es Salaam. Three hundred mothers and their children aged 13-36 months participated in the study. Demographic information and breastfeeding practices were inquired. Intraoral examination was done with the child being held on the mother's lap. Caries was scored according to WHO criteria. Data was analyzed using SPSS program.  $P < 0.05$  was set as a significant level.

**Results:** The overall prevalence of caries was 16.7%, it was 14% on upper central incisors, 3% on lower central incisors and 1.3% on lower molars. Bivariate analysis demonstrated significant association between caries on upper central incisors and low education of the mother ( $P = 0.04$ ) as well as leaving a nipple in the mouth at night ( $P = 0.0001$ ) whereas Logistic regression revealed significant association only with leaving a nipple in the child's mouth at night ( $P < 0.001$ , Exp(B) = 3.644, 95% C.I. 1.354 to 9.812).

**Conclusion:** Leaving a nipple in the child's mouth during sleep at night was the main risk factor for ECC.

**Recommendations:** We recommend that the dental professionals in Tanzania should educate the mothers about the causes and prevention of ECC.

**Key words:** Early childhood caries, risk factors

### Introduction

Early childhood caries (ECC) is defined as the presence of one or more decayed (non cavitated or cavitated lesion), missing (due to caries) or filled tooth surface on any primary tooth in children up to 71 months of age<sup>(1)</sup>. Other terms used to describe this condition include baby bottle syndrome, breast milk tooth decay, nursing bottle syndrome, bottle mouth caries, nursing caries, rampant caries, milk bottle syndrome and faciolingual pattern of decay<sup>(2)</sup>. ECC can develop soon after the first tooth erupts. Maxillary deciduous incisors are mostly affected and this pattern of caries attack is known as severe early childhood caries or SECC<sup>(1)</sup>.

ECC may lead to pain, abscess formation, chewing difficulties and malocclusion<sup>(3)</sup>. It brings pain and suffering during developmental vulnerable period of life<sup>(4)</sup>. Besides, it affects the underlying permanent dentition<sup>(5)</sup>. In addition, the condition may lead to complex and expensive dental treatment but also may traumatize the young patient emotionally<sup>(6)</sup>.

The prevalence of ECC has been widely studied. For example, Al Dashti et al.<sup>(7)</sup> found a prevalence of 18% among preschool children in Kuwait, Khan<sup>(8)</sup> a prevalence ranging between 37-63% in 3 to 5 years old South African children, Wyne et al.<sup>(9)</sup> found a prevalence of 27.3% in Saudi preschool children whereas in Brazil Rozenblatt and Zarzar<sup>(4)</sup> reported 28.4% among 12 to 36 months. In

Tanzanian children, the prevalence has been reported by Matee et al.<sup>(10)</sup> to be 6.8%. Mosha et al.<sup>(11, 12)</sup> 24% and 25% among 5-6 year old children respectively, and Mziray & Kahabuka<sup>(13)</sup> 26.4% among children aged 6-36 months.

The reported causes of ECC include at will breastfeeding, frequent use of medicinal syrups, extensive bottle feeding and extensive use of sweetened pacifier<sup>(4)</sup>. On the other hand, there are numerous risk factors significantly related to ECC<sup>(14)</sup>. For instance Hallet and Rourke<sup>(15)</sup> reported a significant relationship between ECC and the socioeconomic background and according to Huntington et al.<sup>(16)</sup> children who had no ECC frequently visited dentists and were less likely to sleep while feeding compared to children with ECC. Moreover breastfeeding at will after 6 months of age was significantly related with ECC<sup>(7, 17)</sup>. Furthermore a positive association of ECC and the habit of sleeping with the nipple in the mouth was reported by van Palenstein Helderman et al.<sup>(18)</sup>.

ECC is among the most common chronic disease affecting young children in Tanzania. It is a big challenge to the dentists in terms of the work load but also on the age of the affected children. Likewise, it is a challenge to the parents due to its nature, presentation and associated complications at the child's tender age. Unfortunately, parents seek dental treatment after many of their children's teeth have been affected by caries. This increases the load to both the dentist and even to the parents since parents may have to pay for the costs related to repeated visits and the expensive restorations. In Tanzania, children often suffer from life threatening diseases like malaria and diarrhoea, thus parents give priority to these diseases over the chronic diseases like dental caries<sup>(19)</sup>. Moreover, ECC accounts for about 80% of the Tanzanian children's reasons for visit to a dentist.

Therefore, this study was designed to determine the risk factors of ECC among children aged 13 – 36 months in Dar es Salaam, Tanzania. The results of this study will be used to plan intervention programmes aiming to raise parental awareness on the causes, prevention and the consequences of ECC and thus ultimately contribute to improved children's quality of life and minimize treatment costs.

### Materials and methods

A cross sectional descriptive study that involved children aged 13 – 36 months with their mothers seeking medical care at four government hospitals (Amana, Mwananyamala, Temeke and Mnazi Mmoja). Records at these hospitals showed that on average 50-80 mothers bring their children to the clinic daily from Monday to Friday. All mothers and their children aged 13 – 36 months who were seeking medical attention at each of the four hospitals on the day of study were eligible to take part. A systematic sampling was done by recruiting every third client until the required number of 75 participants at each hospital was attained.

Data collection was done using a structured questionnaire and through clinical examination. The questionnaire was used to inquire from mothers about demographic information; the education level of parents

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and style of breast feeding. Examination for ECC was done through visual inspection under natural day light with a child being held on the mother's lap. Caries was scored according to the WHO criteria<sup>(20)</sup> and was recorded as caries on; upper central incisors with or without caries on other sites, lower central incisors only, upper molars only and lower molars only. No probing was done for confirmation of ECC.

Data was entered in a computer and was analysed using an SPSS program version 11.0. The frequency distributions of breast feeding practices and caries on various sites were generated. Independent variables were breast feeding style at night, child's sex, age at stopping breast feeding, mother's education, marital status and employment. Style of breast feeding was dichotomized to mothers wake up to breastfeed or leave a nipple in the child's mouth, marital status into married and not married (single, divorced, cohabiting), employment into employed or not employed, education into low (primary school education or no formal education) and educated (secondary to university education) whereas child's age at stopping breast feeding was dichotomized into younger and older (younger = 3 to 17 months and older = 18 to 30 months). The dependent variables were caries on; upper central incisors, lower central incisors, upper molars and lower molars. Few children had caries on lower central incisors, upper molars and lower molars; therefore only crosstabulations between caries on upper incisors and the independent variables were generated with their associated Chi-square tests.

A backward Logistic regression was performed by entering in the model, variables that showed significant associations on bivariate analysis and those thought to have influence although they were not significant on a bivariate analysis. The dependent variable category coded 0 was taken as the desired outcome, that is (no caries on upper central incisor = 0 and presence of caries on upper central incisor = 1). The independent variable category coded 0 was taken as a reference point whereby child's age at stopping breast feeding (3 to 17 months = 0, 18 to 30 months = 1), Style of breast feeding at night (Not leaving a nipple in the mouth at night = 0, leaving a nipple in the mouth at night = 1), Mother's education (Educated = 0, low education = 1), mother's employment (Employed = 0, Not employed = 1), Mother's marital status (married = 0, not married = 1). The statistically significant level was set at  $P < 0.05$ .

No invasive procedure was undertaken. The researcher explained the purpose of the study to the mothers and requested them to participate. Those willing to take part in the study signed a letter of informed consent.

## Results

The study was done among 300 mothers and their children aged 13-36 months. Out of the 300 children; 53% were males and 47% were females. The mothers who participated in the study were aged 17-65 years, about 73% of them were married, while the remaining 27% were either single, cohabiting or separated. Seventy five percent of the mothers had up to primary school education, 21% had secondary school education while only 0.3% attended College or University. Furthermore, 72% of the mothers

were housewives, while the remaining 28% were either petty businesswomen or were employed in private or public sectors. All the children were either breastfeeding or were breastfed before. About 46% of the children were currently breastfeeding while 54% had stopped breastfeeding. The age at which the children stopped breastfeeding ranged from 3 to 30 months, median 20 months and mean age  $19.4 \pm 4.2$  months.

ECC was found in 16.7 % of the children, with 14% having caries on maxillary central incisors, and not a single child had caries exclusively on upper molars (Table 1). Caries on maxillary central incisors accounted for 76% of caries observed. Out of 300 children, 45% were breastfed "at will" during day time and 33.7% were breastfed "at will" during the night, (Table 2)

Table 1. Caries occurrence according to tooth type.  
(n=300)

Tooth type	Frequency*	Percentage
Caries on Upper central incisors	42	14
Caries on Lower central incisors	9	3
Caries on Lower molars	4	1.3
Caries on Upper molars	0	0
Caries free children	250	83.3

\* A few children had caries on more than one site

Table2. Distribution of breastfeeding frequencies among the children.

Breast feeding frequency	Day time		Night time	
	Number	%	Number	%
2	24	8	69	23
3	45	15	87	29
4	48	16	27	9
>4	48	16	16	5.3
Breast feed at will	135	45	101	33.7
Total	300	100	300	100

Applying bivariate analysis, 16% of the children whose mothers had low education had caries on upper central incisors, while only 6% of the children whose mothers had secondary school or college education had caries on upper central incisors. This difference was statistically significant, ( $P < 0.05$ ). There was a significant relationship between the pattern of breast feeding and occurrence of caries on upper central incisors. Among the children who were left with nipples in the mouth while their mothers fell asleep during night time, 34% of them had caries on upper central incisors compared to 8.8 % of the children whose mothers woke up to breastfeed them. The difference was highly significant ( $P < 0.0001$ ). No significant relationship was found between occurrence of caries on upper central incisors and the mother's marital status or employment, nor the children's sex or age at stopping breast feeding (Table 3).

With logistic regression analysis, mother's education was no longer significant. Leaving a nipple in the mouth at night remained significant ( $P < 0.01$ ,  $\text{Exp}(B) = 3.644$ , 95% C.I. 1.354 to 9.812). Few children had caries on lower central incisors 9 (3%) and on lower molars 4 (1.3%). However, relatively more children who were breastfed at will during the night had caries on the lower molars and lower central incisors than those whose mothers woke up to breastfeed them. Similarly, only 3 children out of 35 who stopped breast feeding at the age of 3 to 17 months had caries on upper central incisors. Therefore,

crossstabulations for these variables could not be computed.

Table 3: Association of caries on upper central incisors and mother's level of education, marital status, sex and leaving a nipple in the child's mouth at night

	Number and percentage of children with caries on upper central incisors		P- value (χ-square test)	P- value (Logistic regression)
<u>Education</u>				
Low	38	16	0.044	0.153
High	4	6		
<u>Marital status</u>				
Married	30	13.7	0.85	0.176
Not married	12	14.8		
<u>Employment</u>				
Employed	4	16	1.00	0.722
Not employed	38	13.8		
<u>Breast feeding at night</u>				
Wake up to breastfeed	21	8.8	0.0001	0.01 95% CI (1.354-9.812)
Leave nipple in child's mouth	21	34.4		
<u>Child's sex</u>				
Females	14	9.9	0.06	
Males	28	17.6		
<u>Age stop breast feeding</u>				
12 – 17 months	9	9.1	0.414	0.549
18 – 36 months	33	16.3		

## Discussion

Interpretation of the findings should bear in mind that the study sample was hospital based thus it may not represent the situation of ECC among Tanzanian general child population. Moreover, no instruments were used during caries examination; this may lead to either underestimation or over estimation of the caries prevalence.

The prevalence of ECC in the current study is lower than previous reports in Tanzania such as 24% and 25% reported by Mosha et al.<sup>(11,12)</sup> and 26% reported by Mziray and Kahabuka.<sup>(13)</sup> The difference may be attributed by differences in prevalence of ECC at different sites as was previously reported by Matee et al.<sup>(10)</sup> who conducted a study in northern Tanzania and found out that the prevalence of ECC varied between different areas. Although the current study and that of Mziray and Kahabuka<sup>(13)</sup> were both conducted in Dar es Salaam, the two studies exhibited slightly different prevalence in ECC. While only one district of Dar es Salaam was included in the previous study, in the current study all the three districts were included. Furthermore, the prevalence in this study is much lower than 27-66% as reported in Saudi, South Africa and Brazil.<sup>(4,8,9)</sup> On the other hand, the prevalence observed in the current study is similar to 18% reported by Al Dashti et al.<sup>(7)</sup> among preschool children in Kuwait, but it is higher than 6.8% reported in Tanzanian children by Matee et al.<sup>(10)</sup> The teeth most affected in this study were maxillary central incisors similar to the findings by Drury et al.<sup>(1)</sup> and Carino et al.<sup>(21)</sup> but it is much higher than those by Mziray and Kahabuka<sup>(13)</sup> and lower than Wyne et al's findings.<sup>(9)</sup>

The current study demonstrated that the children who were left with a nipple in the mouth during the night had more caries on the upper central incisors than those whose mothers woke up to breastfeed them. These findings are

similar to those of Matee et al.<sup>(10)</sup> and van Palenstein Helderma<sup>(19)</sup>. It has been known that when human milk is in prolonged contact with the enamel, it results in the acidogenic conditions and softening of the enamel<sup>(22)</sup>. When milk remains in the oral cavity for a long time, it is fermented to acids by the bacteria present on the biofilm on the teeth. This results in shifts towards demineralization. While it is known that, saliva protects the teeth due to its buffering capacity, at night the saliva flow decreases resulting in higher levels of lactose and dental plaque<sup>(23)</sup>. Thus when the child sleeps with the nipple or with the milk in the mouth at night, the residual milk results in a compounded shift to demineralization due to increase in frequency of sugar exposure coupled by decrease in salivary flow. The finding in the current study that the children who were breastfed "at will" during night time had more ECC than those whose mothers woke up to breastfeed them supports the above theory.

On the other hand, Mziray and Kahabuka<sup>(13)</sup> and Rosenblatt and Zarzar<sup>(4)</sup> found no significant association between occurrence of ECC and breastfeeding. This difference may be because Mziray and Kahabuka<sup>(13)</sup> inquired on breastfeeding as a general term. They did not inquire on a habit of the mothers to leave their nipples in the baby's mouth at night. The difference between the current study and the study done by Rosenblatt and Zarzar<sup>(4)</sup> may be because majority of the participating children in Rosenblatt and Zarzar's study<sup>(4)</sup> were breastfed up to 6 months whereas in the current study majority of the children were breastfed for longer periods. This is in agreement with the findings of Al Dashti et al.<sup>(7)</sup> and Du et al.<sup>(17)</sup> that breastfeeding at will after 6 months of age is significantly related with ECC. At the age of six months only a few children will have erupted one or two teeth. Consequently if breast feeding is stopped at the age of six months, it is unlikely for the breast feeding practice to be associated with ECC causation. Children born to mothers with low education had a higher chance of getting caries on upper central incisors than those born to educated mothers. Probably more mothers with low education share beds with their children than the educated ones and thus increase a chance of leaving a nipple in the mouth at night. Sharing a bed with the child which increases the chance of breastfeeding at will at night is a common practice in Tanzania and is advocated by WHO.<sup>(24)</sup>

## Conclusion

A significant relationship was seen between ECC and leaving a nipple in the child's mouth during sleep at night. Besides children whose mothers were less educated were more likely to have ECC than those born to educated ones. We recommend that the dental professionals in Tanzania should educate the mothers about the causes and prevention of ECC.

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