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Dental Caries Experience and Associated Risk Factors Among Pre-School Going Children In Bureti Sub-County, Kericho County, Kenya

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ABSTRACT

Globally, dental caries is one of the most prevalent dental health problem that affects children. Its prevalence in Bureti division is not known. The objectives were to determine dental caries experience, prevalence and risk factors associated with dental caries among pre-school going children of Bureti Sub-County, Kericho County. The Study population was all pre-school going children aged 3-6 years. The study utilized cross sectional descriptive design that involved quantitative techniques. The teeth of the children was examined at that point in time by a qualified dentist and also their caregivers/parents interviewed on oral health hygiene practices. The dmft scores was recorded. A proportionate stratified sampling technique was used to sample schools. Data was analysed using Stata version 12 and data presented in tables and graphs. Chi test was used to test for associations between outcome/dependent variables and independent variables. Regression analysis was done to establish significance of associations among dependent and independent variables. The mean age of children was 53.22±17.29 months, with boys being majority (51.7%). The child age of starting brushing teeth was 3.5±0.94 years. Majority (63.88%) had dental caries. The mean dmft was 3.54±1.95 with the greatest component being decayed teeth (53.1%). Majority of the children (62.26%) brush teeth with tooth paste and brush at least once weekly (61.73%). The main risk factors for dental caries were mother's occupation (OR=3.18), Eating of sugary foods (OR=2.49), lack of brushing (OR=3.08), bottle feeding (OR=7.17), and poor social demographics. The prevalence of dental caries was high (63.88%) and severe (mean dmft=3.54±1.9) which indicate high dental care treatment need. Consumption of sugary foods rich in cariogenic particles, poor social demographics of the caregivers, poor brushing of teeth, bottle feeding (p-value≤0.05) are associated with high dental caries prevalence and dental caries experience.

Keywords: Dental Carries, Risk factors, Decayed teeth, Pre-school children

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INTRODUCTION

Globally, dental caries one of the most prevalent dental health problem that affects children (Abdullah *et al*., 2008). Dental caries are defined as gradual irreversible decay of teeth resulting from a series of biochemical events occurring at a localized tooth site.

Dental caries is an infectious contagious disease caused by altered molecular interactions between the teeth's surface/subsurface and microbial biofilm. This lead to demineralization of the inorganic portion with subsequent destruction of the organic substance by producing cavities in the enamel and collateral damage in dentine and pulpar tissue (Kiwanuka *et al*., 2004; McDonald, Stookey and Avery, 2004). According to Kiwanuka et al., and Selwitz et al., the high consumption of dietary sugars, chronic exposure to fluoride and poor preventive measures such as lack of brushing, nonuse of tooth paste and use of bottle water especially at night contribute significantly to occurrence of dental caries (Kiwanuka *et al*., 2004; Selwitz *et al*., 2007). Tooth decay spread to the surrounding tissue causing inflammation and abscess formation, which can cause other health problems (Selwitz et al., 2007; WHO, 2007).

The World Health Organization (WHO) Oral Health Area profile program showed that 68% of 12 year old in one eighty four countries examined had less than three decayed/missing/filled teeth (dmft) (Petersen, 2004). The report demonstrated a gradual decrease in the incidence rates of dental caries among 12 year old children over a 30- year period. This was not the case in developing countries such as South Asia and Sub Saharan Africa where an increasing trend was observed (Petersen, 2004). The WHO/FDI has set a goal target for dental caries 50% reduction among 5-6 years old children by the year 2000 and this has not been achieved (Liompart *et al*., 2010). A Brazilian found 55% prevalence of dental caries among children less than less than 6 years (Ogido *et al.*, 2004). In South Africa, the incidence rate of dental caries stood at 1.1% in the year 2003 (South Africa Oral Health Survey, 2003). In the study area, dental caries is number four main cause of morbidity among under five year old children (DMOH, 2013) and accounts for up to 20% of morbidity cases. The factors contributing to these variations could be nutritional, socio-cultural, genetic, and/or environment of the victims.

Problem Statement

Dental caries in preschool going children are both an individual and community health problem. Dental caries can pose great physical pain and complications such dental alveolar abscess if not well treated. These dental alveolar complications can affect child early developmental milestones of children including poor dental structure and significant weight loss. This poses great burden not only to the patient, but also to his/her parents and society. It also leads to psychological trauma among affected children as it is associated with stigma and has been shown to affect academic performance. It also increases school absentism. It also

reduces quality of life among affected children as it reduces ability of children to learn, sleep, play, eat and smile. Little attention and partly ignorance among parents/guardians on dental caries has lead to late diagnosis and treatment of dental caries and these has led to occurrence of dentalalveolar complications is associated with increased cost for treatment, hospitalization and overall increase in burden of health care. Dental caries is irreversible dental health condition and therefore prevention is most efficient way of managing it. Prevention is cheap but treatment of caries and accompanying complication is expensive. This study therefore seeks to investigate the caries experience and associated risk factors among pre-school going children in Bureti Division, Kericho County, Kenya.

MATERIALS AND METHOD

Study Area:

The study was conducted in selected pre-schools in Bureti Sub-County in Kericho County. Bureti Sub-County has approximately 22 public pre-schools and 27 private pre-schools. Bureti Sub-County lies between 0°50´ and 1°50´ South and Longitude 34° 35´ east.

Target Population:

The target population comprised all the pre-school going children aged 3-6 years in Bureti Sub-County, Kericho County. The target population was all pre-school children meeting the study inclusion criteria in all the sampled schools. The pre-school going children include those in grade 1, baby class, introductory, and kindergarten.

Study Design:

cross-sectional Study Design

Determination of sample size:

In order to be 95% sure that the proportion of children with dental caries among those attending kindergarten (preschool) is within plus or minus 5% of the population proportion of 50% a sample size was estimated using the following formula (Cochran, 1963).

$$n=\frac{Z^2pq}{d^2}=\frac{1.96^2x0.5x0.5}{0.05^2}=385$$

Where;

P= is the population proportion of children with dental caries, d=1-p; d= is the margin of error equal to the 5% used in this case, and $Z_{1-\alpha/2}$ = is the $(1-\alpha/2)\times 100\%$ quartile of the standard normal distribution. Population less than 10,000. It then adjusted using population finite correction.

Adjusting for finite population size $\left(\frac{385}{1+385/9000}\right)=369$ participants as our number to study.

A conservative value of 50% was used as the proportion of those with dental caries among the children attending pre-school was not known. The total number used in adjusting for finite population was obtained from survey conducted across the schools in the two zones. The sample size was allocated to the schools proportionately. Total sample size for girls and boys are equal but will be allocated proportionately in each school. See table 1

Table 1: Distribution of study participants

School	Zone	Type	N	N_Boys	N_Girls	n_Boys	n_Girls	n
Bargiro	Litein	Public	44	24	20	10	8	18
Kapkarin	Litein	Public	101	57	44	23	18	41
Ngeny	Litein	Public	95	45	50	18	20	38
Sinendet	Litein	Public	32	18	14	7	6	13
sambon AIC	Litein	Private	38	22	16	9	7	15
Isaiyana	Litein	Private	57	26	31	10	13	23
Sunshine	Litein	Private	80	40	40	16	16	32
Samoget	Litein	Private	52	22	30	9	12	21
Tiiritab Moita	Kapkatet	Public	62	32	30	13	12	25
Mabwaita B	Kapkatet	Public	27	15	12	6	6	12
Sebetet Pri	Kapkatet	Public	75	33	42	13	17	30
Kaptirbet	Kapkatet	Public	35	18	17	7	7	14
Nganaset	Kapkatet	Public	105	48	57	19	23	42
Koitabai Shephered	Kapkatet	Private	36	23	13	9	5	15
Perea Junior	Kapkatet	Private	60	33	27	13	11	24
Doves Kales Valley	Kapkatet	Private	14	8	6	3	3	6
Total			**913**	**464**	**449**	**185**	**183**	**369**

Sampling procedures:

Proportionate stratified random sampling was used to recruit the research participants.

Data collection:

Data was collected using self-administered structured questionnaire.

Data analysis:

Stata version 12 was used to manage data. Descriptive analyses was used to describe the sample such as socio-demographic characteristics and dental visits was analysis bivariate analysis was done to establish associations and relationships between independent variables (Socio-demographic such as age, gender, economic status of the family, parents education level and mouth and teeth hygiene practices such as source of drinking water and dental visits) and the outcome variable (dental caries experience and prevalence of dental caries). Thirdly, all the factors that was significant at bivariate level was entered into a multiple logistic regression model to identify significant predictors of dental experience. Significance was considered at 5% α-level.

Ethical Consideration:

Approval to carry out this study was sought from Maseno University's Ethics Review Committee (MUERC).

RESULTS AND DISCUSSION

Demographic characteristics

A sample of 371 children and their parents/guardians was sampled from randomly selected 16 pre-schools with Bureti Sub-County. The mean age of the respondents was 53.22 (SD=17.29) months. The mean age of children starting brushing was 3.55 (SD=0.94) years. The demographic characteristics of the sample were summarized in table 2

Table 2: Demographic characteristics

Characteristic	Subgroup (category)	Frequency (n)	Percent (%)
Sex	Male	192	51.75
	Female	179	48.25
Religion	Christian	328	88.41
	Muslim	43	11.59
Class	Baby class	191	51.48
	pre unit	38	10.24
	top class	142	38.27
School Category	Private	141	38.01
	Public	230	61.99
Fathers' Occupation	Formally Employed	142	38.27
	Self employed	127	34.23
	unemployed	102	27.49
Mother's occupation	Formally employed	84	22.64
	Self employed	115	31
	unemployed	172	46.36
Father's highest education level	Primary	0	0
	Secondary	247	66.58
	University/college	96	25.88
	None	28	7.55
Mothers' education level	Primary	89	23.99
	Secondary	162	43.67
	University/college	36	9.7
	none	84	22.64
Type of housing	Stone wall	138	37.2
	Timber	130	35.04
	Mud wall	103	27.76

There was a slight majority of boys of 51.75%. Majority of the respondent's profess Christian faith (88.8%) and the 34.23% and 38.27% of the fathers were self-employed and formally employed, respectively. See table 2

Prevalence of Dental Caries and Dental Caries Experience

The overall prevalence of dental caries was 63.88% and among the boys alone, it was 41.77% (138) while 58.23%(99) among girls. The mean dmft score among school going children was 3.54 with standard deviation of 1.95. The mean dmft for girls was 4.68 while boys had mean of 3.17. The dmft range from 0- 8.

When demographic characteristics was stratified by dental caries and caries experience, it was found that the prevalence of dental caries and mean dental caries experience was higher among preschool children and mostly in public schools and of the female gender compared to private schools counterparts and boys. Details are as shown in table 3. The mean dmft index was 3.54±1.9 with the range of 0-8.

Table 3: Household oral behavioral characteristics

Characteristic	Category	n	%
Sugary foods	Yes	235	63.34
lack of brushing	Yes	264	71.16
Breast feeding	Yes	122	32.88
Bottle feeding	Yes	149	40.16
Brushing with tooth paste	Yes	108	29.11
limiting sugary food	Yes	107	28.84
Taking bottle of water at night instead of milk	Yes	177	47.71
Child frequency of brushing teeth	Daily	87	23.45
	weekly	229	61.73
	not applicable	55	14.82
Brushing teeth with tooth brush	Yes	231	62.26
Brushing teeth with sticks	Yes	225	60.65
Not brushing teeth	Yes	14	3.77
Child eats candy food	Yes	273	73.58
Parent talk with child over oral health	Yes	149	40.16

Dental Caries and Related Risk Factors

The risk factors for dental carries were investigated in this study. These include too much sugary food, use of bottle water and poor brushing methods.

When respondents was asked whether eating too much sugary food, or not brushing teeth, or bottle feeding at night, or brushing with tooth paste, or limiting the amount of sugary food or giving a child bottle of water at night instead of milk, are causing tooth decay in children, they gave varied reasons with majority reporting consumption of sugary food and not brushing being the cause of tooth decay in preschool children. Details, among others, are as shown in table 3. Majority (n=229, 61.73%) reported that their children brush teeth weekly, with 5(14.82%) who are not able to brush teeth because they are too young and unable to do so. Majority, 225(60.65%), brush teeth with sticks and another 14 (3.77%) do not brush at all yet they are able to do so. Most 273 (73.55%) eat candy food with different frequencies. Upto 251 (67.6%) of the children have never visited a dental specialist for oral health services. Approximately, 40.16% of children have never talked with their parents over oral health.

Table 3: Cross Tabulation of Dental Caries and dmft with demographic characteristics

		Dental Caries				
Characteristic		Yes	%	No	%	P-value
Class						
	Baby class	100	42.19	91	67.91	<.0001
	Pre unit	24	10.13	14	10.45	
	Top class	113	47.68	29	21.64	
Sex						
	Male	99	41.77	93	69.4	<.0001
	Female	138	58.23	41	30.6	
Median Age		62	(36, 72)	43	(37, 68)	0.2358
Religion						
	Christian	222	93.67	106	79.1	<.0001
	Muslim	15	6.33	28	20.9	
School Category						
	Private	89	37.55	52	38.81	0.8112
	Public	148	62.45	82	61.19	
dmft						
			N	**Mean**		**Median**
Class						
	Baby class		163	3.00		3 (2,4)
	Pre unit		38	3.76		3.5 (3,4)
	Top class		137	4.98		5 (4,6)
Sex						
	Male		178	3.17		3 (2,4)
	Female		160	4.68		4 (4,5)
Religion						
	Christian		309	4.10		4 (3,5)
	Muslim		29	1.59		2 (1,2)
School Category						
	Private		136	3.30		3 (2,4)
	Public		202	4.28		4 (3,5)
Tooth Decay						
			N	**Mean**		**Median**
Class						
	Baby class		65	1.00		1 (1,1)
	Pre unit		19	2.00		2 (2,2)
	Top class		113	3.52		3 (2,4)
Sex						
	Male		99	2.04		1 (1,3)
	Female		98	3.05		3 (2,4)
Religion						
	Christian		183	2.66		2 (1,4)
	Muslim		14	1.00		1 (1,1)
School Category						
	Private		62	1.26		1 (1,1)
	Public		135	3.13		3 (2,4)
Missing Teeth						
			N	**Mean**		**Median**

Class				
	Baby class	163	1.49	1 (1,2)
	pre unit	38	1.50	1.5 (1,2)
	top class	132	1.92	2 (1,2)
Sex				
	Male	173	1.51	1 (1,2)
	Feale	160	1.83	2 (1,2)
Religion				
	Christian	304	1.72	2 (1,2)
	Muslim	29	1.03	1 (1,1)
School Category				
	Private	131	1.45	1 (1,2)
	Public	202	1.80	2 (1,2)
Filled Teeth				
		N	**Mean**	**Median**
Class				
	Baby class	149	1.47	1 (1,2)
	pre unit	24	2.00	2 (2,2)
	Top class	53	1.19	1 (1,1)
Sex				
	Female	122	1.15	1 (1,1)
	Male	104	1.83	2 (2,2)
Religion				
	Christian	211	1.49	1 (1,2)
	Muslim	15	1.07	1 (1,1)
School Category				
	Private	133	1.59	2 (1,2)
	Public	93	1.28	1 (1,2)

When respondents was asked on the frequency of brushing their teeth, majority (61.73%,n=229) reported that they brush their teeth once a week while 23.45% (n=87) reported that they brush at least once every day. Some respondents (n=14, 3.77%) reported that they do not brush their teeth

Association between Dental Caries and Risk Factors

Table 4 shows the risk factors of dental caries such as employment status, gender, age, school category (Public vs Private), Religion and Class. As shown in table, pre-school going children who were of the same gender, same age, same school category, belong to the same religion and are in the same class, a child whose mother is unemployed, is more than 3 times likely to get dental caries as compared to a child whose mother is formally employed (OR: 3.18, 95% CI: 1.49-6.79). There was no significant difference in risk of developing dental caries between a child whose mother is self-employed as compared to a child whose mother is formally employed (OR: 0.81, 95% CI: 0.30-2.13).

A child who does not brush teeth is two time (OR=2.13) more likely to develop dental caries as compared to a child who brushes teeth.

The expected number of dmft's for a child whose mother is unemployed is 0.62 times whose mother is formally employed. The expected number of dmft's for a child who is not bottle feeding is 1.31 times the expected number of a child who is bottle feeding. See table 5.

Table 4: Adjusted logistic regression analysis

Characteristic		OR	Lower 95% CI	Upper 95% CI
Mother's occupation (ref=Formally employed)	Self employed	0.81	0.30	2.13
	unemployed	3.18	1.49	6.79
Father's highest education level(ref=Secondary)	University/college	0.31	0.13	0.76
Mother's highest education level(ref=Primary)	Secondary	0.14	0.06	0.34
	none	0.74	0.32	1.69
	University/college	0.41	0.13	1.31
Type of house living in(ref=Stone wall)	Timber	16.66	7.88	35.23
	mud wall	7.21	2.97	17.50
Eating sugary foods(ref=Yes)	yes	2.09	1.11	3.93
lack of brushing(ref=Yes)	yes	2.13	1.08	4.19
Breast feeding(ref=Yes)	yes	0.17	0.08	0.39
Bottle feeding(ref=Yes)	yes	7.17	3.99	12.90
Brushing with tooth paste(ref=Yes)	yes	0.02	0.00	0.11
Taking bottle of water at night instead of milk(ref=Yes)	yes	2.00	1.18	3.39
Child's frequency of brushing teeth(ref=Daily)	not applicable	0.37	0.12	1.13
	weekly	0.16	0.06	0.42
Brushing teeth with tooth brush(ref=Yes)	No	0.61	0.31	1.18
Child eats candy food(ref=Yes)	No	0.18	0.10	0.35
Child Frequency of seeing dental specialist(ref=Never seen one)	once a year	0.44	0.21	0.91
	once in 6 months	0.31	0.10	0.96
Age started brushing teeth		0.58	0.37	0.92

DISCUSSION, CONCLUSION AND RECOMMENDATIONS

Prevalence of dental caries

The prevalence of dental caries in the study population was high (63.88%). This results are similar to NIH findings which showed that in United States, Dental caries is prevalent and upto five times more common than Asthma (NIH, 2000) and upto 80% in Maharashtra, India (Shingare *et al*., 2012).

The present study finding contradicts a Nigerian study by Odegua and Alade (2017) that found much lower prevalence of dental caries in primary school pupils in Port Harcourt at 12.6%

with lower prevalence of dental caries among the private school pupils (10.2%) than in public school pupils (15%). Another study in Nairobi carried out in 2001 found 63.5% prevalence of dental caries among 3-5 years old pre-school going children (Ngatia *et al*., 2001). This is almost similar to the present study findings which found the prevalence of 63.88%. This being urban area showed that there are other factors other than residence that could be significantly affecting the prevalence of dental caries and this include parental role in oral health education and access to oral health services.

The prevalence of dental caries among in developed countries are believed to be lower than those in developing countries. For instance, In Canada, the prevalence of dental caries was reported to be 52% among 3- 5 years old preschool going children. The lower prevalence could be attributed to lower sugar consumption and possibly a higher oral health awareness among the caregivers. Optimal fluoride use could also be responsible for lower prevalence of dental caries in developed countries like Canada unlike in developing countries such as Kenya.

Dental caries experience

Dental caries experience was assessed using the dmft index which is universally employed to measure caries. It was observed that the present study findings are consistent with data reported by World Health Organization (WHO) that dental caries is a pandemic disease and wide spread (60% to 90%) among school age children, including preschools'(Petersen *et al*., 2005). The mean dmft in the current study was 3.54±1.95 with a range of 0-8.

Risk factors for dental caries and dental caries experience

The level of oral health related knowledge among parents and caregivers is likely to influence the development of dental health habits in their children from the early age. This is due to the ability of children to model dental behaviors from their parents/caregivers. However, few studies have explored the relationship between parents/caregiver's level of oral health related knowledge and practices and preschool going children's prevalence of dental caries.

In the present study, oral health knowledge was relatively high. Majority of the respondents reported that eating of sugary food (63.3%), lack of brushing (71.1%), and not brushing teeth with tooth brush (62.3%) was the main risk factors for occurrence of dental caries. Despite the relatively high level of knowledge on dental health, 273(73.6%) children eats candy food with high carcinogenicity, with majority eating them more than twice a week (33%) and only during the weekends (30%). Quite a number of respondents (28.8%) thought that limiting sugary food is the best way of reducing dental caries. Kiwanuka et al (2004) found that upto 98% of the children examined brushed teeth at least once daily and 99% used tooth paste unlike in the present study where 23.4% brush their teeth daily with majority (61.73%) brushing at least once every week. However, there was no association between frequency of brushing teeth and

incidences of dental caries, though more children brushing at least once weekly tend to have more incidences of dental caries compared to those brushing daily. A number of studies has demonstrated the oral care practices such as poor brushing of teeth, lack of use of tooth paste and poor knowledge of caregivers in occurrence of dental caries (Hallonsten *et al*., 1995; Mattila *et al*., 2000; Raadal *et al*., 2000).

The role of infant feeding practices on caries initiation was not known by the majority of the parents/caregivers. The practice of breast feeding and the 'bottle feeding at night' was reported to cause caries by 32.88% and 40.2% of the parents/caregivers, respectively. The Kenya Ministry of Health encourages exclusive breast-feeding especially in the first six months during ANC and MCH/FP clinics, though may not be accompanied by adequate oral health education. All these reflect a knowledge gap among parents/caregivers on the effect of infant feeding practices on dental caries prevention. Thus oral health education emphasizing the role of infant feeding practices on dental caries among 3-6 year old children is important and necessary among the parents and caregivers.

Lack of brushing teeth was identified as a risk factor with those not brushing having two times more risk for developing dental caries than those who brush (odd ration =2.13) and that those eating sugary food are twice likely to get dental caries (odd ratio= 2.09). The expected number of dmft for a child who is not bottle-feeding is 1.31 times the expected number of a child who is bottle feeding. All these reflects the knowledge gaps and there is need for oral health education among parents/caregivers. There are consistent with many epidemiological studies relating to the dental health of toddlers and preschool children from the Nordic countries (Wendt *et al*., 1991, 1992, 1999; Grindefjord *et al*., 1993, 1995b; Hallonsten *et al*., 1995; Mattila *et al*., 1998, 2000; Raadal *et al*., 2000; Karjalainen *et al*., 2001; Stecksen-Blicks *et al*., 2004; Skeie *et al*., 2005b; Hugoson *et al*., 2008). All these have contributed to understanding the relationships and complexity of the caries disease among pre-school children.

CONCLUSION

The prevalence of dental caries among children aged 3-6 years was high (63.88%) despite relatively high oral health knowledge of the causes and prevention of dental caries among parents/caregivers**.** The caries experience as measured by the mean dmft-index was relatively high (3.54±1.9 with the an interquartile range of 2-5**.** The main risk factors associated with prevalence of dental caries and caries experience were unemployed status of the mother (OR=3.18), household type of housing (OR=16.16 for timber and OR=7.21 for mud wall), eating sugary food (OR= 2.09), lack of brushing (OR=2.13), bottle feeding (OR=7.17) and bottle of water at night instead of milk (OR=2.0).

RECOMMENDATIONS

1. Initiate health education programs integrated with ANC, MCH/FP and school health education programs.
2. Mobilize community oral health officers to perform regular dental check ups of preschool going children and educate their caregivers to enable prompt referral to the nearest dental health facility
3. More research should be conducted on factors influencing dental health seeking behaviors and dietary habits of preschool children in peri-urban and rural areas.

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