

Research

Dental caries and oral health practices among 12 year old children in Nairobi West and Mathira West Districts, Kenya

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Abstract

Background: Dental caries is a common disease in children which causes pain with resultant effect on various physiological and social functions. The main objective of the study was to determine the association between dental caries and oral health knowledge and practice among children in Nairobi West and Mathira West Districts. **Methods:** A cross-sectional study was conducted among 639 children aged 12 years attending public primary schools in Nairobi West and Mathira West districts between August 2009-February 2010. A questionnaire was used to determine the level of knowledge and practices employed. Oral screening was performed using World Health Organisation (WHO) recommended methods. Dental caries was measured using the Decayed, Missing, Filled Teeth (DMFT) index. **Results:** Nairobi West District had significantly higher caries prevalence of 37.5% than Mathira West District (24.0%). The DMFT in Nairobi West District was 0.76 ± 1.2 , while in Mathira West District it was 0.36 ± 0.7 . On multivariate analysis high consumption of soda was found to be a significant risk factor for dental caries in Nairobi West District (Odds Ratio (OR) = 3.0). In Mathira West District having an illiterate mother was a significant risk factor for dental caries (OR=4.3). **Conclusion:** Countrywide intensive oral health promotion should be carried out especially in urban areas, to reduce the higher prevalence of dental caries. The school health policy should be used to promote oral health by provision of oral health instructions and highlighting harmful dietary practices. Preventive practices such as regular dental checkups should be advocated and promoted in schools.

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Background

Dental caries is a chronic infectious disease that causes demineralization of teeth. The interaction of four factors allows this to happen: a susceptible tooth surface, specific bacteria in dental plaque (e.g, *Streptococcus mutans*, *lactobacillus*), time and a diet rich in fermentable carbohydrates, particularly refined sugars. The impact of dental caries includes oral pain which may affect speech, eating, sleeping, swallowing and breathing. The altered appearance it causes can lead to low self esteem and undermine social acceptance [1].

The World Health Organization (WHO) recognizes dental caries as a pandemic and reports that the prevalence of dental caries among school aged children is 60% to 90% [2]. In several industrialized countries the prevalence and severity of dental caries have declined substantially because of preventive oral health care programmes and changes in living conditions and lifestyles [3]. In developing countries, especially sub-Saharan Africa, the prevalence varies according to country population group and socio-economic status [4].

To date, no national oral survey has been carried out to determine the prevalence of dental caries in Kenya. A study done in 1992 found the prevalence of dental caries to be 40% to 50 % among children aged 13-15 [5] in Nairobi, while in 2006 Kassim et. al found the prevalence among adults living in a rural arid region, to be 43% [6]. Basic oral health education is taught in Kenyan primary schools. Children are instructed to avoid sugary foods because they cause dental caries. They are also taught that they should brush their teeth three times a day. The two messages are important but do not cover the entire aspects of dental caries and its prevention. Another source of dental education is dental clinics, but access to these facilities is limited due to several barriers including poverty. A visit to a public dental clinic will require one to purchase a card, the cost of which is prohibitive to many people. Government facilities, of which 80% are situated in the urban areas, are also understaffed and are unable to provide dental education to visiting clients as demonstrated by the dentist- population ratio of 1:60,000 [7]. Dental caries has been shown to affect a significant number of children in our country, but there is limited recent information about dental caries prevalence and oral health habits among children in Kenya. This study describes the dental caries experience among 12 year old children in two Kenyan districts and relates it to their oral health habits.

Methods

Study design

The study employed a cross-sectional design determine the relationship between dental caries and oral health practices among 12 year old children attending public primary schools in Nairobi West and Mathira West districts, Kenya.

Setting

Nairobi West District is located in Nairobi Province, the capital city of Kenya, and is predominantly an urban area. It is a cosmopolitan district. Drinking water is supplied by pipes to homes by the Nairobi Water Company. Mathira West District is located in Central Province and is predominantly a rural area. The main economic activity is farming, and the main sources of drinking water are boreholes, rivers and streams.

Study population

The study population consisted of 12 year old children attending public primary schools. Children aged 12 years were used as the study population as this is an index age recommended by WHO [8]. Children who assented to the study and whose parents/guardians gave written informed consent were included in the study.

Time frame

The Study was conducted between August 2009 and February 2010.

Sampling

A two stage sampling technique was used. Stratified sampling was used to sample the primary schools. A total of twelve schools were included, six out of 54 schools from Nairobi West District and six out of 36 from Mathira West District. In both Nairobi West and Mathira West Districts, two schools were randomly selected from each of the three divisions in each District. To select the children, simple random sampling was used. A register was obtained containing all the 12 year olds. A unique number was assigned to each child, and then a list of random numbers was generated using the computer via Microsoft Excel software. A total of sixty children were selected from each school, and the refusal rate ranged from 0%-15% in the two districts.

Data collection

An oral interviewer-administered pre-tested questionnaire was used to collect data from the children. Consumption of cariogenic foods was classified into three categories: high consumption (consumes at least three times a week), low consumption (consumes two times a week or less) and never consumes.

Clinical examination

Dental caries status was determined by oral screening using the WHO caries diagnostic criteria: Decayed Missing Filled Teeth (DMFT) index [8]. Dean's index was used to record the prevalence of dental fluorosis [9]. Results were reported as either sound (score 0) or very mildly to severely fluorosed (score 1-4). Instruments used during the screening included dental mirrors and tongue depressors. The children were examined while seated in an upright chair using natural day light. All examinations were done in the classrooms independently by two examiners. A calibration exercise was conducted to assess the consistency of the two examiners, which revealed agreement between the two examiners for all but 8% of the children. Differences between the two examiners were discussed and a consensus reached.

Fluoride content in water

One water sample was collected from each of the six schools in Nairobi West District for analysis of their fluoride content. In Mathira West District six water samples were collected from nearby rivers, water tank and boreholes. The fluoride analysis was done at Kenya Water Institute Laboratory. Fluoride concentration was determined using photometric analysis [10].

Ethical considerations

Approval to conduct the study was given by The Jomo Kenyatta University of Agriculture and Technology, National Council of Science and Technology and the Nairobi City Council. Written informed consent was obtained from the children's guardian/parents and assent was sought from the children. All information was treated confidentially. The children were subsequently given oral health education, advice and referral instructions if indicated.

Data management and analysis

The collected data were entered, cleaned and stored using Epi info version 3.3.2. Measures of statistical significance were done using the T-test, Chi-square and Wilcoxon test. P-value of less than 0.05 was considered significant. Logistic regression was done separately for each district using the forward method by including variables that had p-values of less than 0.25.

Results

Study Population

A total of 639 children participated in the study. Of these, 347 (54%) were from Nairobi West District while 292 (46%) were from Mathira West District. Females were 57% and 52% in Nairobi West and Mathira West, respectively. The mothers of the children in Nairobi West had a higher level of education (75% with secondary level and above) than mothers in Mathira West (56%). Two percent and 3% of mothers in Nairobi West and Mathira West Districts, respectively, had no formal education.

Dental caries status

The prevalence of dental caries was significantly higher in Nairobi West District (37.5%) than in Mathira West District (24.0%) (OR= 1.9, CI=1.3-2.7). The major portion of caries experience for both districts was decayed teeth. The DMFT index was 0.76 in Nairobi West and 0.36 in Mathira West. None of the children in Mathira West District had their teeth filled (**Table 1**). The indices for decayed teeth, missing teeth and DMFT were significantly higher ($p < 0.05$) in Nairobi West than Mathira West.

Sixty-one percent and 45% of the children in Nairobi West and Mathira West districts, respectively, brushed their teeth two or more times per day as indicated in **Table 2**. Chewing sticks were reported to have been used by 14%, and of these, 1.2% and 30.0% were from Nairobi West and Mathira West districts, respectively. In all, 77.0% of the children admitted to brushing each of their teeth carefully. Twenty-nine percent of children in Nairobi West District had received instructions on tooth brushing, while in Mathira West District 40% had received instructions. The proportion of those who had ever visited the dentist was more than twice for Nairobi West District children (38.0%) in comparison to Mathira West District (17.5%).

In Mathira West District, having a mother with no formal education was a significant risk factor for dental caries (OR=4.3) as illustrated by **Table 3**. In both districts children who had visited a dentist in the past 12 months were more likely to have dental caries than those who had never visited a dentist. In Nairobi West district children who ate cakes/biscuits had significantly more caries than those who never ate cakes/biscuits. The risk of dental caries was significantly higher among children who drank sodas at a higher frequency compared to those who did not drink (OR=2.2) in Nairobi West District. There was no significant difference in the distribution of dental caries by sex, frequency of tooth brushing and presence of dental fluorosis (**Table 3**).

The mean Fluoride water content for Nairobi West District was 0.59 mg/L (range 0.35-0.85), while for Mathira West District it was 0.77mg/L (range 0.4-1.05). The difference between the fluoride content in the two regions was not significant.

Logistic regression analysis revealed that high consumption of soda was a significant risk factor for dental caries in Nairobi West District (OR= 3.2, CI=1.3-8.0). In Mathira West District having an illiterate mother was a significant risk factor for dental caries (OR=4.3, CI=1.1-1.6).

Discussion

The prevalence of dental caries was found to be 37.5% (DMFT 0.76) in Nairobi West and 24.0% (DMFT 0.36) in Mathira West. These results indicate a decline in dental caries as compared to previous Kenyan studies that found a prevalence of 50% in 11 - 13 year olds [5] and 64% in 3-5 year olds [11]. The decrease may be attributed to increased oral health awareness and number of available dental professionals.

The prevalence of dental caries and the DMFT were significantly higher in Nairobi West District than in Mathira West District. Living in urban areas has implications for lifestyle, including dietary pattern and has been shown to be associated with an increased prevalence of dental caries [12]. The prevalence of dental caries found here is slightly lower than other East African countries which have recorded a prevalence of 41% in urban areas and 29% in rural areas in Uganda [13], and 41.5% among urban children in Tanzania [14]. Our results were quite similar, however, to the findings in a study done in Burkina Faso where the urban area prevalence was 33.8%, while the rural area prevalence was 21.2% [15].

The decayed teeth component of the DMFT index formed the major component in both districts: 0.67 in Nairobi West District and 0.35 in Mathira West District. These high numbers of untreated teeth may be a result of a low perception of the need for treatment and the low priority placed on oral health care compared with other needs [16,17]. None of the children in Mathira West District had any of their teeth filled, compared with 13 fillings in children in Nairobi West District. This can be explained by the low number of dental clinics, both private and public, and lack of resources in the few clinics that are available in Mathira West District. A study done in South Africa also indicated that none of the 12 year olds in the rural population had their teeth filled [17].

Children who had illiterate mothers had higher caries prevalence than children whose mothers had secondary and above level of education in Mathira West District. Similar findings have been reported in Uganda [18]. Mothers with no formal education may lack access to literature on caries prevention and oral health in general.

Sixty-one percent of children in Nairobi West District and 45% of children in Mathira West District brushed their teeth at least twice per day. These figures are higher than what has been reported in Sudan, where 30% of twelve year old children brushed their teeth at least twice a day [19].

Sixty-two percent of the children in Nairobi West District and 82% in Mathira West District had never visited a dentist compared to 76% in Tanzania [14], 60% in India [16], and 34% in Thailand [20]. Although an earlier study done in Sudan [19] showed that children who had ever visited a dentist had lower caries prevalence than those who had never visited a dentist, this was not found in our study. It was also found that children who had reported visiting a dentist at least once had significantly higher caries prevalence than those who had not in Nairobi West District. The same results applied to those who reported visiting a dentist within the past 12 months though the association was slightly more for both districts. This finding is in agreement with other studies [16,18,20] and may be explained by the fact that children tended to visit the dentist when there was already a problem instead of going for routine checkups as confirmed by the reasons they gave for visiting the dentist; only 15% had gone for a checkup. Reasons for visiting were curative rather than preventive.

In Nairobi West District, children who ate cakes/biscuits and children who had a high consumption of sodas had significantly higher dental caries prevalence than those who did not. A study done in Mexico revealed that drinking of sodas particularly between meals was significantly associated with dental caries [21]. This study had several potential limitations. First, the study involved school children who are twelve years old, thereby missing the small percentage of children not attending school. The children in this study may therefore not have been representative of the general population of the target children. Secondly, there was no way to verify the information reported on the questionnaire and so its validity could not be assessed. Therefore, there could have been information bias, including over-reporting of socially accepted behavior such as tooth brushing and under-reporting of less accepted behavior such as consumption of cariogenic foods. Nevertheless the self-reported information clearly shows deficits of healthy oral hygiene behavior, and the dental examinations documented a high degree of inadequate dental care.

Conclusion

A high prevalence of dental caries and poor dental hygiene practices was observed in 12 year old children in Nairobi West and Mathira West Districts, Kenya. It is recommended that countrywide intensive oral health promotion should be carried out especially in urban areas, to reduce the high prevalence of dental caries. The school health policy should be used to promote oral health by provision of oral health instructions and education on harmful dietary practices. Preventive practices such as regular dental checkups should be advocated and promoted in schools.

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Competing interests

Authors declared they have no conflict of interest.

Authors' contributions

Gladwell Gathecha: Principal investigator of the study and main author of the manuscript. Anselimo Makokha: Provided technical assistance in conducting the study. Peter Wanzala: Provided technical assistance in conducting the study Jared Omolo: Provided technical assistance in conducting the study. Perry Smith: Co-author of the manuscript. Provided technical assistance in writing the manuscript.

Tables

Table 1: Caries experience among 12 year old children in two Kenyan districts, 2009-2010

Table 2: Oral health practices among 12 year old children in two Kenyan districts, 2009-2010

Table 3: Dental caries in relation to sociodemographic characteristics, oral health habits and consumption of cariogenic foods among children in two Kenyan districts, 2009-2010

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Table 1: Caries experience among 12 year old children in two Kenyan districts, 2009-2010

	Nairobi West (347 Children)		Mathira West (292 Children)	
	Number of teeth	Index*	Number of teeth	Index*
Decayed Teeth	233	0.67**	102	0.35
Missing Teeth	19	0.05**	3	0.01
Filled Teeth	13	0.02	0	0
DMFT	265	0.76**	105	0.36

DMFT: Decayed, missing and filled teeth; *Index was calculated as the number of affected teeth divided by the total number of children; **p< 0.05

Table 2: Oral health practices among 12 year old children in two Kenyan districts, 2009-2010

	Nairobi West n=347	Mathira West n=292	Total n=639
Frequency of tooth brushing			
Less often than daily	12 (3.5%)	10 (3.0%)	22 (3.0%)
Once /day	122 (35.2%)	152 (52.0%)	274 (43.0%)
Two or more/day	213 (61.4%)	130 (45.0%)	343 (54.0%)
Tooth cleaning aids			
Toothbrush and toothpaste	322 (96.0%)	192 (66.0%)	514 (80.0%)
Chewing stick*	4 (1.2%)	88 (30.0%)	92 (14.0%)
Others**	21 (2.8%)	12 (4.0%)	33 (6.0%)
Reported brushing every tooth very carefully	320 (93.0%)	168 (58.0%)	488 (77.0%)
Reported receiving instructions on tooth brushing	100 (29.0%)	116 (40.0%)	216 (34.0%)
Reported visiting a dentist at least once	132 (38.0%)	51 (17.5%)	183 (28.6%)
<i>Of those visiting a dentist, reasons for dental visits</i>			
"For a checkup"	22 (17.0%)	6 (12.0%)	28 (15.0%)
" My gums were bleeding"	8 (6.0%)	3 (6.0%)	11 (6.0%)
"Teeth were growing badly"	14 (11.0%)	3 (6.0%)	18 (10.0%)
"My teeth were loose"	6 (4.0%)	2 (4.0%)	8 (4.0%)
"My tooth was aching"	82 (62.0%)	37 (72.0%)	118 (65.0%)
Reported visiting a dentist within the past 12 months	70 (20.0%)	34 (12.0%)	104 (16.0%)

*Piece of stick cut from a tree that is flayed out at the end for brushing teeth; **Includes salty water, charcoal and limestone

Table 3: Dental caries in relation to sociodemographic characteristics, oral health habits and consumption of cariogenic foods among children in two Kenyan districts, 2009-2010

	Nairobi West			Mathira West		
	n	Children with Caries	OR (95%CI)	n	Children with Caries	OR (95% CI)
Sex- Female	199	78 (39)	1.2 (0.8-1.9)	152	38 (25)	1.1 (0.6-1.9)
Mothers Education						
No formal education	8	3 (38)	0.9 (0.2-3.9)	9	5 (56)	4.3(1.1-6.7)*
Primary	49	16 (33)	0.7 (0.4-1.4)	99	21 (21)	0.9 (0.5-1.7)
Secondary and above	259	103 (40)	ref	163	37 (23)	ref
Dental fluorosis present	28	11 (40)	1.1 (0.5-2.4)	3	0 (0)	0
Frequency of tooth brushing						
Less often than daily	12	4 (33)	1.1 (0.3-3.1)	10	2 (20)	1.2 (0.1-4.3)
Once /day	122	51 (31)	1.3 (0.8-2.0)	152	39 (20)	1.2 (0.6-2.0)
Twice or more/day	213	75 (35)	ref	130	29 (22)	ref
Reported receiving instructions on tooth brushing	100	37 (37)	0.9 (0.6-1.6)	116	21 (18)	0.6 (0.3-1.0)
Reported visiting a dentist at least once	132	64 (49)	2.1 (1.4-3.3)*	51	17 (33)	1.7 (0.9-3.4)
Reported visiting a dentist within the past 12 months	70	40 (57)	2.7 (1.6-4.8)*	34	13 (38)	2.1 (1.0-4.6)*
Consumption of cakes/Biscuits-High	148	63 (42)	2.3 (1.2-4.6)*	92	23 (25)	0.6 (0.3-1.6)
Low	136	52 (38)	2.0 (1.0-3.9)*	161	39 (21)	0.5 (0.2-1.5)
Never	63	13 (24)	ref		26 (33)	ref
Consumption of soda-High	117	55 (47)	2.2 (1.1-4.5)*	30	3 (23)	0.9 (0.2-3.6)
Low	177	60 (34)	1.3 (0.7-2.5)	203	48 (24)	0.9 (0.5-1.7)
Never	55	15(28)	ref	76	19(25)	ref

ref = reference group OR = Odds Ratio CI = Confidence Interval *p<0.05