

Factors associated with oral health status and normative treatment needs among primary school children in Kinondoni Municipality, Tanzania

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Abstract

Aim: The aim was to determine oral health status, factors affecting caries, experiences, and dental treatment needs among primary school children in Kinondoni District, Dar Es Salaam Region. **Materials and Methods:** A cross sectional survey was done in 2005 to involve 784 (females 56.2%) children aged 7 to 19 years, with average age of boys slightly higher than that of girls. The examinations were carried out according to WHO criteria (World Health Organisation, 1997) under artificial light using dental mirrors and the WHO CPI periodontal probe. Before the clinical examinations took place the children participated in an interview whereby information was gathered about oral health related knowledge, experience with toothache, extractions, restoration and tooth brushing practices. A structured questionnaire was used which was field tested to a group of 50 primary school children prior to the survey. **Results:** Dental caries experience was 1.35 dft and 0.33 DMF-T, for 12 year olds (the WHO indicator age group) DMFT was 0.4. The proportion of caries free among 12 year olds was 77.6. The determinants of caries experience were age and sex, while oral health related knowledge, caries in deciduous dentition, geographical location that was taken to be a proxy indicator of social economic status, were not associated with caries experience in permanent dentition. Much of the dental caries went untreated and every 8th child needed one surface filling on at least one tooth. Few children required extractions and two surface fillings. One third of the children had calculus requiring oral hygiene instructions and scaling and on average one sextant had calculus per child. One third of the children experienced bleeding upon brushing, and 54.8% had experienced toothache. All children brushed their teeth at least once a day. Knowledge on gingival health did not account for variations in calculus accumulation. **Conclusion:** Caries experience; predicted by age and sex, was very low but much of the disease went untreated, toothache was a common encounter, with every eighth child requiring one surface filling on at least one tooth. Every third child had calculus requiring oral hygiene instructions although all children reported to brush their teeth at least once a day. The findings are discussed in line with their usability in planning oral health services in the District.

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Introduction

Within the past three decades evidence has accumulated especially in industrialised countries of encouraging trends in the prevalence and severity in oral diseases. In children this has been shown by a reduction of dental caries and an improvement of gingival conditions (1). The reasons for this improvement may involve a more sensible use of sugar, improved oral hygiene practices, use of fluorides in toothpaste, rinses, and topical fluoride application (2). Brushing twice a day with fluoridated toothpaste is a fundamental oral health practice. However the opportunity to brush twice a day with fluoridated toothpaste is highly dependent on corporate and public policies that determine the availability and affordability of fluoridated toothpaste (3). Knowledge on caries preventive effect of fluoride also may affect the utilization of fluoridated toothpaste (4) and thereby be linked to dental caries experience. Several other factors have been linked to caries experience in permanent dentition; to mention only a few these may include socio-demographic factors, eating

patterns, caries in deciduous dentition, and utilization of preventive services. Understanding the factors underlying caries experience in a particular group will greatly enhance the tactics of interventions to be targeted to that group.

On a worldwide comparison, Tanzania has not reached yet an alarming caries experience (1) nevertheless, with improved economy and liberalisation of trade, the consumption of sugar is likely to rise and thereafter increase caries experience. Dental diseases are not life threatening, but have far reaching effects on the quality of life in terms of pain they cause, school and work absenteeism as well as psychosocial sequel left by disease. In addition, treatment of dental diseases is very expensive, in the advent of cost sharing for health services much of the disease is likely to go untreated for long periods of time. In view of this scenario preventive measures have to be in place to contain the diseases at the lowest possible levels.

Kinondoni municipality is in the initial phases of implementing School Health Program in primary schools, which contains a component of oral health as emphasized in several scientific reports (5,6,7,8). The goals of school oral health component include: raising oral health knowledge and self-care oral health habits among primary school children, and provision of comprehensive treatment to the children in need as stipulated in the Policy Guidelines for Oral Health Care in Tanzania (9). Authorities faced difficulties in preparing a comprehensive school health plan that contain evidence-based budget covering aspects of oral health because there was no data on oral health status, knowledge on oral health and self-care oral health habits of children attending primary schools in Kinondoni municipality. In order to get the required oral health data, an oral health survey among primary school children in the municipality was planned and implemented in 2005. This paper reports on the factors associated with oral health status and normative treatment needs among primary school children in Kinondoni municipality, Tanzania as an extract of the main report submitted to the Kinondoni municipal council.

Materials and methods

Kinondoni municipality has 150,000 children schooling in 131 government primary schools. The present survey was carried out in March to May 2005. The district was divided into three zones. Three schools were selected purposively one from each zone. The schools included Oyesterbay, Karume and Ununio primary schools representing high, middle and low socio-economic status groups. In each school all pupils were eligible for the study. Nevertheless only those who were willing participated in the study. A total of 784 children (56.4% females) with age ranging from 7 to 19 years were enrolled into the survey after getting their consent.

Data were collected in classrooms by means of clinical examinations and questionnaires. The examinations were carried out according to WHO criteria (10) under artificial light using dental mouth mirrors and the CPI periodontal probe. The following conditions were registered: dental caries status and treatment needs, Community Periodontal Index (score 0; healthy; score 1: gingival bleeding; score 2: calculus).

Demographic variables were recorded as part of clinical examination. Before the clinical examinations took place the children participated

in an interview whereby information was gathered about oral health related knowledge, experience with toothache, extractions, restoration and tooth brushing practices. A structured questionnaire was used which was field-tested to a group of 50 primary school children prior to the survey.

Processing and analysis of data was carried out by means of the statistical package for the social Sciences (SPSS-PC Version 11.5). The prevalence of dental disease was expressed by proportions. Frequency distributions and means of dft/DMFT were calculated for the univariate and bivariate analyses. The CPI data were analysed according to WHO recommendations whereby participants were categorized by maximum CPI score and the mean number of sextants with certain gingival conditions were computed. Frequency distributions were generated to describe prevalence data. Chi-square statistics, t-test, One-way ANOVA and correlation coefficient were computed to identify bivariate relationships between variables of interest. Multivariate analysis was done by Regression analysis to identify factors that contribute to the children oral health status.

Treatment needs were expressed as frequency distribution of individuals and teeth needing one surface fillings, two surface fillings, extractions, oral hygiene instructions and scaling as appropriate.

Results

Table 1 depicts that in both sexes more children belong to the older age group (12-19 years). Nevertheless the difference is not significant. Twelve year olds, the WHO indicator age group, constituted 18.2%. Age profile is of normal distribution with only one out-lier at the age of 19 years.

The sample's mean DMFT was 0.33. The D component constituted 87.9 of the DMFT, the M component 12.1 and the F component zero. The mean DMFT for females (0.40) was significantly higher than that of males (0.25) with p value < 0.05. Caries lesions per child ranged from 0 to 12. The prevalence of caries was 18%, that is, 82% were caries free.

Filtering all age groups and consider only 12 year olds (the WHO indicator age group for monitoring caries trends), the mean DMFT for 12 year olds was 0.4, with caries lesions ranging from 0 to 4 per child. Among 12 year olds, the

mean DMFT for girls was 0.52 and boys 0.16. The difference was statistically significant, $p < 0.05$. The proportion of caries free individuals among 12 year olds was 77.6

Significantly higher proportion (87.10%) of younger age group (7 –11 years) were caries free as compared to 77.3% of the older age group (12 –19 years), $\chi^2 = 12.33$, p value < 0.001 .

Selecting children who still had tooth number 85, (the last deciduous tooth to exfoliate), 206 children were eligible for computations of the dft which was composed of the *d component* only. The sample mean dft was 1.35, with 26.7% having a dft of 1, while some children had a dft as high as 6-10. There was no significant difference between the mean dft for girls (1.5) and that of boys (1.2).

To check if caries in deciduous dentition would predict caries experience in permanent dentition, both DMFT and dft scores were dichotomized to caries free and caries experienced children. These were cross tabulated, irrespective of their caries status in primary dentition, almost similar proportions of caries free children were displayed in the permanent dentition i.e. 95.6% caries free versus 92.2% among caries free and caries experienced children in deciduous dentition respectively. Bivariate association of dft and DMFT revealed a Spearman's rho of 0.092 ($p = 0.189$) indicating that caries experience in deciduous dentition had no significant association with caries in the permanent dentition. One ANOVA indicated that there was no significant difference in mean DMFT among the three schools representing high, medium, and low socio-economic status.

Exploring the data further, knowledge on anti-caries effect of toothpaste did not have an effect on prevalence of caries. The proportion of caries free individuals among those who were knowledgeable (82.8%) was not significantly different from those who were not knowledgeable (80%). Those who had ever experienced toothache had significantly higher mean DMFT (0.48) than those who had never had tooth-ache experience (0.15), p value < 0.001 . Those who reported to have tooth extraction before had a higher mean DMFT (0.54) than those who never had extraction before (0.24) p value < 0.001 . Bleeding gums were associated with differences in mean DMFT, those with bleeding gums had a slightly higher DMFT (0.43) than those who did not have

bleeding gums (0.28), p value < 0.05 . Knowledge of the effect of sugar on caries did not affect DMFT variations among the knowledgeable and none knowledgeable. To rule out confounding, multivariate analysis using multiple linear-regression was performed. When a summative index for knowledge (summation of 5 items of knowledge on caries), age, sex of the child and dft (caries experience in primary dentition) and bleeding on brushing (gingivitis) were regressed upon DMFT (caries experience in permanent dentition), the most important predictor of caries experience was age ($\beta = 0.15$, $p = 0.000$) followed by sex ($\beta = 0.09$, $p = 0.01$) and bleeding during brushing ($\beta = -0.08$, $p = 0.03$). Caries status in primary dentition and knowledge on caries were not significant predictors of caries experience in the permanent dentition.

Table 1: Sample distribution by Age and sex

Age group	Males		Females		Total	
	N	%	N	%	N	%
7- 11 yrs	140	40.9	208	47.1	348	44.4
12- 19 yrs	202	59.1	234	52.9	436	55.6
Total	342	100.0	442	100.0	784	100.0

A total of 101 children needed one-surface fillings, which implies that every 8th child requires one surface filling on at least one tooth. Those who needed these fillings ranged from one tooth to seven teeth per child, of these 68.3% had one tooth each needing one surface filling. On average each child needs 0.2 one surface fillings. Among the ten children who needed two surface fillings, 90% of children had one tooth each needing two surface fillings. One child had three teeth needing two surface fillings. Forty-two children needed extraction ranging from one tooth to four teeth per child; of these, 59.5% needed extraction of one tooth per child (Table 2).

Three percent had one bleeding sextant, 1.1% had two bleeding sextants. It should be noted that some bleeding sextants were not scored under bleeding because they had calculus; a higher score was recorded for periodontal conditions as per CPI hierarchical scoring. Thirty seven percent of all pupils had calculus ranging from those with calculus involving one sextant (12.2%) to those who had calculus in all sextants (1.4%) (Table 3). Computing mean calculus score, it was shown that on average each child had 1 sextant with calculus. Table 4 shows that posterior teeth followed by lower incisors were

more affected by calculus and bleeding than other teeth

Table 2: Sample distribution of treatment needs

Need for one surface fillings	Need for two surface Fillings		Need for extraction
	Number of teeth	n (%)	
1	69 (68.32)	9 (90)	25 (59.53)
2	21 (20.79)	0 (0)	14 (33.33)
3	7 (6.93)	1 (10)	2 (4.76)
4	2 (1.98)	0 (0)	1 (2.38)
7	2 (1.98)	0 (0)	0 (0)
Total	101 (100)	10 (100)	42 (100)

Table 5 shows nearly one third of the children did not know that toothpaste prevents tooth decay and 54% did not know that conservation is a treatment of dental decay. One third experienced bleeding on brushing and about a half had experienced toothache while 52.6% claim to brush their teeth twice a day. About half of the children reported to brush their teeth twice a day, 43.4 % brush once a day. Only 4% brush three times a day. Majority of children had good knowledge on causes of gingivitis. When the items that measured knowledge on gingivitis were entered into a logistic regression model, with dichotomized calculus score as the dependent variable, none of the knowledge items turned out to be a significant predictor of calculus.

Table 3: Distribution of individuals and affected sextants by calculus and bleeding

Number of Sextants affected	Calculus n (%)	Gingival bleeding n (%)
0.00	495 (63.00)	746 (94.90)
1.00	96 (12.20)	26 (3.30)
2.00	85 (10.80)	9 (1.10)
3.00	38 (4.80)	5 (0.60)
4.00	47 (6.00)	0 (0)
5.00	14 (1.80)	0 (0)
6.00	11 (1.40)	0 (0)
Total	786 (100)	786 (100)

Discussion

In Tanzania, the health care has been in transition over the past years since independence.

The health care is mainly financed through the Health budget, donor assistance, cost sharing and to lesser extent through medical insurances. Publicly funded oral health care service is limited and not comprehensive and there are very few oral health outreach programs for school children. In contrast to general health, no systematic oral health surveillance systems have been established which could assist the planning of evidence-based oral health interventions. Thus, the present study intended to assess oral health status, factors affecting it and dental treatment needs among primary school children in Kinondoni in view of establishing baseline data for planning school dental services for the District. Both urban and semi-urban schools were chosen in order to capture the various characteristics in this rather heterogeneous population. The sample size was sufficiently large for calculation of precise statistical parameters. The reliability of the interview was controlled by using highly structured field-tested questionnaire and potential information bias may either relate to recall bias or possibly by participants intention to seek social desirability. For clinical data the WHO (10) (1997) criteria for scoring caries and periodontal conditions were used.

Table 4: Distribution of individuals with Calculus (ca) and Bleeding (bl) on every sextant. Frequency distribution and percentages in parenthesis, N=786

Sextant number	Calculus	Gingival Bleeding
1	178 (22.6)	16 (2.0)
2	18 (2.3)	3 (0.4)
3	176 (22.4)	13 (1.7)
4	124 (15.8)	13 (1.7)
5	80 (10.2)	4 (0.5)
6	128 (16.3)	10 (1.3)

On a global perspective, the actual level of dental caries in Tanzanian children is very low (11, 12, 13, 14). Similar levels have been observed in this study sample. The Tanzanian National policy guidelines for oral Health (MOH 2002) stipulates that, the DMFT among 12 year olds should be no more than 1 and 75% of 5-6 year olds should be caries free. Caries levels outlined in the present investigation and those done previously in Tanzania indicate that the national goals were set at a worst level than the existing caries status among most Tanzanian children. As Brathal

(2000)15 correctly puts it, time is due that a new global oral health goal is proposed. Tanzania in the same footing is called upon to reset its

national oral health goal for 12 year olds in accordance with the prevailing caries levels in Tanzania.

**Table 5: Sample distribution of knowledge experience and practices (percentages in parenthesis)
N =778**

Knowledge	Yes	No
Tooth decay is caused by sugar	702 (89.3)	76 (9.7)
Gingivitis is caused by dirty teeth	679 (86.4)	99 (12.7)
Decay can be prevented by tooth paste	528 (67.2)	250 (31.8)
Sweets cause tooth decay	748 (95.2)	30 (3.8)
Conservation is a treatment of caries	354 (45.5)	424 (54.5)
Ice cream cause tooth decay	624 (80.2)	154 (19.2)
Sweets cause tooth decay	748 (96.1)	30 (3.9)
Brushing prevents gingivitis	649 (82.6)	129 (16.4)
Refrain tooth brushing cause bleeding	670 (86.1)	108 (13.9)
Experience and practices		
Bleeding on brushing	258 (33.2)	520 (66.8)
Had extraction before	230 (29.6)	548 (70.4)
Had experienced tooth ache	426 (54.8)	352 (45.2)
Had teeth filled	100 (12.9)	678 (87.1)
Brush once a day	338 (43.4)	438 (56.6)
Brush twice a day	409 (52.6)	367 (47.4)
Brush thrice a day	31 (4.0)	772 (96.0)

Although there is no evidence yet to suggest caries increment in Tanzania (11,14) and that caries experience is low as also demonstrated in this study, much of the observed disease goes untreated as reflected by the df/DMFT-components. This is a mirror image of an incapacitated health care delivery system on one hand. On the other hand it could symbolize family poverty (16,17), lack of awareness on available services and treatment options 16, lack of dental check-up initiative and lower use of preventive services (18), dental fear and anxiety (19,20), and unsatisfactory previous dental treatment (21) that surpass improvements in oral health.

In addition this investigation revealed that more than half did not know that conservation is a treatment of a decayed tooth. Indeed much needs to be done to uphold the dental health care delivery system and address the psychosocial, sociocognitive, and economic factors underlying service utilization in Tanzania and Kinondoni District in particular.

On a serious note, every second child had experienced toothache before. This is one of the aspects by which poor oral health impacts on

quality of life. Whereby pain impairs chewing, and participation in various activities including school attendance, not withstanding the suffering it causes to the victim (22).

Every eighth child required one surface filling on at least one tooth. Only a few teeth needed two surface fillings or extraction. Regrettably, as most people in Tanzania would visit the dental clinic in the late stages of painful oral diseases (6,7), most of these decayed teeth might end up being extracted. Therefore these findings on treatment needs should offer a timely aid for estimating the number of teeth and children requiring different types of dental treatment in the District. Precisely, dental materials, time, instruments, equipment, space and personnel can be elucidated based on this information. Moreover, in this era of evidenced based planning, emergency of new diseases and the low importance attached to diseases that rarely kill, pains should be taken to gather and present data that will defend dental budgets to decision makers.

Those who had ever experienced toothache had significantly higher mean DMFT than those who had never had toothache experience indicating

that much of the pain is caused by the untreated caries. More to the point, those who reported to have tooth extraction before, had a higher mean DMFT than those who never had extraction before, implying that the long standing untreated disease actually ends up with extractions as the treatment option.

Females tend to be more affected by caries than males (14) (Mosha et al., 2005), this among other things could be attributed to females' inclination to snacking behaviour. Among children sex differences in caries experience could also be attributed to different tooth-eruption times between males and females. Hence children of the same age could have their teeth exposed to the oral environment for different periods of time thereby contributing to variation in caries experience. In Tanzanian, permanent teeth of children erupt earlier in girls than in boys (23). This could explain the sex differences in caries experience observed in this study. Caries experience in deciduous dentition did not predict caries in permanent dentition. This could be explained by the fact that factors affecting caries in deciduous dentition are different from those affecting caries in permanent dentition. In deciduous dentition, breast and bottle-feeding at will, as well as weaning practices account for much variation in caries experience (24).

In this study children were purposively selected from three different clusters representing high, medium and low-income settlements. However the presumed socio-economic status did not have an effect on caries experience. It could be that geographical location did not capture the real economic status of those children.

Age is an important determinant of dental caries as also demonstrated in this study. In this survey, there were almost similar proportions of boys and girls in both young and old age groups, and controlled for the effect of other factors yet age and sex accounted for variations in caries experience. The effect of age on caries need not be over emphasised, as much is known about the cumulative effect of caries experience throughout the years one has lived. To the contrary, Joshi et al., (25) found no significant relationship between age, sex, and dental caries experience among a group of Indian children. However, in that Indian study the sample size was small and this could have decreased the power of the study to detect the differences (26).

The importance of oral hygiene has been linked to caries prevention especially when tooth brushing is done with fluoridated toothpaste (27). In this investigation bleeding on brushing was a significant predictor of caries, indicating that those with gingivitis brush less frequently and presumably miss the protective effect of mechanical plaque removal and topical fluoride application from toothpaste. On the other hand presence of big carious lesions exposing the underlying dentine might cause pain upon brushing, eventually discouraging affected children to brush their teeth. This survey also revealed that about one third had at least one sextant with calculus, with posterior teeth mostly affected. All children reported to brush their teeth at least once everyday with some of them claiming to brush up to three times a day. Ignoring the concept of seeking social desirability (28), still clinical indices of calculus and bleeding suggest that the claimed tooth brushing is not done systematically and eventually posterior teeth are not brushed regularly. This information should assist in demonstration of systematic tooth brushing to schoolchildren, that emphasis should purposively be put to those areas in the mouth that are difficult to access. In addition, these participants displayed good knowledge related to gingival health, nevertheless the knowledge possessed did not account for significant variations in calculus accumulation. Analytically there is some evidence to suggest that they knew and probably wanted to do the right thing but disappointingly, the skills required to do the right thing were lacking. Equally worth noting, is that a sizable proportion of children did not know that fluoridated toothpaste prevents caries. As also emphasized by the World Health Organisation, the situation portrayed in this study calls for a deliberate action by the dental profession to promote the use of fluoridated toothpaste through various avenues (29). Moreover, dentists should not only educate the community to use fluoridated toothpaste but also should prescribe it as a therapeutic agent to patients attending the dental clinic (30). This approach would as well strategically target the caries high-risk individuals who happen to visit the dental clinic.

Conclusion: Caries experience; predicted by age and sex, was very low but much of the disease went untreated, toothache was a common encounter, with every eighth child requiring one surface filling on at least one tooth. Every third child had calculus requiring oral hygiene

instructions although all children reported to brush their teeth at least once a day.

Recommendation

A more worked out socioeconomic measurement needs to be worked and used to assess its effect on caries

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A housewife, an accountant and a lawyer were asked,
"How much is 2 + 2?"

The housewife replies: "Four!"

The accountant says: "I think it's either 3 or 4. Let me run those figures through my spreadsheet one more time."

The lawyer pulls the drapes, dims the lights and asks in a hushed voice. "How much do you want it to be?"

Teacher: Why were you absent yesterday, John

John: The doctor said I had acid indigestion.

Teacher: then you'd better stop drinking acid