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DENTAL CARIES AND PERIODONTAL CONDITIONS AMONG PRIMARY SCHOOL CHILDREN IN MOROGORO MUNICIPALITY, TANZANIA

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ABSTRACT

Objective: To describe the occurrence of dental caries and periodontal conditions among standards three and four primary school children in Morogoro municipality and compare the obtained oral health indicators with the goals stipulated in the National Plan for Oral Health by the year 2002.

Design: Cross sectional study of the oral health status among eight to 15-year old primary school children.

Setting: Primary schools in Morogoro municipality, Tanzania.

Subjects and methods: A total of 1297 standards three and four children in five primary schools randomly selected from a list of 36 primary schools of Morogoro municipality were examined for oral health status. Dental caries and periodontal status were recorded using the criteria described in the WHO manual for Oral health Surveys, Basic Methods (1997). Oral cleanliness was assessed using plaque index.

Main outcome measures: Dental caries prevalence, experience and its distribution by tooth type and jaw and prevalence and severity of periodontal conditions and oral cleanliness.

Results: Seventy six percent of the children were caries free, and the mean DM-T was 0.41. No fillings were encountered. Seventy six per cent of carious lesions were in pits and fissures of lower molars. Only 21% of the caries lesions were in the pits and fissures of upper molars. Seventy five per cent of the children had all sextants with no gingivitis or calculus. Mean sextants with gingivitis, calculus and visible plaque were 0.25, 0.69 and 2.44 respectively.

Conclusions: Standard four and standard four children in Morogoro municipality primary schools had very low levels of dental caries, good oral hygiene and a very low prevalence of gingivitis. No restorative treatment had been provided to these pupils. It is recommended that Morogoro municipality should start a dental caries treatment programme in primary schools in order to attain the national goal of 10% of the "F" component of DMF-T by the year 2002.

INTRODUCTION

Dental caries and periodontal conditions among primary school children in Tanzania have been studied extensively in the 1980s. In all those studies, dental caries has been consistently recorded as very low, with the mean DMF-T ranging from 0.4 - 0.9 in children aged 10-14 years(1-8). Caries-free children ranged from 50% - 70% (1-7, 9). Most of the caries lesions were in the pits and fissures of molar teeth, in particular, lower molars(1,3-6,9-10). Periodontal conditions, mainly plaque, calculus and gingivitis have been recorded as very high, the prevalence of which ranged from 55%-99%(1,11-13). These data enabled the Ministry of Health to prepare the national plan for oral health in 1988 that extends to the year

2002. In this plan, several goals were set including the following: twelve-year old children would on average have no more than 0.6 DMF teeth; gingival bleeding would occur, on average, in no more than 1.5 sextants of the 12-year old children using the CPI index; and the DMFT index in the 12-year old children would be composed of 80% decayed, 10% missing, and 10% filled components.

To enable Tanzania achieve these goals, the following strategies were identified: promotion of lifestyles conducive to oral health, prevention of preventable oral conditions; provision of basic curative and rehabilitative oral health services to those in the target population in greatest need; and development of the oral health services to cover the

entire population with emergency and preventive oral health care(14). It was the expectation of the Ministry of Health that every district in Tanzania would undertake the four strategies seriously.

Morogoro district is best placed to achieve these goals because it has adequate human resources and facilities, and serves as a training ground for fieldwork in Community Dentistry, a programme run by the department of Preventive and Community Dentistry of the Faculty of Dentistry. In the Morogoro municipality alone, there are four dental clinics: one owned by the government and the rest are privately owned. The Faculty of Dentistry sends dental students for their fieldwork in community dentistry in the same district three times every year for a total of 12 weeks. The field rotations for the dental students are mainly conducted in primary schools. Each primary school has an opportunity of being visited twice in six years. During these field rotations, five principles of primary health care are put into practice with adequate attention to the strategies stipulated in the National Plan for Oral Health. In this way, dental students' field rotations serve as the training opportunity for students and as service to the population in the district.

To enrich the learning opportunities for dental students in the area of appropriate technology in dentistry, as well as improving the service component to Morogoro primary school children, it was thought appropriate to start the field testing of Atraumatic Restorative Treatment (ART) for dental caries in Morogoro municipality. With these opportunities, the goals for oral health in Tanzania are likely to be fulfilled in this district more easily than in any other district. Therefore this study was conducted in Morogoro municipality first, to evaluate the oral health status of school children and compare with the set goals in the National Plan for Oral Health. Secondly, to screen children with dental caries lesions to be treated using the ART technique (under field conditions) as part of a service and for the evaluation of ART fillings. Thirdly, to update the available oral health data bank because the available data is more than ten years old and several social, political and economic changes have taken place during this period that could affect the oral health of Tanzanians positively or negatively.

MATERIALS AND METHODS

Five schools in Morogoro municipality were selected randomly from a list of 36 schools. All class three and class four pupils studying in the selected schools were examined by two calibrated dentists for dentition and periodontal status using the WHO criteria(15). Class three and class four pupils were chosen because they were the classes most studied in, the 1980s, and by then these classes represented the majority of 12-year-olds, the index age for global data for oral health. Periodontal status was assessed using Community Periodontal Index (CPI). Oral cleanliness was assessed using plaque index with a 4-interval scale (0= tooth surface clean, no plaque seen even on running a probe along the gingival margin, 1 = plaque seen on scraping

along the gingival margin, 2 = plaque seen by necked eye along the gingival margin, 3 = plaque seen by necked eye covering the whole tooth surface).

Data analysis: Data were entered and analysed using SPSS programme. DMFT was computed as the sum of decayed, missing and filled teeth and the means and standard deviations were generated by age. Since there were no filled teeth recorded, the DMFT index in this report was simplified to DMT. Examined children were categorised into those with 0, 1, 2, 3 or more DMT. Decayed and missing teeth were counted for each of the tooth types to identify the most affected part of the dentition. The T-test was applied to check for differences in mean DMT between sexes, age, school and class. Frequency distributions of Community Periodontal Index scores by sextant were generated. Since the majority of people will have scrapable plaque some hours after tooth brushing, oral cleanliness was computed by combining scores 0 and 1 of the plaque index into score 0 (clean), and scores 2 and 3 into score 1 (dirty). Intra- and inter-examiner consistency was calculated using kappa statistics. Kappa values were 0.85 and 0.8 respectively for dental caries, and 0.76 and 0.68 for periodontal status.

RESULTS

The distribution of studied children by DMT scores is shown in Table 1 and in Figure 1. Percent caries free children ranged from 70% to 79%, with an average percentage of 76. Only 4% of the children had DMT score of 3 or more.

Table 2 shows the distribution of DMT and its components by age. Decayed teeth constituted the major part (90%) of the DMT index. Caries experience was very low ranging from mean DMT of 0.27 in 8-year-olds to 0.50 in 15-year-olds, with an overall mean DMT of 0.41.

The differences in mean DMT between the sexes, age and school were not statistically significant, but class 4 had significantly higher mean DMT value (0.4849, sd=1.054), than class 3 had (0.3547, sd=0.8229) (p< 0.013).

Table 1

Distribution of children by DMT and age

Age (yrs)	DMT = 0		DMT = 1		DMT = 2		DMT = 3+*	
	n	%	n	%	n	%	n	%
7	1	100	0	0.0	0	0.0	0	0.0
8	23	76.7	6	20.6	1	3.3	0	0.0
10	270	78.7	40	11.7	21	6.1	12	3.5
11	279	79.5	40	11.4	19	5.4	13	3.7
12	185	74.0	33	13.2	21	8.4	11	4.4
13	89	73.0	14	11.5	12	9.8	7	5.8
14	33	70.2	7	14.9	7	14.9	0	0.0
15	5	83.3	0	0.0	0	0.0	1	16.7
Total	993	76.6	166	12.8	88	6.8	50	3.8

*maximum score = 9

Figure 1

Distribution of children by DMT score

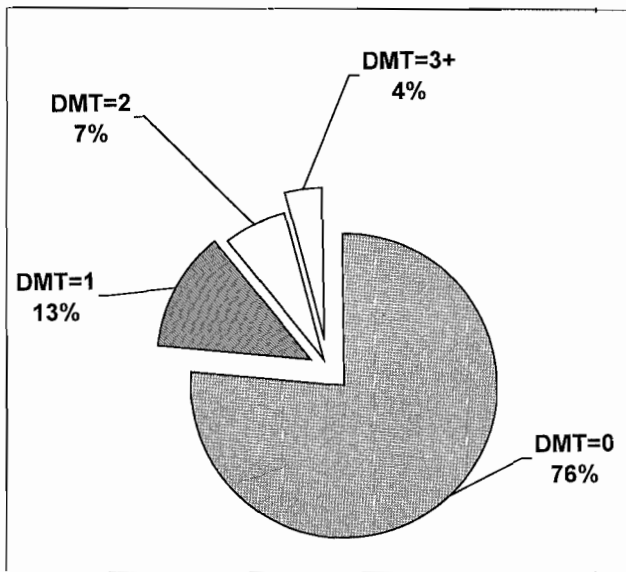


Figure 2

Distribution of caries lesions by tooth type

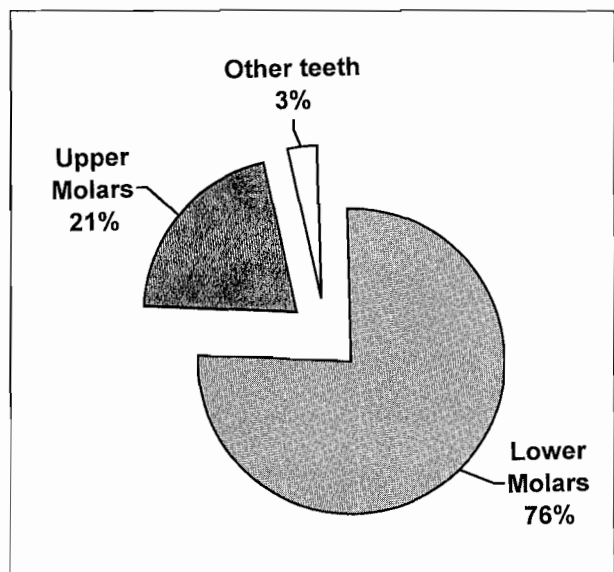


Table 2

DMT and its components by age*

Age (yrs)	No. examined	Decayed	Missing	Total DMT	Mean DMT	SD
7	1	0	0	0	0.00	0.00
8	30	7 (86%)	1	8	0.27	0.52
9	148	57 (90%)	6	131	0.38	0.93
10	342	125 (95%)	6	131	0.38	0.93
11	351	113 (86%)	19	132	0.38	0.97
12	250	106 (91%)	10	116	0.46	0.96
13	122	54 (86%)	9	63	0.52	1.01
14	47	20 (95%)	1	21	0.45	0.75
15	6	3 (100%)	0	3	0.50	1.22
Total	1297	485 (90%)	52	537	0.41	0.94

*No filled teeth were found

Table 3 and Figure 2 show the distribution of teeth affected by dental caries. Seventy six per cent of all affected teeth were lower molars. Upper molars constituted 21% of all affected teeth.

Table 3

Distribution of caries lesion by tooth type and jaw

Tooth type	No. of caries lesions	%
Lower molars	407	76.2
Upper molars	111	20.8
Upper premolars	7	1.3
Lower premolars	6	1.1
Upper canines and incisors	2	0.4
Lower canines and incisors	1	0.2
Total	534	100.0

Table 4

Mean sextants and percent distribution of 1298 subjects by the number of sextants with gingivitis, calculus or both and visible plaque

	Gingivitis	Calculus	Gingivitis and calculus	Visible plaque
0 sextants with	81.7	90.1	75.0	69.8
1 sextants with	5.2	2.9	5.3	4.6
2 sextants with	6.4	3.0	8.6	10.8
3 sextants with	3.8	0.9	4.3	3.0
4 sextants with	1.4	1.6	2.6	5.9
5 sextants with	0.8	0.9	2.2	1.2
6 sextants with	0.7	0.5	2.0	4.7
mean sextant with	0.25 (0.91)	0.69 (1.41)	0.69 (1.41)	2.44 (2.41)

The periodontal status and oral cleanliness scores are shown in Table 4. Eighty one per cent of all children had no gingivitis, 90.1% had no calculus and 75% had neither calculus nor gingivitis. About 70% of all the children had no visible plaque. Only 0.7%, 0.5%, 2.0% and 4.7% had all sextants with gingivitis, calculus, gingivitis and calculus and visible plaque, respectively.

Table 5

Goals for 12 year-old children by year 2002 and 1998 oral health status of children in Morogoro municipality

Goals to be achieved by year 2002	Oral health status in 1998
Mean DMFT ≤ 0.6	DMT = 0.46
DMFT components:	DMFT components
D = 80.0%	D = 91.0%
M = 10.0%	-M = 0.9%
F = 10.0%	-F = 0.0%
Gingivitis - mean sextants ≤ 1.5 (CPI index)	Gingivitis - mean sextants = 0.25 (0.91)

Table 5 compares the national goals for the oral health in 12- year old children and oral health status of school children in Morogoro municipality in this study. The mean DMT of 0.41 and the mean sextants with gingival bleeding of 0.25 fall within the expectation of the set goals for dental caries and gingivitis respectively. The M and F components of the DMF-T fall below the expected values. In this study, the F component is 0% of the total DMF-T instead of 10% and the M component is 0.9% instead of 10%.

DISCUSSION

In interpreting and comparing these results with previous studies conducted in Tanzania, two points need to be borne in mind. First, the clinical examination was conducted using natural light only. The examination sites were either under tree shades or open corridors of school buildings. Although efforts were made to position subjects in such a way as to capture maximum light, intensity of natural light varied due to some parts of a day being cloudy and other times, bright sunshine. This may have affected decision making in clinical diagnosis especially of visible plaque and to some extent dental caries. Secondly, dental caries lesions were confirmed by testing the softness of the floor/wall of lesions using Community Periodontal Index (CPI) probe. In all previous studies that were conducted in Tanzania, sharp explorers were used to confirm the diagnosis of dental caries. The variation of light intensity and use of the CPI probe are likely to introduce some degree of bias in the results of this study that is towards underestimation of oral health indicators. The authors, who also did the clinical examination, still think that elimination of this bias would not give statistically significant higher indicators for oral health than these ones.

The mean DM-T of 0.41 and the prevalence of 23.4% (per cent caries free=76.6) reported in this study indicate a very low level of dental caries. This fact is further confirmed by the distribution of dental caries in the dentition. The majority of lesions were pit and fissure caries in lower molars (76%) and upper molars (21%). A country or a community is categorised as having very low level of dental caries if the mean DMF-T in 12-year old children is below 1.2. A very low level of dental caries has also been reported in previous studies conducted in Morogoro and in different parts of Tanzania. The social, political and economic changes that have taken place since 1985 have not affected the levels of dental caries adversely. The level of dental caries reported in this study is lower than the recently reported mean DMFT among children in Kenya, Nigeria, India and Brazil. In 1997, Dattani *et al*(16) reported a mean DMFT of 1.34 and 0.71 among 12-13-year old children residing in urban and rural Kenya respectively. Adegbembo *et al*(17) reported a mean DMFT of 0.7 and 1.3 among 12 and 15-year old Nigerian children respectively. Singh *et al* (18) reported a mean DMFT of 1.03 among 12-15-year old children from rural

India in 1999. Sampaio *et al*(19) has reported a mean DMFT of 3.9 and 2.5 among Brazilian children from rural areas with low and medium levels of fluoride in drinking water.

Seventy five per cent of all children examined had all sextants with healthy gums, that is to say, with neither gingivitis nor calculus, and only 0.7% of the examined children had all sextants with bleeding gums. On average bleeding gums were recorded in 0.25 sextants. These findings indicate a healthy periodontal status among standard three and standard four children in Morogoro municipality schools. This was confirmed by the fact that about 70% of the studied children had all sextants with no visible plaque. The prevalence of gingivitis, calculus and plaque was lower than those reported in previous studies(1, 11-13). In 1986 Frencken reported the prevalence of gingivitis in seven to nine year old children in urban schools in Morogoro as 55%. In 1990, Mumghamba reported that only 10.8% of 10-14-year-old children in Ilala district had healthy gums(13). In 1994, Mosha *et al*(8), reported a mean number of sextants with gingivitis and calculus as 1.5 and 0.9 respectively for 12-year old children in Mbeya and Tanga. Assuming comparability of data, there is an improvement of periodontal health among seven to 14-year old school children in Morogoro.

Comparison of the goals stipulated in the National Plan for Oral Health and the findings in this study, showed that the levels of dental caries and periodontal status was within the set levels. The only setback was the composition of the DMF-T index whereby the components that represent treatment of dental caries was zero. The M and F component were expected to be ten per cent each, so as to reduce the D component to 80%. In this study the D component still stood at 91% among 12-year old children, M component was nine per cent and no fillings were recorded. It can be concluded that despite the availability of all the facilities and human resources in Morogoro municipality, standard three and standard four children in schools of the same municipality have not utilised the available restorative dental services. This may be due to the fact that since the late 1970s the economy of Tanzania dropped to an extent that dental clinics could not get restorative materials from the government. Therefore, conserving decayed teeth was stopped, and extraction became the only feasible treatment for dental caries. This has led most Tanzanians to believe that the only treatment for dental caries is tooth extraction. This in turn has led people to seek dental services only when in severe pain due to pulp necrosis and periapical dental abscesses. Relief of pain by tooth extraction becomes the immediate choice. There is a need to raise awareness in the treatment alternatives other than tooth extraction as well as to educate them on the importance of dental check-ups to enable dentists detect carious lesions at stages that can be treated by restorative procedures.

Since the majority of the dental caries lesions were in pits and fissures in molar teeth, Morogoro municipality should be encouraged to start school based oral health services using ART that does not require expensive

equipment and electricity. The available human resource should be utilised to run the school based oral health services. With motivation through the school committees, cost-sharing could be introduced in this school programme.

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