Oral hygiene practices and periodontal health in primary school children in Nairobi, Kenya

Peter M. Ng'ang'a and Jakob Valderhaug
Department of Paediatric Dentistry and Orthodontics, Dental School, University of Nairobi, Nairobi, Kenya, and Department of Prosthetic Dentistry and Stomatognathic Physiology, Dental Faculty, University of Oslo, Oslo, Norway

Ng'ang'a PM, Valderhaug J. Oral hygiene practices and periodontal health in primary school children in Nairobi, Kenya. Acta Odontol Scand 1991;49:303–309. Oslo. ISSN 0001–6357.

The purpose of this study was to obtain data on the oral hygiene practices, oral hygiene status, and periodontal health among primary school children in Nairobi. The study group consisted of 513 children, 262 aged 6–8 years and 251 aged 13–15 years. The children were from 6 schools randomly selected among the 154 public primary schools in the city. The clinical examination was performed in a room with natural daylight, using the WHO (1980) criteria. Although most of the children reported brushing habits, 75% of the index tooth surfaces in the younger and 55% in the older age group had visible plaque. In both age groups about 25% of the index sites had gingivitis. Moderate amounts of calculus were recorded among the older children. Only two children had periodontal pockets ≥4 mm. There was no statistically significant difference ($p > 0.05$) between males and females recorded with plaque and gingivitis in the younger age group. In the older group, however, a significantly higher proportion of males ($p < 0.05$) were recorded with plaque and gingivitis. The oral hygiene practices and oral hygiene status were poorer among children from low than from high socioeconomic status. Provision of dental health education for children in Nairobi is recommended. □ *Epidemiology; gingivitis; oral hygiene; periodontal disease; prevalence*

Jakob Valderhaug, Department of Prosthetic Dentistry and Stomatognathic Physiology, Dental Faculty, University of Oslo, P.O. Box 1109 Blindern, 0317 Oslo 3, Norway

The few studies carried out on oral hygiene status among children (1) and groups of young adults (2, 3) in Kenya have reported high levels of plaque and gingivitis. Investigations in children from other parts of East Africa have shown similar findings (4–13). However, information about the oral hygiene practices of children in these countries is scanty. In most of these studies (1, 6, 8, 9, 11–13) it has been found that the older children have moderate levels of calculus, whereas the prevalence of periodontal disease is low (4, 5, 9–11).

Nairobi is the capital of Kenya, with a population of about 1.5 million. There are over 130,000 children in public primary schools, a number expected to double by the year 2000 (Nairobi City Commission Education Department, personal communication). Children usually enter the first grade at 6 years of age, and education lasts 8 years.

Although the Health Department provides some dental services to school children in the city, there are no well-established dental health education programs. While the extent to which such services and programs can be planned and run is largely dependent on availability of manpower and financial resources, it is also necessary to have knowledge of the nature and extent of the oral problems and of the defined target groups. At present the latter have not been satisfactorily achieved, partly because of inadequacy of information on the oral health status of the children.

The purpose of the present study was to provide data on the oral hygiene practices, oral hygiene status, and periodontal health of the youngest and the oldest groups of children in public primary schools in Nairobi.

Materials and methods

Public primary schools in Nairobi are divided into five administrative divisions in accordance with their geographic locations—that

is, Central, Eastern, Western, Northern and Southern. At the time of this study in 1987, the Central division had 31 schools; the Eastern, 33; the Western, 24; the Northern, 41; and the Southern, 25. There were 18,311 grade-1 and 10,422 grade-8 children altogether (Nairobi City Commission Education Department, personal communication).

From a list of the schools, two were randomly selected from the Northern division and one from each of the others. The selected schools had more than one class in grades 1 and 8. In every school, therefore, all the children from one randomly selected class (mean, 42 children; range, 40–50) in each grade were examined. The sample consisted of 513 children; 262 were aged 6–8 years; 138 M and 124 F (mean, 7.0 years), and 251 were aged 13–15 years; 111 M and 140 F (mean, 14.1 years). Details on age and sex for each child were obtained from school records.

The socioeconomic categories of the schools in the sample were obtained from the Education Department. One school was categorized as of low, one as of high, and the rest as of middle socioeconomic status.

The clinical examination was carried out in a room with natural daylight, the children sitting on a chair next to a window. They were first asked about oral hygiene habits—whether they brushed their teeth, the frequency of the brushing, and whether they used a commercial toothbrush or a traditional chewing stick (*mswaki*).

The examinations were done using dental mouth mirrors and probes. Cotton rolls were used to control moisture during the examination. Scoring for plaque, gingivitis, and calculus was done by one examiner (P. M. Ng'ang'a), in accordance with WHO criteria (14). The following were examined:

Plaque

The buccal surfaces of teeth no. 11, 16, 26, and 31 and lingual surfaces of no. 36 and 46.

Gingivitis

The buccal, distal, lingual and mesial surfaces of teeth no. 16, 12, 24, 36, and 44.

Calculus

The buccal, distal, lingual, and mesial surfaces of teeth no. 16, 11, 26, 31, 36, and 46 for supra- and sub-gingival calculus.

The information was entered in pre-prepared charts by an assistant. Chi-square statistics was used to test for significant sex differences with regard to plaque and gingivitis in the two age groups. Correlations between plaque and gingivitis scores and between plaque and calculus scores in the index teeth and surfaces were evaluated with Pearson's correlation coefficient.

Results

The toothbrushing habits of the children in the two age groups are shown in Table 1. Overall 88% of the children said they brushed; of these 83% brushed daily and 17% occasionally. Ninety per cent used a commercial toothbrush and 8% used the *mswaki*. The percentage of index tooth surfaces recorded with plaque, gingivitis, and calculus are presented in Table 2.

Table 1. Tooth-brushing habits of children who said that they brushed, in accordance with age

	6–8 years (n = 208), %	13–15 years (n = 241), %
Brush daily	75	91
Brush occasionally	25	9
Use commercial toothbrush	89	90
Use chewing stick (*mswaki*)	7	9
Use other aids (charcoal etc.)	4	1

Table 2. Index surfaces with plaque, gingivitis, and calculus in the study population

	6–8 years		13–15 years	
	%	(*n*)	%	(*n*)
No visible plaque	25	(1572)	45	(1506)
Plaque < 1/3 of tooth surface	44	(1572)	43	(1506)
Plaque ≥ 1/3 of tooth surface	31	(1572)	12	(1506)
Gingivitis (bleeding)	25	(6288)	26	(6024)
Calculus	1	(6288)	14	(6024)

In the low socioeconomic group there was little difference in the oral hygiene status between the older and the younger groups of children. In the middle and high socioeconomic groups, however, there was a tendency towards relatively better oral hygiene status (smaller proportion of surfaces with plaque and sites with gingivitis) in the older than the younger age group. The difference, however, was significant ($p < 0.05$) only in the high socioeconomic group.

The mean plaque score for each index tooth is shown in Fig. 1, and the mean gingivitis score for each index tooth in Fig. 2. Forty-two per cent of the buccal surfaces of 16, and 51% of the lingual surfaces of 36 in the younger age group had gingivitis. The corresponding figures in the older children were 41% and 54%.

Table 3 shows the percentage and statistical differences between males and females with regard to plaque and gingivitis in the two age groups. There was no significant difference ($p > 0.05$) between the proportion of males and females with plaque and gingivitis in the 6- to 8-year-olds. In the older children a significantly higher ($p < 0.05$) proportion of males had plaque and gingivitis than females. There was significant ($p < 0.01$) positive correlation between plaque and gingivitis scores in both age groups (Table 4).

The mean calculus score for each index tooth in the older age group is shown in Fig. 3. The calculus, which was mainly subgingival, was most frequently encountered on the buccal surfaces of 16 and on the lingual surfaces of 36. There was significant positive correlation ($p < 0.01$) between plaque and calculus (Table 4). Children from the high socioeconomic background had relatively better oral hygiene status than those from the low socioeconomic background. The findings for oral hygiene habits, plaque, gin-

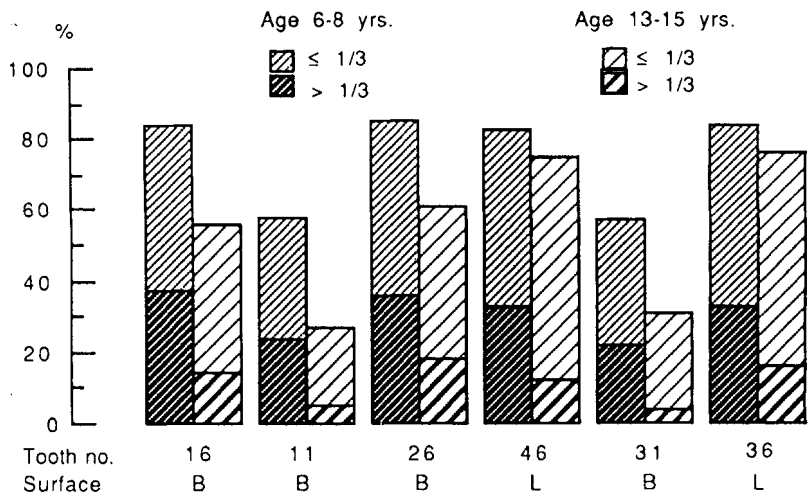

Fig. 1. Mean plaque score (%) for each index tooth. ('1/3' refers to the length of tooth surface from the cervical margin with visible plaque. B = buccal surface; L = lingual surface.)

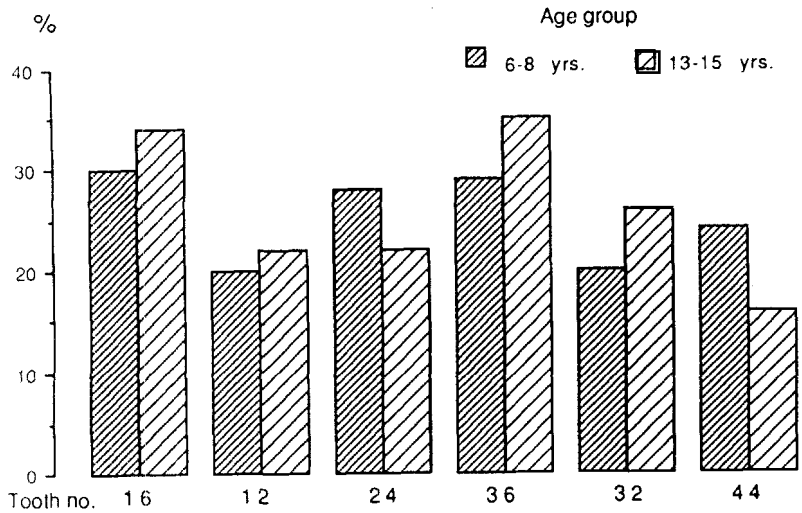

Fig. 2. Mean gingivitis score (%) for each index tooth.

Table 3. Children with plaque and gingivitis, and statistical differences between males (M) and females (F) by age

	6–8 years (n = 262)		13–15 years (n = 251)	
	M, %	F, %	M, %	F, %
Plaque	94.9	93.5	90.1	82.1*
Gingivitis	71	72.6	85.6	65.7**

Differences between M and F, $*p < 0.05$, $**p < 0.01$.

givitis, and calculus in children from the low and the high socioeconomic backgrounds are presented in Table 5.

Only two children had periodontal pockets ≥4 mm.

Discussion

The present findings are consistent with those previously reported for comparable populations in East Africa with regard to plaque and gingivitis (1–11), calculus (1, 5, 8, 9, 11–13), and periodontal disease (5, 8–11). In general, the claims of toothbrushing by the children were inconsistent with the results for oral hygiene. The inconsistency was particularly marked among the younger children, implying that some of them either did not brush as claimed or did so ineffectively.

In the older age group a significantly higher proportion of males than females had plaque and gingivitis, an indication that the males had poorer oral hygiene practices. The tendency towards more efficient brushing among females than males has been observed among Caucasian children as well (15). This is probably a reflection of a greater desire for general cleanliness and more appealing appearance among female teenagers. As one would expect, such sex dif-

Table 4. Correlation between plaque/gingivitis and plaque/calculus in the different age groups

		6–8 years (n = 262)	13–15 years (n = 251)	
		Plaque/gingivitis (r)	Plaque/gingivitis (r)	Plaque/calculus (r)
Index tooth and surface	16 B	0.365**	0.441**	0.358**
	36 L	0.304**	0.377**	0.360**

** $p < 0.01$.

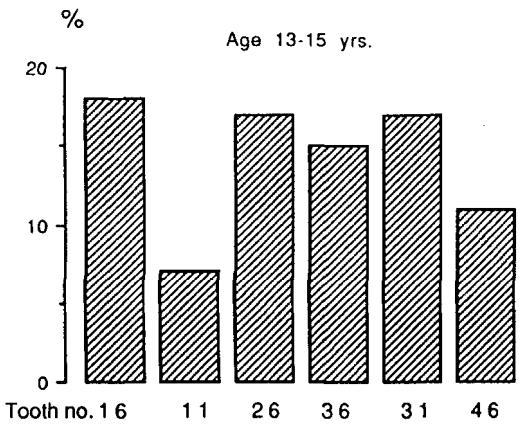

Fig. 3. Mean calculus score (%) for each index tooth in 13- to 15-year-olds.

ferences were not observed among the 6- to 8-year-olds.

The socioeconomic status in the present study was determined on an aggregate level (school-based). It is therefore necessary to interpret the findings with some caution, because of the possibility of a socioeconomic 'crossover' effect between the groups. The results showed better brushing habits and relatively better oral hygiene status among children of high than of low socioeconomic status. This is in agreement with the findings of other investigators (15–17) and suggests that socioeconomic-related factors have an influence on oral hygiene. Such factors are personal hygiene, grooming, and desire for dental health (17). Within the socioeconomic categories the status of oral hygiene tended to be relatively better in the older than in the younger age group in both the middle and the high, but not the low, socioeconomic groups. The difference, however, was significant only in the high socioeconomic group.

Almost all the children from the high socioeconomic background brushed and used a toothbrush, a practice probably related to their ability to afford oral hygiene aids as well as influence from parents and commercial advertising. Most of the children in this socioeconomic category have access to mass media such as radio and television, which strive to inform the public of the need to keep teeth clean and which depict the toothbrush as a more sophisticated way to do so. The older children would be expected to grasp the importance of such information more readily than the younger children and, accordingly, seemed to perform better in oral hygiene. Conversely, over half of the children from the low socioeconomic status were found to use the *mswaki*. This, together with the lower frequency of brushing, may explain the larger proportion of surfaces with plaque in most of these children. A recent investigation in Nairobi has shown the *mswaki* to be less efficacious than the commercial toothbrush in plaque control among persons with high levels of plaque deposits in the posterior teeth (18).

The significant positive correlations between plaque/gingivitis and plaque/calculus observed are in accordance with the general view in the literature that gingivitis

Table 5. Oral hygiene practices, plaque, gingivitis, and calculus in children from the low and the high socioeconomic schools (combined age groups in each school)

	Low (n = 81), %	High (n = 86), %
Brush	64	91
Brush daily	43	88
Brush occasionally	58	11
Use commercial toothbrush	46	96
Use the chewing stick (*mswaki*)	54	3
Surfaces with plaque	86	61
Sites with gingivitis	76	16
Surfaces with calculus	19	5

and calculus are related to the presence of plaque deposits. In spite of the high plaque and gingivitis levels in the present population, only two subjects were recorded to have periodontal pockets ≥4 mm. This is in line with the findings of other investigators (1–3, 19), which indicate that except for a subfraction that is susceptible, the occurrence of destructive periodontal disease is low in Kenyan youth. Although not all gingivitis conditions proceed to periodontitis (20), epidemiologic studies have demonstrated a direct correlation between the severity of inflammatory periodontal disease (gingivitis and periodontitis) and plaque mass (21). Antibacterial measures such as good self-administered oral hygiene will diminish the plaque mass and reduce the injurious load on the tissues.

Effective oral hygiene requires proper instruction and motivation. Studies on adolescents in East Africa (22, 23) have demonstrated that preventive oral health education programs can be effective in increasing knowledge, modifying attitudes, and hence improving oral-health-care practices. In most parts of these countries, however, such preventive programs and comprehensive dental services are hampered by inadequate resources and facilities and the unfavorable dental-manpower/population ratios (4, 6, 24). These constraints call for relatively inexpensive but practical means of disseminating oral health information, particularly among the low socioeconomic communities.

In Kenya, training of community oral-health workers was started recently. Their primary role will be to create oral health awareness in the community and to perform simple dental procedures. We suggest that one way to pass preventive oral health information to the children would be through the community oral health workers instructing groups of schoolteachers, who would in turn educate the children.

Acknowledgements.—The authors are grateful to Nairobi City Commission Education Department and the headmasters of the schools involved for their kind permission to carry out the study, and to Alice Oluoch for assistance during the field work.

References

1. Manji F. Gingivitis, dental fluorosis and dental caries in primary school children of Nairobi, Kenya. East Afr Med J 1984;61:524–32.
2. Wagaiyu EG, Wagaiyu CK, Valderhaug J, Arneberg P. A survey of periodontal health in Kenyan National Youth Service Trainees [abstract]. Scandinavian Association for Dental Research, IADR 71st Annual Meeting, 1988: no 73.
3. Chindia ML, Valderhaug J, Ng'ang'a PM. Oral hygiene habits and periodontal health among a group of university students in Kenya. East Afr Med J. In press.
4. Jensen K, Kizito EK, Langebaek J, Nyika TA. Dental caries, gingivitis and oral hygiene among schoolchildren in Kampala, Uganda. Community Dent Oral Epidemiol 1973;1:74–83.
5. Mosha HJ, Langebaek J. Dental caries, oral hygiene, periodontal disease and dental fluorosis among school children in Northern Tanzania: oral health surveys. Odontostomatol Trop 1983;6:149–56.
6. Mosha HJ. Dental caries, gingivitis and oral hygiene among school children in Dar-es-Salaam, Tanzania. Report on oral health surveys 1979 and 1983. Odontostomatol Trop 1986;9:43–9.
7. Frencken JEFM, Truin G-J, König KG, Ruiken RMHM, Elvers HJW. Prevalence of caries, plaque and gingivitis in an urban and rural Tanzanian child population. Community Dent Oral Epidemiol 1986;14:161–4.
8. Lembariti BS. Review: studies on the occurrence of periodontal disease in Tanzania. In: Oral Health Research in Africa. Dar-es-Salaam, Tanzania: Proceedings of The East African Dental Research Conference, 1986.
9. Tirwomwe JF. Oral health in Uganda. In: Oral health research in Africa. Dar-es-Salaam, Tanzania: Proceedings of The East African Dental Research Conference, 1986.
10. Kerosuo E, Kerosuo H, Kallio P, Nyandini U. Oral health status among teenage schoolchildren in Dar-es-Salaam, Tanzania. Community Dent Oral Epidemiol 1986;14:338–40.
11. Mumghamba EGS, Kimaro SS. Periodontal status among 12 year-old children in primary schools in Moshi. Proceedings of The Second East African Dental Research Conference, 1987.
12. Bingeleki FB, Mosha HJ. A longitudinal study on oral hygiene, gingivitis and caries among selected school children in Nzega district, Tabora, Tanzania. Proceedings of The Third African Dental Research Conference, 1988.
13. Mumghamba EGS, Mugonzibwa EA, Rugarabamu PGN. Periodontal status among 12 year-old children in primary schools in Bukoba. Proceedings of The Third African Dental Research Conference, 1988.
14. World Health Organization. Planning oral health services. Geneva: WHO Offset publication 1980; no 53.
15. Dummer PMH, Addy M, Hicks R, Kingdom A.

The effect of social class on the prevalence of caries, plaque, gingivitis and pocketing in 11–12-year-old children in South Wales. J Dent 1987;15:185–90.
16. Hollist NO, Oyedele RB. Survey on the comparison of oral hygiene status and dietary habits of two socio-economically different groups of primary school children in Ile-Ife (Oyo State), Nigeria. Odontostomatol Trop 1978;1:19–26.
17. Hodge HC, Holloway PJ, Bell CR. Factors associated with toothbrushing behaviour in adolescents. Br Dent J 1982;152:49–51.
18. Ndung'u FL, Kaimenyi JT, Arneberg P, Muthami LN. A comparative study of the efficacy of plaque control by a chewing stick and a toothbrush. East Afr Med J 1990;67:907–11.
19. Baelum V, Fejerskov O, Manji F. Periodontal diseases in adult Kenyans. J Clin Periodontol 1988; 15:445–52.
20. Newman MG, Nisegard R, eds. Oral microbiology and immunology. Philadelphia: WB Saunders Company, 1988:367–86.
21. Listgarten MA. The role of dental plaque in gingivitis and periodontitis. J Clin Periodontol 1988; 15:485–7.
22. Ngenda JJ, Mabelya L. Assessment of oral health knowledge, attitude and behaviour of school pupils in Morogoro. Proceedings of the Second East African Dental Research Conference, 1987.
23. Mushi VM, Mabelya L. The effect of comprehensive oral health-care on oral health status of a group of adolescents in Morogoro. Proceedings of the Second East African Dental Research Conference, 1987.
24. Maina SW, Ng'ang'a PM. Root canal treatment and pulpotomy by dentists in Kenya. East Afr Med J. In press.

Received for publication 21 December 1990