DENTAL FLUOROSIS WITH SPECIAL REFERENCE TO INCISORS AND MOLARS OF TANZANIAN SCHOOL CHILDREN

A K Awadia,* K Bjorvatn,* J M Birkeland* and O Haugejorden*
Bergen, Norway

SUMMARY: The prevalence and severity of dental fluorosis are investigated in (maxillary) central incisors and first molars in 192 children (6-16 years of age) born and raised in two neighbouring municipal communities, Arusha and Moshi. The fluoride content of the community water supply in Moshi was 0.4 mg F/L as compared to 3.8 mg F/L in Arusha. Randomly selected children from 8 different schools were examined according to field conditions. Fluorosis was found to be endemic in both communities: 91 % of the children in Arusha had a Thylstrup/Fejerskov index of ≥ 1, as compared to 65 % in Moshi. In Arusha 90% of the upper central incisors and 68 % of the upper first molars had fluorosis scores ≥ 1. Similarly, in Moshi, fluorosis prevalence was 57 % and 51 % in, respectively, central incisors and first molars. Also, the severity of fluorosis was higher in Arusha than in Moshi: 70 % of the Incisors in Arusha had a TF score ≥ 4 as compared to 27 % in Moshi. Similar scores for first molars were 32 % and 19 %. Our findings underscore the importance of the fluoride content of drinking water in the development of dental fluorosis. However, the present study does not support the commonly held opinion that dental fluorosis is more prevalent in the six-year molars than in the central incisors[3] in fluorosis endemic areas.

Key words: Dental fluorosis; Upper central incisors; Upper first molars; Tanzania.

INTRODUCTION

A positive relationship is normally found between the fluoride content of drinking water and the prevalence and severity of dental fluorosis. However, wide individual variations in severity as well as distribution of dental fluorosis may be seen within the same area.[1,2] No tooth is immune to dental fluorosis, but all teeth are not equally affected. According to Fejerskov et al.[3], teeth that develop early in life, such as incisors and permanent first molars are the least affected.[3,4] One would expect that the two groups of teeth, mineralising at more or less the same time, would be equally affected by the intake of high-fluoride water. However, even among this group of early mineralising teeth, the relative severity of fluorosis may differ: according to a study from Uganda, the maxillary incisors had the highest scores,[2] whereas a similar study in Kenya reported the first molars to be most affected.[5] Various explanations have been put forward to explain the observed variability; such as individual patterns of mineralisation, varying thickness of the enamel in the affected teeth etc.[3,4]

The present study is part of a greater project to assess oral health, especially dental fluorosis, in selected areas in the East African Rift Valley and to elucidate the importance of nutritional and other relevant factors. We here report on our findings regarding dental fluorosis in permanent central incisors and molars in school children in two Tanzanian communities with, respectively, high and low fluoride content in the drinking water.

* *Faculty of Dentistry, University of Bergen, Bergen, Norway. E-mail: mihaa@pop.odont.uib.no*

MATERIALS AND METHODS

Two neighbouring municipalities in the Rift Valley area of Northern Tanzania, Arusha and Moshi, were chosen for the study. Arusha is located at approximately 1500 m above sea level, whereas Moshi is at slightly lower elevation. Ethnicity and standard of living were similar, and both communities had public water works serving the whole population.

TABLE 1. Distribution of subjects according to age, area and fluoride concentration in the drinking water.

Age years	Arusha 3.8 mg/ L	Moshi 0.4 mg/ L	Total
6-9	46	9	55
10-16	74	63	137
Total	120	72	192

Approximately 30 children, 6-16 years of age, were randomly selected from each of 8 urban schools (5 in Arusha and 3 in Moshi), cf. Table 1. The selection was based on the schools' attendance register. Only children born and raised in the respective areas were included in the study. Using a structured questionnaire, subjects and accompanying parents were interviewed on diet, dietary habits and living conditions. Special emphasis was put on questions regarding the intake of fluoride containing food items such as **tea** and **magadi**.

All oral examinations were carried out by the principal investigator (AKA) under field conditions[6] in the shade outside the schools, while the children were seated on a school chair. The teeth were cleaned and dried using gauze and cotton rolls. The buccal surfaces of the permanent teeth were inspected for dental fluorosis, scorings were recorded using the Thylstrup-Fejerskov index (TF-index).[7] In order to make comparison with earlier studies, scorings were also recorded according to Dean's Index.[8] In case of doubt, lowest score was given. Teeth with less than 50% of the buccal surface visible, were excluded.

Drinking water samples were collected, and analysed for fluoride by the use of the ion selective electrodes, according to standard procedures (ORION 9600 BN). The SPSS program was used for data entry and statistical analyses.

RESULTS

The fluoride content of the relevant water sources was 3.8 mg/L in Arusha and 0.4 mg/L in Moshi.

The prevalence of dental fluorosis in the two cities was 91% and 65% in Arusha and Moshi, respectively.

As demonstrated in Figure 1, the prevalence of dental fluorosis - in both communities - was higher in maxillary central incisors than in first molars. The difference was statistically significant in Arusha (paired t-test t = 5.17, df = 119, p = 0.001), but not in Moshi (t = 1.58, df = 71, p = 0.118 NS).

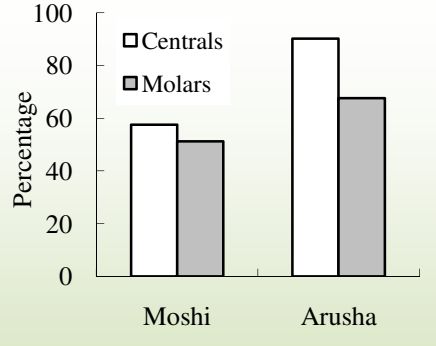

FIGURE 1. The prevalence of dental fluorosis in maxillary centrals and first molars in Moshi (0.4 mg F/L) and Arusha (3.8 mg F/L).

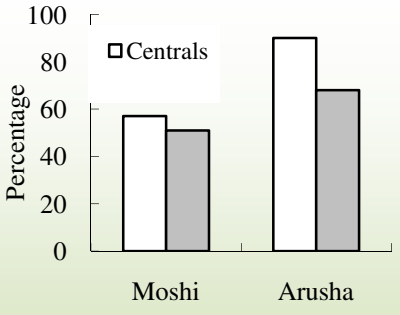

FIGURE 2. Tooth prevalence with TF score ≥4 in maxillary centrals and first molars.

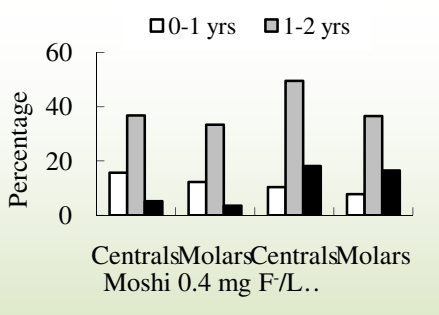

FIGURE 3. Fluorosis in maxillary centrals and first molars according to age at start of tea drinking.

Also, as shown in Figure 2, the **severity** of fluorosis was more pronounced in incisors than in molars. A significant difference was, again, found in Arusha (paired t-test, t = 8.35, df = 100, p = 0.001), whereas, in Moshi the difference between the prevalence of severely fluorosed incisors and 1st molars (TF= ≥4) was insignificant, according to the t-test (t = 1.42, df =71, p = 0.159 NS).

As compared to individuals who started to drink tea during the first year of life as well as to those who started to take tea only during the third year of life, significantly higher prevalence of dental fluorosis was recorded in individuals who started to drink tea while they were between 1 and 2 years of age (cf. Figure 3). (Arusha, χ^2 =37.8, df=2, p=0.0001; Moshi, χ^2=15.3, df=2, p=0.0005).

Magadi was found to be a common food additive in both Moshi and Arusha. In Moshi, 70 % of those who had dental fluorosis consumed magadi while only 40 % did in Arusha (cf. Figure 4). The data, however, included no information on the time of introduction to the diet of the child.

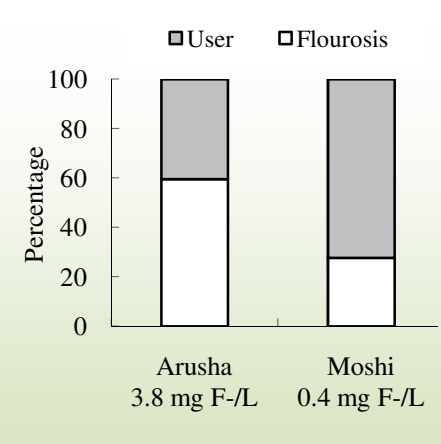

FIGURE 4. Magadi users among the cases with dental fluorosis.

DISCUSSION

Considering the low fluoride content of the drinking water, the prevalence of fluorosis might seem unexpectedly high in Moshi. This may partly be explained by the frequent use of magadi; the local brand of which has a high content of fluoride.[9] Our findings are in agreement with what has previously been reported from the same area,[10] and the prevalence might even be considered low in comparison to what has been reported from two low-fluoride areas in Kenya[11] and in the Sudan.[12]

The difference in prevalence and severity of fluorosis between maxillary central incisors and first molars was found to be significant only in high-fluoride Arusha. A similar but weaker trend was seen in low-fluoride Moshi. This pattern of dental fluorosis is different from what has been presented e.g. by Fejerskov *et al*,[3] Manji *et al*,[5,11] van Palestein *et al*,[4] but is in agreement with Møller *et al.*[2]

No convincing explanation has been offered for the conflicting findings. It should be noted, however, that, according to Watson and Lowrey,[13] the mineralization of the first molars will start at birth, while the incisors may start three to four months later. Depending upon the weaning time and the introduction to high-fluoride water, tea and possibly magadi, this small difference in time, may play a decisive role in development of dental fluorosis. Further studies of the early feeding habits in Arusha and Moshi should be conducted.

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