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DIETARY PATTERNS AND DENTAL CARIES IN NURSERY SCHOOL CHILDREN IN NAIROBI, KENYA

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**DIETARY PATTERNS AND DENTAL CARIES IN NURSERY SCHOOL CHILDREN
IN NAIROBI, KENYA**

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ABSTRACT

Objective: To determine the dietary patterns and the prevalence of dental caries among nursery school children in Nairobi.

Design: A cross-sectional study.

Setting: Nursery schools in Nairobi, Kenya.

Subjects: Three hundred and four nursery school-children (149 males and 155 females) aged 3-5 years were assessed in 1997.

Results: There was a high consumption of fruits, vegetables and milk on a daily basis. There was also a high consumption of snacks both at home and at school. About 96% of the children had been breastfed, while 41% had been bottle-fed. The prevalence of dental caries was high at 63.5% and a mean decayed, missing and filled teeth index (dmft) of 2.95, with the d-component comprising 96% of the total dmft. Only 1.3% of the children had filled teeth. Increasing age was the most predictive factor in dental caries.

Conclusion: The high consumption of refined foods and snacks, as well as the high prevalence of dental caries raises a strong public health concern. It is recommended that dietary counselling and preventive oral health programmes should be initiated and the already existing ones strengthened and incorporated in primary healthcare programmes. There is also need for policy makers to come up with guidelines on advertisements promoting cariogenic snacks.

INTRODUCTION

Dietary intake is an important factor in dental health. Eating of refined carbohydrates and snacking especially in between meals are good grounds for the development of dental caries, especially in the absence of good oral hygiene(1). Studies have shown that urban lifestyles influence dietary patterns of a community and that dietary patterns have an effect on the dental status of children. Dietary patterns have been changing with urbanisation, modernisation and industrialisation with the changes mainly geared towards refined and convenient foods, which are quick and easy to prepare(2). There has been an invasion of sweet snacks into the Kenyan urban way of life and these could have contributed to development of dental caries in school children(3).

Past studies in Kenya have revealed a high dental caries prevalence in school children, with very few children seeking dental treatment(3,4). Nairobi is the capital city of Kenya and has a population of approximately 2.5 million(5). According to the 1992 nursery school statistics, Nairobi had a total of 595 nursery schools, serving a population of 42,987 children(6). In Kenya, nursery school education caters for children aged between three and seven years.

This early education aims at educating, caring, socialisation and the total development of the child. The purpose of this study was to provide data on the dietary patterns and the prevalence of dental caries in children attending nursery schools in Nairobi.

MATERIALS AND METHODS

There are eight administrative divisions in Nairobi. Four divisions were randomly selected out of a total of seven. One division was left out due to lack of relevant statistics. The sample comprised 304 children drawn from 16 randomly selected schools from the four divisions. The schools selected were normal schools with normal children, no special schools were included in the study. Only children aged 3-5 years were included in the study. By the age of three years, all the deciduous teeth are present in the mouth. The age limit of five years was used to allow for assessment of nutritional status of the children as one group.

A self-administered questionnaire was given to the parents/guardians of the study children to collect information on dietary patterns of the children. The questionnaire was accompanied by an explanatory letter and a consent form, and it had to be returned to the school within two weeks from the date of issue. A questionnaire was also administered to the headmistresses of the schools to collect information on meals and snacks eaten by the children in school as well as the fee structure. Using the school

fees structure, the schools were grouped into three categories: low, middle and high class. The socioeconomic categorisation of the schools was done using the earnings of the average urban Kenyan of Ksh 6,487(7) per month. Schools charging fees less than Ksh 2,000 per term were classified as low-cost, those charging between Ksh 2,000-4,000 as middle-cost, while those charging more than Ksh 4,000 were classified as high-cost. The schools studied comprised seven low-cost, three middle-cost and six high-cost schools. Dental examination was carried out by one examiner (EMN) in a room with natural day-light. Dental mirrors and probes were used as diagnostic aids. Dental caries was diagnosed according to criteria recommended by WHO for oral health surveys(8). All teeth present were assessed for dental caries, but only the results of deciduous teeth are presented.

The Chi-square test was used to determine associations between dietary patterns and dental caries. One-way analysis of variance was used to test for differences between the mean dmft scores. T-test was used to test for any significant difference between the dental caries prevalence in the male and female children.

RESULTS

A total of 432 questionnaires were sent out, of which 325 were returned giving a response rate of 85.5%. Twenty one of the questionnaires were discarded due to incomplete information, leaving a sample size of 304. Although this is a difficult age to deal with, the children were cooperative and with the assistance of the teachers, it was possible to carry out the study without any constraints.

Dietary patterns: The majority of the children (96%), had been breastfed for a mean duration of 20.17 months (SD 10.39). About 41% of the children had been bottle-fed for a mean duration of 13.6 months (SD 12.40), with two children aged 36 and 45 months still bottle-feeding at the time of the study. The fluids used in bottle-feeding included milk with or without sugar, porridge with or without sugar and fruit juices.

The children consumed a variety of snacks and beverages both at home and at school. Some of the children had sugar added to the foods they consumed. The main snacks brought to school by the children comprised cereals, confectioneries and starchy staples. Meats, meat products and fruits were also brought to school by the children. The main beverages included juices/sodas, milk and tea/cocoa. Table 1 shows the snacks and beverages brought to school by the children.

The parents/guardians reported that they gave the children biscuits, chocolates, sweets, ice-cream, fruits, juices, ice-breaker (kool), chips and sausages as a way of rewarding them. Figure 1 shows the distribution of the study children by snacks given as a reward. The children consumed sugar in most of the beverages and breakfast cereals, with 88.5% consuming porridge, 86.2% beverages, 43.1% breakfast cereals and 39.8% milk with sugar. The confectioneries such as chocolate, cookies, soda, ice-cream, cakes, sweets and biscuits were consumed occasionally. Table 2 shows the frequency of consumption of confectioneries by the children.

Figure 1

Distribution of children by snacks given as reward

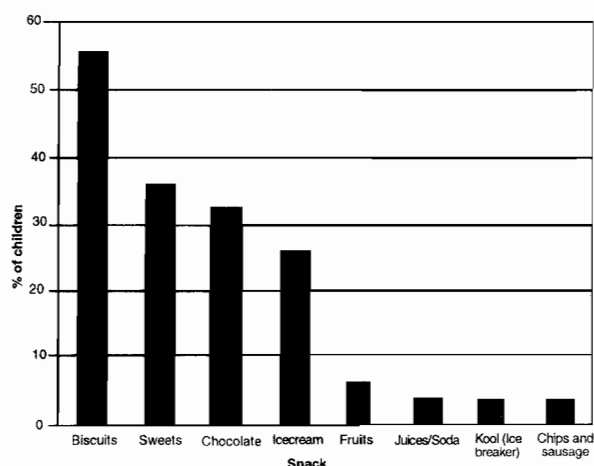


Table 1

Frequency distribution of the children who brought snacks and beverages to school

Type of snack	% of children	Beverage	% of children
Cereals	62.5	Juices/sodas	41.1
Confectioneries	30.9	Milk	13.8
Starchy staples	19.7	Tea/cocoa	10.9
Meats & meat products	17.1	Porridge	3.6
Fruits	16.8		
Groundnuts	0.02		

Table 2

Distribution of the children according to the consumption of confectioneries

Food	Daily	Twice a week	Once a week	Occasionally	Never
Chocolate	3.3	1.6	10.5	47.7	36.8
Cookies	2.3	3.0	6.3	44.1	44.4
Tea with sugar	84.9	1.3	0.7	7.6	5.6
Soda	4.9	10.9	15.5	56.9	18.1
Icebreaker	1.3	0.7	1.3	20.1	76.2
Ice-cream	3.3	3.6	5.9	52.0	35.2
Cakes	4.3	7.6	14.5	5.2	16.4
Sweets	6.3	5.6	9.2	55.9	23.0
Biscuits	12.8	11.2	10.9	51.3	13.8

The various food items consumed by the children were grouped into seven food groups. Fruits, vegetables, milk and milk products were the foods commonly consumed by the children on a daily basis. Meats and meat products, starchy staples and confectioneries were mainly consumed on occasional basis. There were no significant

statistical differences between the dietary patterns of the male and female children. Table 3 shows the distribution of children by frequency of consumption of the various food groups.

Table 3

Frequency of consumption of the various food groups by nursery school children in Nairobi

Food	Daily	Twice a week	Once a week	Occasionally	Never
Meats and meat products	1.0	8.2	3.3	86.5	1.0
Pulses	3.6	21.1	19.4	53.9	2.0
Milk and milk products	47.0	6.9	4.9	38.5	2.6
Starchy staples	2.0	24.3	6.9	66.4	0.3
Fruits and vegetables	65.8	17.8	5.3	9.9	1.3
Fats	41.8	5.6	6.9	37.8	7.9
Confectioneries	5.9	3.6	4.9	83.9	1.6

Dental caries: The proportion of children with dental caries was 63.5% and the mean dmft was 2.95, with the d-component making 96% of the total dmft. As would be expected, dental caries prevalence increased with age, with the 5-year-olds having a prevalence of 68% and the 3-year-olds 52%. The dental caries prevalence positively correlated with age ($p < 0.05$), and stepwise logistic regression analysis showed increasing age as the most predictive factor in dental caries ($r = 0.11$, $p = 0.004$). The prevalence of dental caries was slightly higher among the female children (65.8%) than among the male children (61.1%). However, the dmft for the male children (3.29) was higher than that of the female children (2.62). It was noted that the female children had a higher number of filled teeth than the male children. These differences in the caries experience between the male and female children were, however, not statistically significant. The prevalence of dental caries, mean dmft and the values for components of the dmft are shown in Table 4.

The teeth mostly affected by dental caries were the maxillary incisors, mandibular and maxillary molars. The highest number of lesions per child was 17, while the lowest was one. There were no statistically significant differences in dental caries prevalence or mean dmft between the male and female children. Table 5 shows the caries experience by individual teeth, while Figure 2 shows the distribution of children by the number of lesions.

Table 4

Caries experience among the male and female children

	Male	Female	Total
Caries free (No. and %)	58 (38.9)	53 (34.2)	111 (36.5)
Mean dmft	3.29	2.62	2.95
dt	3.19	2.46	2.82
mt	0.09	0.08	0.08
ft	0.01	0.08	0.05

Table 5

Caries experience among the children by individual tooth

Teeth (n=6023)	No. decayed	No. missing	No. filled
Lower molars	321	5	9
Upper incisors	254	12	0
Upper molars	167	2	5
Lower canines	69	3	0
Lower incisors	25	1	0
Upper canines	20	2	0
Total	856	25	14

Figure 2

Distribution of children by number of lesions (n=304)

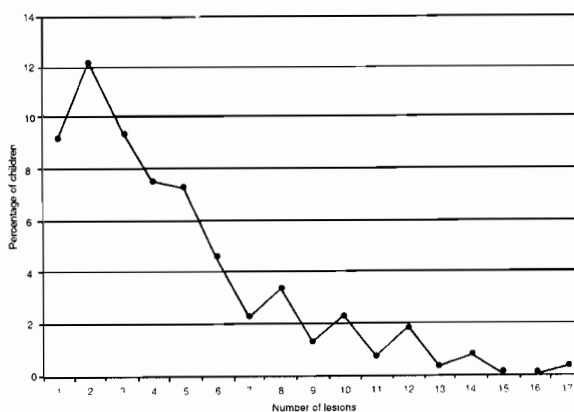


Table 6

Caries experience among the children in relation to social class

	Low cost schools (n=143)	Middle cost schools (n=62)	High cost schools (n=99)
% with caries	60.1	69.4	64.6
dmft	2.73	3.79	2.72
dt	2.54	3.71	2.66
mt	0.11	0.08	0.04
ft	0.08	-	0.02

Dental caries and dietary patterns: A higher prevalence of dental caries was seen in children consuming some of the confectioneries like sweets, biscuits, ice-cream, ice-breaker and chocolate, compared to those who did not consume. However, this difference in prevalence was not statistically significant. There was no statistically significant association between dietary patterns and dental caries in the study.

Dental caries and social class: The prevalence of dental caries and mean dmft were higher among children attending the middle-cost schools than those attending the low and high cost ones. Whereas children in the low and high cost schools had some filled teeth, there were none among those in middle-cost schools. Table 6 shows the caries experience by social class.

DISCUSSION

According to the results of the national demographic and health survey, almost all Kenyan children (97%) are breastfed for a period of time; and bottle-feeding is also common with one out of every six infants below the age of four months being fed in this way (9). The present study showed similar results with 96% of the children having been breastfed and 41% bottle-fed. The dietary patterns of these children included a high consumption of milk, fruits, vegetables and starchy staples, as well as a relatively high consumption of sugars and confectioneries. This high consumption of sugar among these children could be attributed to the high influx of sugary snacks in the Kenyan market.

The caries prevalence (63.5%) in this study was high compared with previous studies by Masiga and Holt in 1993 (4), which showed a caries prevalence of 55% in nursery school children. The teeth most affected by dental caries were the maxillary incisors, mandibular and maxillary molars. Although there was no significant relationship between bottle-feeding and dental caries in this study, bottle-feeding is believed to be a common cause of nursing caries. Past studies have shown a strong parallel relationship between the prevalence of dental caries and increase in age among bottle-fed children (10). It has been suggested that salivary flow around maxillary anterior teeth is low and slow due to gravity, thus making them highly susceptible to bacteria colonisation. Sugars in the bottle act as a bacterial substrate and especially when the bottle is used as a pacifier (11). This could explain the high number of maxillary incisors affected by caries.

Studies have shown that consumption of cariogenic foods and snacks, mainly carbohydrates, refined and processed foods leads to a higher prevalence of dental caries, the prevalence being directly related to the frequency of consumption (12-14). Since dental caries is strongly dependent on carbohydrate and sugar intake, the high prevalence of dental caries could also be attributed to the changing food habits where people tend to move into more refined forms of carbohydrates, as well as the high influx of relatively accessible sugary snacks in the Kenyan market. Some of these snacks like sweets, biscuits, chocolates and ice-breakers are sold in the streets and kiosks, thus making them very convenient, hence encouraging snacking which is detrimental to dental health. This study did not reveal a statistically significant relationship between dietary patterns and dental caries. However, a higher prevalence of dental caries was observed in children consuming some confectioneries, as opposed to those who did not consume them. Further research on this subject is recommended.

The prevalence of dental caries tended to be higher among children attending middle-cost schools compared to those in the other classes. This could imply that this is the class where children are more exposed to cariogenic foods, which the lower socioeconomic class might not afford. In the high socioeconomic class, it would be assumed that the children are less exposed to these foods

and hence reduced frequency of consumption. It could probably be due to the fact that parents in this class are more aware of the effects of these foods, and therefore more keen on oral hygiene. Previous studies have also found a lower dental caries prevalence in the higher socioeconomic class (15). The categorisation of socioeconomic classes according to monthly earnings in this study however, cannot be taken strictly due to the fact that the average earnings are very low considering the prevailing economic status, and also there could be cross-over effects across the socioeconomic groups.

Whereas the prevalence of dental caries in the developed countries is going down (16), this study suggests that dental caries in this Kenyan population is of public health concern and there is need to address the problem. The most important fundamentals in the reduction of dental caries in developed countries has been the introduction of fluoride programmes, mechanical cleaning of teeth and improved nutrition and eating habits. Dental treatment for young children is not common in many parts of the world (17), and in this study, as well as previous ones, it has been found to be so among Kenyan children (4). Despite the high prevalence of dental caries, only 1.3% of the children had filled teeth.

The Nairobi City Council and some private clinics as well as hospitals offer dental treatment to children in Nairobi. Although the city council health personnel and some toothpaste manufacturing companies carry out dental health education and checkups in nursery schools, there are no well established oral health education programmes. Hence the issue of inadequate professional dental care for young children needs to be urgently addressed. This should include use of information, education and communication (IEC) materials geared towards dietary counselling and caries prevention. These could be incorporated in primary healthcare or maternal and child health (MCH) programmes, as well as in the nursery school curriculum, and other children programmes. There is also need to stress to the community the importance of dental treatment for young children.

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LETTER TO THE EDITOR-IN-CHIEF

Sir;

RE: MEDICINE AND LITERATURE: SYMPOSIUM IN NAIROBI ON HEALTH-RELATED FICTION

Over 40 authors, medical and health professionals, editors, publishers, literary critics, educators, curriculum developers and readers attended the one-day Medicine and Literature Symposium on 15 November 2001 at the new African Medical and Research Foundation (AMREF) International Centre, Langata Road, Nairobi.

The symposium was sponsored by the Publishing Unit in the Directorate of International Training and was held to discuss recent entries for the prestigious Jomo Kenyatta Literature Prize, a biennial literary award in Kenya. According to Eva Ndavu, Senior Editor, AMREF created this forum to acknowledge these writers who had contributed, upon their own initiative, health or medical themes to the world of modern literature.

Works under discussion were *Clean Hands*, a play by David Mulwa; *The Last Plague*, a novel by Meja Mwangi; and *Walk to Recovery*, a children's book by Temo Buliro. Meja Mwangi's novel about the AIDS pandemic and its effects on the small village of Crossroads was the winner of the 2001 Jomo Kenyatta Literature Prize.

According to literature instructor, Evans Mugarizi of Kenyatta University, the novel's metaphor of death presented a dismal picture of corpses, coffins and burial mounds surrounded by an emaciated populace. However, Dr. Basil King, Manager of the AMREF Somalia programme, emphasised the satire and humour which contrasted Janet Juma, the local health officer intent on dispensing condoms throughout Crossroads, with the visiting donors who inspect the condom clinic in their whirlwind tour of development projects.

While the climax of *The Last Plague* is the introduction of volunteer counselling and testing and its effect on various

characters, *Clean Hands* is the story of Veronica and Moses and the difficulties they experience in their vow of abstinence before marriage.

Temo Buliro's story is about a young boy who suffers the loss of a leg due to his own disobedience. *Walk to Recovery* sensitively captures his anguish and eventual adjustment to the world of disability. The writing of this book turned out to be a catharsis for the author whose own brother died 9 years ago in an automobile accident on Kenya's increasingly dangerous roads.

Medicine and literature is a subject that is being integrated into a growing number of medical school curricula around the world. It addresses issues in Medical history, ethics in health care provision, the role of different categories of health care providers and the experience of healing, suffering and death under a variety of circumstances. The range of literature is broad: novels, biography, autobiography, short stories, plays, poetry. This first experience was encouraging and we will start planning another symposium on a related subject for next year.

Yours Sincerely

E. Nordberg, MD, NPH

FURTHER READINGS

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