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CORRELATION OF ORAL HEALTH HOME-CARE PRACTICES, SNACKING HABITS AND DENTAL CARIES EXPERIENCE AMONG HIV-POSITIVE CHILDREN IN NAIROBI, KENYA

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M.A. MASIGA and J. M. MACHOKI

ABSTRACT

Objective: To determine the correlation of oral health home-care practices, snacking habits and dental caries experience among 3-15 year-old- HIV-positive children attending out-patient clinic at the Kenyatta National Hospital, Kenya.

Design: Cross-sectional descriptive study.

Setting: Kenyatta National Hospital comprehensive care centre out-patient clinic.

Subjects: Two hundred and twenty participants were selected by consecutive sampling. The children's socio-demographic characteristics and oral health home-care practices were obtained from parent or guardian interviews. Oral examination of the children was carried out to determine the presence of dental caries.

Results: Of the 220 children in the study, 126 (57.3%) brushed their teeth at least once a day. Forty one (18.6%) children regularly consumed sweetened snacks daily. Almost all children (75.5%) were taking medication in the form of tablets and capsules. One hundred and seventy nine (81.4%) children had never had a dental visit. The prevalence of dental caries was 65% while the mean dmft and DMFT scores were 1.75 and 1.08 respectively. Caries experience was significantly higher for those children who frequently consumed sweetened snacks and those who took their medication in the form of sweetened syrups while it was lowest in those who brushed their teeth at least twice a day.

Conclusion: Dental caries experience was significantly higher among HIV-infected children who had increased frequency of consumption of sweetened snacks and those who used syrupy medication. There was poor attendance for dental treatment among the children.

INTRODUCTION

Dental caries is the most common chronic oral disease of public health concern in children worldwide. Disease progression can cause great damage to teeth or even tooth loss and it may result in local, systemic, psychological and social complications (1). Dental caries, however, can be prevented, controlled or even resolved. In order to prevent dental caries, it is necessary to know its aetiology and the risk factors contributing to its development.

Dental caries has a multifactorial aetiology. It develops upon the presence of a dental biofilm which is responsible for mediating the demineralisation of dental tissues: enamel and dentin. It results from the interaction of three factors; cariogenic microorganisms (*Streptococcus mutans*) (2), fermentable substrate (such as sucrose) (3) and a vulnerable host. The interaction among these factors during a period of time promotes

the development of caries, which begins with the appearance of opaque white spots resulting from the demineralisation of tooth enamel.

There is a strong association between the frequency of sucrose intake and caries experience, especially if such contact takes place between meals and during sleep when the protective effect of saliva is minimal since the salivary flow is reduced (4). However, more recently, a systematic study of sugar consumption and caries risk concluded that the relationship between sugar consumption and caries risk is much weaker in the modern age of fluoride exposure than previously thought except in prolonged night-time use of the bottle (5).

In infants and young children, such habits as the unlimited use of nursing bottles, sleeping while being bottled-fed with manufactured fruit juices, sweetened teas, milk and milk-containing fermentable carbohydrates are associated with the

development of Severe Early Childhood Caries (S-ECC) (6,7). The family habits that have a high influence on the development of S-ECC include leaving the child with a bottle while sleeping, failure to brush a child's teeth regularly and prolonged holding of liquids in the mouth by a child while sleeping (8). Children with chronic illnesses, who use sweetened oral medication administered at bedtime, can be at risk if there is no oral hygiene after administration of the medicine (9).

Some behavioural characteristics have also been associated with caries experience. With regard to children, it is also important to consider their caregivers' life-style. There is a direct relation between maternal factors such as active caries and consumption of sugar in the mother and the status of decayed, missing or filled teeth (dmf-t) in the child (10). A lower incidence and severity of caries was found in children whose mothers would regularly take them for routine dental visits (11).

Parental educational level has also been considered to be an important socio-economic indicator to the prevalence of dental caries. Mattila *et al.* (12), found a higher possibility of children with zero dmf-t when the mothers were older, had higher educational level and better jobs. Several studies have also detected a strong association between caries occurrence and socio-economic indicators (13-15). Masiga and Holt in a local study on pre-school Kenyan children found that caries was more prevalent and severe among children of single parent families and families having an unemployed father (16).

Reports concerning the oral pathosis observed in paediatric HIV infection have steadily increased in literature, and HIV-infected children are emerging as children with special healthcare-needs who display an elevated dental caries prevalence (17-20). The risk factors that have been postulated as contributory to caries development among HIV-infected children include deleterious infant feeding practices and the long term use of sugar-based medication (21). In addition there is emerging evidence that caries prevalence among HIV-positive children may be correlated to their immunological profile (22,23).

The aim of this study was to determine the oral health home-care practices and snacking habits and their correlation with the dental caries experience among 3-15 year-old HIV-infected children attending out-patient clinic at a hospital in Nairobi, Kenya. The hospital is centrally located in the capital city and is the largest public hospital in Kenya. The practices that were evaluated in the study included tooth-brushing and oral hygiene practices, attendance for dental care, snacking patterns and the long-term use of hospital prescribed oral medication.

MATERIALS AND METHODS

Patient recruitment and Questionnaire administration:

This was a cross-sectional study carried out over a period of three months (Aug -Sept. 2010). A standardised epidemiological dental examination of 220 HIV-infected children aged 3-15 years attending an out-patient clinic at the Kenyatta National Hospital Comprehensive Care Centre (KNH-CCC), was carried out and a semi-structured interview administered to their parents or guardians. The study participants were selected by purposive consecutive sampling. The inclusion criteria were children who were enrolled at the centre, did not suffer from any other disabilities and whose primary caregiver was a biological parent, kin, or foster parent living with the child. Sample size calculation was done using the WHO recommended formula on sample size determination and was based on the estimated prevalence of dental caries among HIV-infected Kenyan children from a previous study (24). Children who met the inclusion criteria were recruited consecutively on a daily basis until the calculated sample size of 220 were achieved. There was no consideration given to CD4 counts for the children recruited in the study. A written consent was obtained for all the participating children.

One accompanying parent or guardian for each subject was interviewed by the principal investigator (PI) using the WHO Simplified Oral Health Questionnaire for Children (25), that had previously been pre-tested on a similar child population at the University of Nairobi Dental Hospital to improve its readability. The questionnaire ascertained each child's socio-demographic data and the specified variables of oral health home-care practices; tooth-brushing and oral hygiene practices, attendance for dental treatment, frequency of consumption of sweetened snacks and the use of hospital prescribed oral medication. Night time snacking and weaning practices were not evaluated.

Clinical examination: The dmft/DMFT index was used to score the presence of dental caries, the PI having been calibrated by a paediatric dental specialist in accordance with the Dental Caries Index (26). Ten children were examined for the calibration exercise where the inter-examiner agreement was 0.92. Intraoral examination of each study participant was carried out within the office setting at the Hospital, with the child seated on an ordinary chair and using natural light. The WHO periodontal probe was used to check for the presence of caries. Each tooth was recorded as decayed (D/d), Missing (M/m) or filled (F/f).

Teeth that were missing were confirmed from the caregiver as having been extracted due to dental caries. Standard interviewing and clinical examination procedures were employed for all participants. Every tenth child was re-examined to test diagnostic consistency in clinical examination obtaining a Kappa value of 0.97.

Data were analysed using the SPSS version 14.0 software. Frequencies, descriptive analysis and bivariate analysis were carried out and appropriate statistical inferences were made. Chi-Square tests were used for categorical variables while the t-test was applied for analysis of the mean dmft and DMFT scores. Results were considered significant when the p-value was ≤ 0.05 .

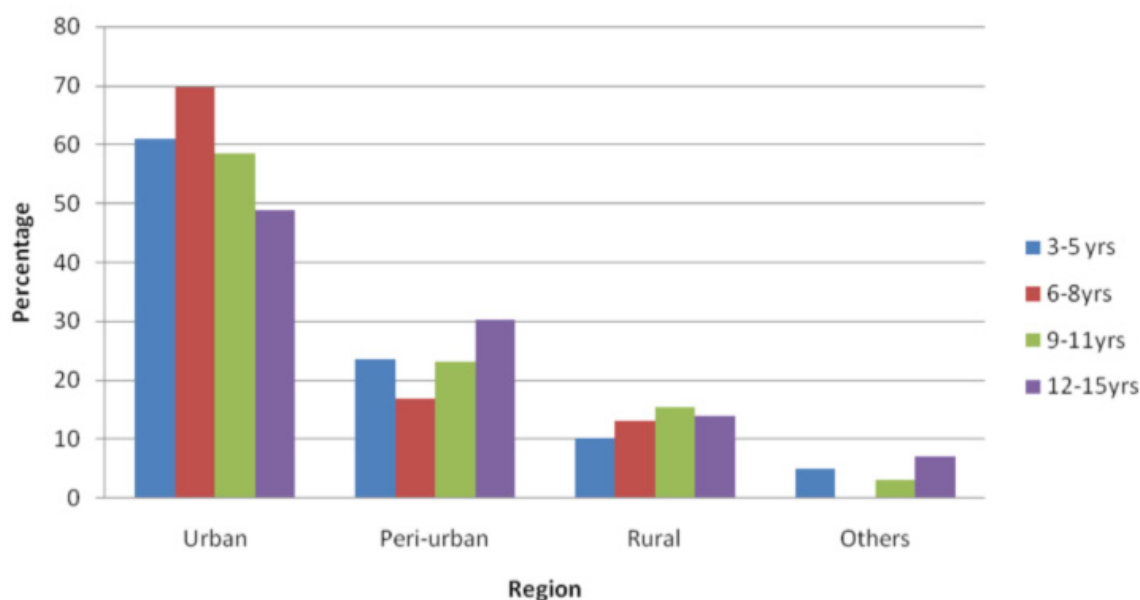
RESULTS

Socio-demographic characteristics: Study participants consisted of 112 (51%) males and 108 (49%) females

with an age range of 3-15 years (mean age = 8.36 ± 3.48 years SD). Males were marginally older (8.57 ± 3.48 years SD) than females (8.14 ± 3.48 years SD). One hundred and thirty-two (60%) of the children were drawn from urban Nairobi, 51 (23.1%) were from peri-urban Nairobi while 29 (13.2%) were from the rural areas, the information not being attainable for eight children (Figure 1). The children were mostly (61%) accompanied to the hospital by their mothers. Ninety-six (43.6%) children had both parents alive and living together, 33 (15%) had both parents alive but living separately while 91 (41.3%) children were orphaned (one or both parents deceased). Eighty five (38.6%) of the children were living in households with no male adult head. Of the households headed by a male adult, 42 (19.1%) of the male adults had primary education and below, 70 (31.8%) had secondary education while only 20 (9.1%) had tertiary education.

Figure 1

Distribution of the study participants by age group and region. 'Others' represent the small number of children (N=8) whose information was not attainable



Caries experience: The overall prevalence of dental caries was 65% while in the deciduous dentition it was 50% and that of the permanent dentition was 30.9%. Caries prevalence for boys was 68.8% while that for girls was 61.1%. The difference in gender prevalence was, however, not significant ($X^2= 1.41$ $p=0.24$). The overall caries experience was dmft 1.75 and DMFT 1.08. Decayed teeth formed the highest component of the dmft and DMFT indices for both dentitions. In the permanent dentition the mean decay rate was $D=1.04$, $M=0.01$ and $F=0.03$, while in the deciduous dentition the mean decay rate was $d=1.63$, $m=0.12$ and $f=0.00$.

Oral hygiene practices and caries experience: One hundred and twenty six (57.3%) children reportedly brushed their teeth at least once a day. Twenty-four (10.9%) children brushed at least twice a day, while others seven (3.2%) brushed two to three times a week, 19 (8.6%) once a week and 18 (8.2%) two to three times a month. Twenty-six (11.8%) did not brush their teeth at all. Of the children who brushed, 188 (96.9%) used ordinary commercial toothbrushes among whom 74% regularly used toothpaste. None of the children employed any adjuncts to their tooth-brushing practices. The parents/guardians were unable to ascertain whether the children used fluoridated

toothpaste, and neither did they have information on the source of drinking water and fluoride content at the time of the interviews.

The overall mean dmft and DMFT of the children who brushed their teeth at the varying frequencies was 1.82 and 1.04 respectively while those who did not brush at all had mean dmft and DMFT of 1.17 and 1.42. The difference in caries experience was not significant; dmft ($T=1.24$ $p=0.22$, DMFT $T=0.84$ $p=0.40$). The lowest caries experience in the deciduous dentition was encountered in those children who brushed their teeth at least twice a day; their dmft being 1.17, while those children who did not brush at least twice a day having a dmft of 1.82. This result was significant, $T=4.08$ $p=0.04$.

Sweetened snacking and caries experience: The children who consumed sweetened snacks and fluids in the form of biscuits, cakes, sweets, icebreakers (kool), soda and fruit squashes as well as having sugar in their beverages which consisted of tea, porridge and milk. Forty-one (18.6%) children regularly snacked on sweetened foods at least once a day. Others 49 (22.3%) snacked at least once a week, 59 (26.8%) snacked a few times a week and 57 (25.9) snacked a few times a month. Fourteen (6%) children did not consume sweetened snacks at all. Sugary fluids had a lower consumption with only 11(5%) children regularly having a sugary drink at least once a day, others at varying frequencies while 40 (18 %) children did not consume sweetened fluids at all. The sweetened snacks were reportedly consumed out of habit rather than indulgence by parents. There was a tendency for increased frequency of snacking in males than in females but the gender differences were not significant for both snacks ($X^2= 8.74$ $p=0.067$) and fluids ($X^2=$

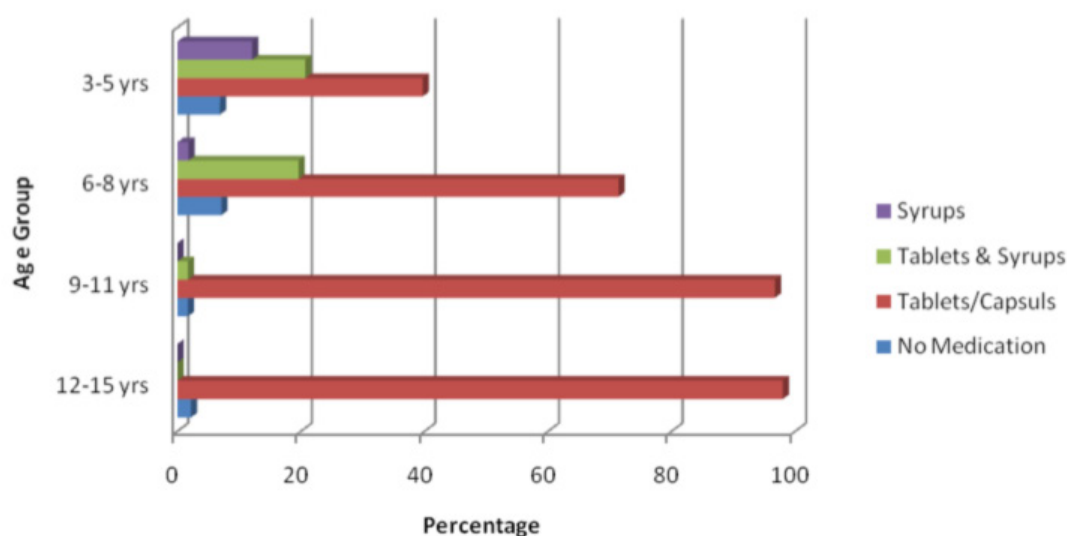
5.54 $p=0.24$).

There was high caries experience in children with an increased frequency of snacking on sugary snacks. The highest dmft 2.44 was found in those children who snacked on sweetened snacks several times a day and the lowest dmft 0.86, in those who did not consume any sweetened snacks. Similarly, the DMFT was highest (DMFT 2.10), in those who snacked several times a day and lowest (DMFT 0.43), in those who did not consume any sweetened snacks. There was a correlation of dental caries experience and increase in frequency of snacking on sweetened snacks which was highly significant for DMFT ($F=4.09$ $p=0.00$) but not for dmft ($F=1.80$ $p=0.12$) although the number of children involved was proportionately small.

Use of medication and caries experience: Almost all (95.5%) of the children at the Hospital were taking between two to four types of medication commonly prescribed for HIV- related diseases, mostly three times a day. Majority 166 (75.5%) took their medication in the form of tablets and capsules, 36(16.4%) combined tablets with syrups while only eight (3.6%) exclusively used syrups. The children who took their medication in the form of syrups were predominantly in the youngest (3-5 year-old) age group. The dmft of those children who took their medication in the form of syrups was dmft 2.32, being significantly higher than those whose medication was in the form of tablets and/or capsules whose dmft was 1.61, ($F=4.97$ $p=0.03$). However, the numbers of children on syrups alone was small and inappropriate for statistical inferences. Figure 2 shows the nature of medication formulation taken by the children according to age- groups.

Figure 2

Nature of medication formulation taken by the study participants by age group. The use of syrupy medication was a factor only among the younger children

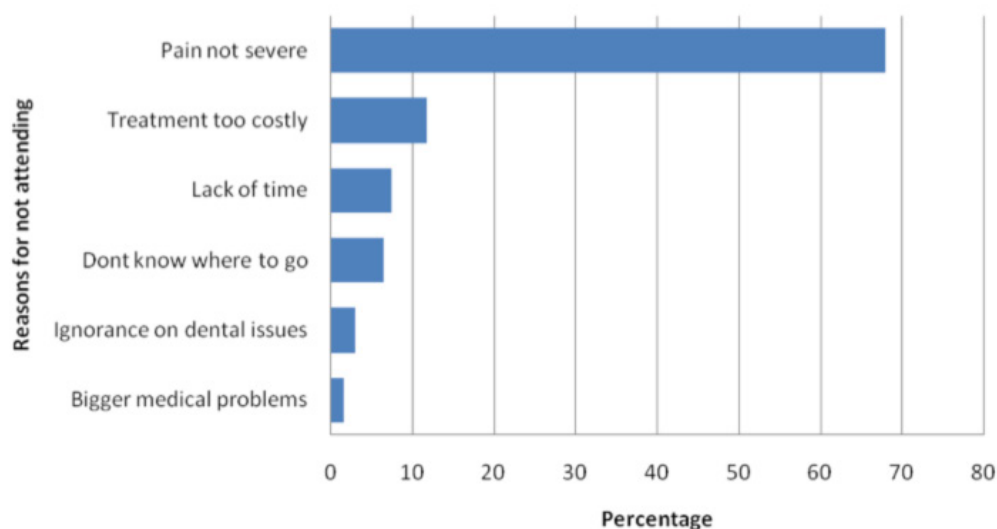


Attendance for dental care and caries experience: One hundred and seventy-nine (81.4%) of the participating children had neither attended nor received any form of dental treatment. Only 41 (18.6%) children had ever visited a dentist. Of these, 19 (8.6%) had attended at least once in the last 12 months, 34 (82.9%) having

done so because of severe pain. There were multiple reasons given for the low attendance for dental treatment, mainly having been that the parents and caregivers did not consider dental pain to have been severe enough to seek treatment (Figure 3).

Figure 3

Reasons given by study participants for not having dental treatment. The presence of a chronic illness does not appear to have been a major deterrent for not seeking dental treatment



Caries experience was high among the children who had attended for dental treatment, with dmft and DMFT scores of 2.95 and 1.73 respectively. Those who had not attended had mean dmft and DMFT scores of 1.47 and 0.93 respectively. Among children who had visited a dentist, the mean decay rate in the deciduous dentition was $d=2.54$, $m=0.41$ and $f=0.00$ while in the permanent dentition, the mean decay rate was $D=1.68$, $M=0.02$ and $F=0.03$. The children who had never visited a dentist had a mean decay rate of $d=1.42$, $m=0.05$ and $f=0.00$ for the deciduous dentition and mean decay rate $D=0.92$, $M=0.01$ and $F=0.00$ for the permanent dentition. The correlation of caries experience with attendance for dental care was highly significant for both dmft ($F=8.50$ $p=0.00$) and DMFT ($F=10.16$ $p=0.00$).

DISCUSSION

This descriptive study reports on the oral health home-care practices, snacking habits and their correlation to the dental caries experience of a specific cohort of medically compromised children. The semi-structured interviews of parents/caregivers provided an opportunity to explore both quantitatively and qualitatively the participants' oral healthcare practices.

Dental caries prevalence among 3-15-year-old HIV-positive children attending the specified

institution was found to be high, with almost two-thirds of the children overall having had evidence of the disease and at least half of the children in their primary dentition. This is comparable to what has been reported in other studies of cohorts of HIV-positive children at identifiable health institutions (60-63%) (19-21). However, it is much lower than had been reported in a previous study on children in the general population in Nairobi and Mombasa with the same medical condition (24), where caries prevalence was estimated to be 84.4% in the deciduous dentition and 78.3% in the permanent dentition and mean dmft and DMFT values of 6.38 and 3.35 were reported. This apparent disparity may have arisen as a result of the inherent differences in the population samples of the two studies; the children in the previous study (24) had been drawn from a variety of children's homes rather than a selected institution, thus representing a more heterogeneous population.

The lowest mean dmft and DMFT scores were found in those children who brushed their teeth at least twice a day particularly in the deciduous dentition. This finding is consistent with other reports on correlation between tooth-brushing frequency with caries experience and caries increment (27,28). Tooth brushing achieves the removal of plaque microorganisms implicated in dental caries development with the added benefit of exposure of the teeth to topical fluoride during the act of tooth-

brushing. Steckslen-Blick *et al* reported that dental caries experience among four-year-old children who brushed once or twice daily was significantly lower than that of children who brushed irregularly (28). It can be assumed correctly for this study, that the children used fluoridated toothpaste as these are the brands that are available in the local (Kenyan) market. The anti-caries efficacy of fluoridated toothpaste when used twice daily for tooth-brushing is well documented in clinical trials reports (29). Such a simple powerful tool ought to be given due consideration in the design of any oral health interventional programme for caries prevention for children, especially in sub-Saharan Africa where financial resources and manpower available to cope with the high cost of providing oral healthcare is limited.

The snacking habits among the children in the present study may be regarded as moderate, contrary to the overindulgence in cariogenic snacks that is commonly associated with medically compromised children as a way of parent's giving their children comfort and attempting to make amends for their illness (30). Nonetheless caries experience was observed to be significantly high among those children who had an increased frequency of consumption of sweetened snacks.

Children who are on long-term prophylactic medication are generally classified as being at risk to developing dental caries due to the sugary formulation of the medicines (9,21). Notably, medications at the hospital were almost always dispensed as capsules and tablets with preponderance for tablets. The reason for this was found to have been that tablets were cheaper and easier to dispense.

There was evidence of negligible dental treatment having been carried out among this cohort of children. The reasons given for the low uptake of dental treatment were indicative of low levels of awareness and concern among the caregivers. This is a common finding in other reported epidemiological studies among Kenyan children (16, 31, 32). Teeth with decay in this study remained the major component of the dmft and DMFT indices. It might have been expected that the medical, physical, psychological and emotional burdens that normally arises from such a chronic illness among children would have been a strong deterrent to seeking dental care, but that did not appear to be the case among these children. The outcome of this unfortunate aspect of health-seeking behaviour is that the children do not get the benefit of preventive, interceptive and curative oral health care.

In conclusion, there was high caries prevalence among HIV-infected children attending out-patient clinic at Kenyatta National Hospital. Dental caries experience was significantly higher among the children with

increased frequency of consumption of sweetened snacks and use of syrupy medication. The oral health practice that posed the greatest concern was poor attendance for dental treatment. This study advocates for clear guidelines on oral healthcare for children with HIV-infection, within the context of Primary Health Care (PHC).

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