

Impact of dental caries on the oral health related quality of life of urban slum children in Nairobi, Kenya

Immaculate Achieng Opondo, Arthur Musakulu Kemoli,
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ABSTRACT

Aims: Dental caries is a public health concern in many developing nations like Kenya. Slum children often do not have access to oral health care, and their oral health-related quality of life (OHRQoL) remains largely un-researched topic in Kenya. The present study was designed to determine the prevalence and severity of dental caries and its impact on the OHRQoL of a cohort of slum-dwelling children in a Nairobi slum. **Methods:** In this descriptive cross-sectional study, a total of 452 children aged 12–14 years participated. Through a structured interview administered using a pretested questionnaire, data on child-oral impacts on daily performance (Child-OIDP), was collected to provide information on OHRQoL. Intra-oral clinical examination was conducted to assess caries experience using DMFT index. The data obtained was analyzed using STATA version 13.0 (STATA Corporation, College Station, Texas, USA). Logistic regression analysis was used to relate caries experience with OHRQoL. **Results:** The prevalence of dental caries for the

participants was 56.2%, with a mean DMFT of 1.72 ± 2.22 . The children who had DMFT scores of 1–3 were 1.5 times likely to report an oral impact on daily performance compared to those who had zero DMFT score (OR = 1.48; 95% CI: 0.89, 2.55). Children with DMFT scores of 4 and above were nearly four times likely to report oral impacts on their daily life (OR = 3.62; 95% CI: 1.51, 7.74). **Conclusion:** In this study population, dental caries negatively affected the OHRQoL of the children.

Keywords: Dental caries, Oral health-related quality of life, Slum children

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INTRODUCTION

Most Kenyan epidemiological studies have used DMFT to evaluate dental caries [1–3], but this index does not in effect evaluate the social and psychological impact the disease could have on an individual. Oral health related quality of life (OHRQoL) was introduced to assess the extent to which dental caries or any oral disease and condition can affect the daily functioning of an individual and even lead to major changes in their behavior [4, 5]. Additionally, OHRQoL data can have the potential in the

promotion and planning of oral health services from the planners' knowledge of the disease impact [6].

A number of child OHRQoL instruments have been developed in the past 20 years, but the child version of the oral impacts on daily performances (OIDP) index, which was developed and tested in Thailand is a commonly used OHRQoL instrument [7, 8]. This is because this instrument has been considered to measure behaviors rather than feelings [9].

Although some studies on OHRQoL in children have been reported in Africa [10–12], none of the reports has been from Kenya. Dental caries, which is a common chronic disease in Kenya [1–3], causes pain, which impacts on daily activities of children; for example, lost school days, and inability to eat and sleep [4, 5]. Since there is a paucity of data relating to OHRQoL of children in Kenya, the present study was planned to determine the prevalence and severity of dental caries and the impacts on the OHRQoL in a population of children from a Kenyan slum area.

MATERIALS AND METHODS

This was a cross-sectional study conducted among primary school children in Viwandani slum, Makadara District, Nairobi City County. This slum area is situated in an industrial area on the southern side of the city. This area with an estimated population of 116,271 (based on the 2009 population census), has poor housing conditions, poor social services and lacks basic amenities, besides the poor low quality, insecurity and unstable incomes of the residents [13]. The study population comprised 12-year-old to 14-year-old children, and for the child to participate in the study, they should have lived and attended a school in the slum from class one and given assent for the study. In addition, the parent/guardian had to provide a signed informed consent. Any child with a physical or mental handicap was excluded from the study.

The schools in the slum were stratified into public and private/community-based schools. The only two public schools in the slum were conveniently included in the study. A sampling frame comprising the seven private/community schools with children of ages 12–14 years was made, out of which three private/community schools were randomly selected using computer-generated random numbers.

To determine the minimum sample size of 389 children to be included in the study, a dental caries prevalence of 50% and an allowance of 5% margin of error at 95% confidence interval was used. In order to determine the sample size for each of the selected schools, a proportion based on the population of standard five to eight pupils in each school was calculated. Standard 5 to 8 classes had children in the chosen age group. The chance proportional to size sampling method was used in order to ensure that all pupils in the selected schools had the same probability of selection. Through this method, a total of 452 children

assented to the study and had their parents/guardians provide signed consent forms.

The Kenyatta National Hospital and University of Nairobi Ethics Research Committee (KNH/UON-ERC/A/312) granted ethical approval for the study. The Education Department of Nairobi City County and the respective school authorities gave permission to conduct the study in the schools.

Using a face-to-face interview and a pre-tested questionnaire, the principal investigator (PI) gathered information on socio-demographic variables, which included age, gender, level of education and occupation of mother, father and guardian and also perceived state of their teeth. In the same manner, data relating to OHRQoL of the study population was collected using the child-OIDP frequency index. The information obtained from the child included difficulties carrying out eight daily activities namely: eating, speaking, cleaning mouth, sleeping, smiling, school work, emotional status and social contact. Each activity was scored on a scale of zero to three where; (0) never affected, (1) once or twice a month, (2) once or twice a week and (3) every day or nearly every day. The frequency in carrying out the eight activities was further dichotomized taking the value '1' if at least affected, and '0' for never affected. Participants who reported any impact on their daily activities were asked to state what they perceived as the cause of the difficulty that they had.

An oral examination was also undertaken to determine the presence of dental caries and the results calculated to give the dental caries score. The clinical examination was done by the PI, who had been calibrated by an experienced pediatric dentist, and the Cohen Kappa agreement for DMFT calculated as 0.92 ($n = 15$). During the period of data collection, every tenth child was re-examined and the intra-examiner Cohen Kappa score was 0.89 ($n = 45$). In obtaining the data, the PI examined the children while seated on an ordinary chair under natural light. Sterile probes and dental mirrors were used for the clinical examination of dental caries, with a trained assistant recording all the observations made by the PI.

The data collected was entered into the computer and cleaned, then analyzed using STATA version 13.0 (STATA Corporation, College Station, Texas, USA). The results were described using frequencies and proportions. The variables were dichotomized to enable carry out logistic regression analysis. The chi-square test was used to test the relationship between the children's age, caregiver's level of education and occupation, and person staying with the child with reporting at least one impact on daily performances. Independent sample T-test and one way ANOVA were used to test the differences in categories by DMFT. The significance level was set at $p < 0.05$. The logistic regression analysis was used to adjust and explain the association between DMFT, gender, person staying with child and perceived state of teeth with reporting at least one impact on daily performances. Statistically, significant variables with a p -value of < 0.2 in the bivariate

analysis were the ones entered in the logistic regression model.

RESULTS

Sociodemographic characteristics and oral health related quality of life

A total of 452 pupils with an equal proportion of male to female, were enrolled into the study. The ages of the participants ranged from 12–14 years with 68% of them being 14 years old, 63% having fathers with no/primary education, 66% with mothers having secondary education, 68% with fathers who were unskilled laborers and 71% of the children with mothers who were skilled laborers. There was no statistically significant association between reporting at least one impact on daily performance and the sociodemographic characteristics (Table 1).

Dental caries and oral health related quality of life

With the prevalence of dental caries calculated as 56.2% and a mean DMFT of 1.72±2.22 (Table 2), the

prevalence of oral impacts on daily performance of these children was also high. A total of 286 (63.3%) children reported having experienced some kind of oral impact on their daily life during the past three months. Decayed teeth contributed 93.7% of the DMFT score while missing teeth contributed 6.3% of the DMFT score.

Perceived cause(s) of impacts on daily activities

The results shown in Figure 1 generally indicate that toothache was the main perceived cause of impacts during eating (n = 78, 47.9%), sleeping (n = 78, 100%), maintaining emotional status (n = 37, 72.5%) and studying (n = 21, 80.8%). The position of the teeth was a perceived cause of impacts on smiling (n = 31, 54.4%) and enjoying social contact (n = 25, 75.6%). Even though bleeding gums was perceived as a cause of difficulty in cleaning teeth by 197 (84.2%) children, toothache still contributed 5.1% of the perceived cause of that difficulty.

Sixty-four percent of the pupils perceived their teeth to be in a good state with a statistically significant association between perceived state of teeth and reporting at least one oral impact on daily performance (p = 0.001). There was no statistically significant difference between

Table 1: Association between reporting impacts on daily performance and sociodemographic characteristics.

Variable	No Impact n (%)	At least one impact n (%)	p value
Age	166	286	
12 Years	64 (38)	104 (62)	
14 Years	67 (38)	108 (62)	
16 Years	65 (32)	74 (68)	$\chi^2=1.318, p=0.517$
Father's highest level of education	87	132	
Non/primary	25 (37)	42 (63)	
Secondary	53 (39)	82 (61)	
Post-secondary	9 (53)	8 (47)	$\chi^2=1.415, p=0.493$
Mother's highest level of education	107	188	
Non/primary	46 (39)	72 (61)	
Secondary	54 (34)	107 (66)	
Post-secondary	7 (44)	9 (56)	$\chi^2=1.2820, p=0.527$
Father's occupation	102	14	
Unemployed	35 (40)	53 (60)	
Skilled labor	34 (40)	52 (60)	
Unskilled labor	33 (32)	69 (68)	$\chi^2=1.473, p=0.479$
Mother's occupation	139	249	
Unemployed	103 (37)	172 (63)	
Skilled labor	11 (29)	27 (71)	
Unskilled labor	25 (33)	50 (67)	$\chi^2=1.302, p=0.522$
Person staying with child	166	286	
Both parents	100 (37)	171 (63)	
Mother	41 (34)	79 (66)	
Father	10 (63)	6 (38)	
Guardian	15 (33)	30 (67)	$\chi^2=5.139, p=0.162$

boys and girls by the way they perceived the state of their teeth ($p = 0.108$).

The unadjusted and adjusted odds ratios (ORs) for reporting at least one oral impact on daily performances are as given Table 3. The unadjusted ORs for reporting at least one impact on daily performances were statistically significant for children with DMFT score greater than 1 if child was staying with father alone and perceived state of the teeth. After controlling for all variables in the regression analysis model, only DMFT score and perceived state

of the teeth remained statistically significant. Children having a DMFT score of between one and three were 1.5 times likely to report an oral impact on daily performance compared to those who had zero DMFT score (OR = 1.48; 95% CI: 0.89, 2.55), while those with DMFT scores of four and above were nearly four times likely to report oral impacts on their daily life (OR = 3.62; 95% CI: 1.51, 7.74). Those who reported excellent state of teeth were 99% less likely to report oral impacts on daily performances (OR = 0.01; 95% CI: 0.004, 0.036).

Table 2: Mean decayed, missing and filled teeth according to gender, age and site.

	Decayed	Missing	Filled	Mean DMFT	p-value
Gender					
Male	1.68±2.27	0.13±0.47	0±0.00	1.71±2.40	t=0.06;p=0.95*
Female	1.67±2.05	0.08±0.37	0±0.00	1.73±2.07	
Age					
12 years	1.60±2.10	0.04±0.20	0±0.00	1.45±2.02	F=2.14;p=0.12**
13 years	1.68±2.19	0.15±0.56	0±0.00	1.81±2.34	
14 years	1.86±2.20	0.14±0.42	0±0.00	1.98±2.30	
Site					
Public schools	1.75±2.20	0.12±0.46	0±0.00	1.81±2.27	t=1.54;p=0.12*
Private schools	1.46±2.03	0.06±0.30	0±0.00	1.44±2.02	
Total	1.68±2.16	0.11±0.43	0±0.00	1.72±2.22	

*Independent sample t-test. **One way ANOVA

Table 3: Odds Ratio (OR) and 95% confidence interval (CI) of children with oral impacts on daily performances > 0 by DMFT and socio-demographic variables.

Variable	Unadjusted Odds Ratio			Adjusted Odds Ratio		
	OR	95% CI	p-value	OR	95% CI	p-value
DMFT						
0						
1–3	1.72	(1.13, 2.62)	0.011	1.48	(0.89, 2.55)	0.019
≥4	3.80	(2.03, 7.11)	0.001	3.62	(1.51, 7.74)	0.002
Gender						
Girl						
Boy	0.93	(0.63, 1.36)	0.696	1.15	(0.71, 1.87)	0.560
Person staying with Child						
Both parents						
Mother	0.89	(0.57, 1.39)	0.604	1.06	(0.60, 1.86)	0.850
Father	0.31	(0.11, 0.92)	0.034	0.39	(0.12, 1.28)	0.071
Guardian	1.04	(0.50, 2.14)	0.920	1.32	(0.56, 3.12)	0.525
Perceived state of the teeth						
Poor/Average						
Excellent	0.01	(0.004, 0.033)	0.001	0.01	(0.004, 0.036)	0.001
Good	0.52	(0.29, 0.89)	0.020	0.58	(0.33, 1.04)	0.068

DMFT: Decayed, Missing and Filled Teeth, OR: Odds Ratio, OHRQoL: Oral Health-Related Quality of Life

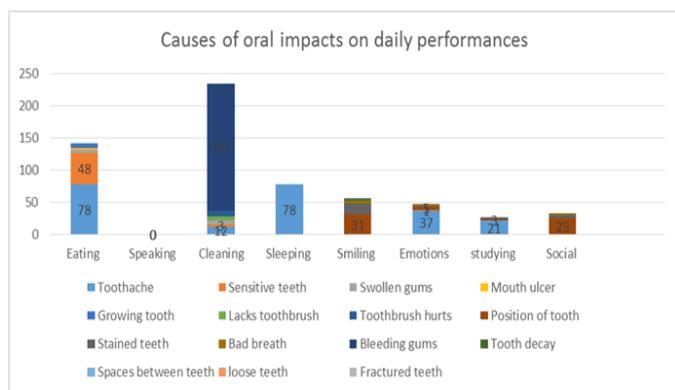


Figure 1: Oral problems perceived as causes of oral impacts on daily performances.

DISCUSSION

The present study was designed to provide some baseline information on the impact of dental caries on OHRQoL of a cohort of slum dwelling children. In this group, the prevalence of dental caries of 56.2% was higher than that reported in some past studies done in Kenya, that gave prevalence of 44.5% [1], 10% [2] and 24% [3] for 12-year-old rural children and 37.5% [3] for the urban children. Probably, the high prevalence was a result of the wider age group of 12–14 years in this study as compared to the other studies. Nonetheless, the mean DMFT of 1.72 in the present study population was in tandem with previous reports on caries experience in the African region [14]. However, the mean DMFT in the present study was higher in relation to the previous mean DMFT for 12-year-old Kenyan children [1–3]. The higher caries experience in these slum children could have been a result of easier access to affordable sugar as a result of smaller packaging of sugar-containing foods and drinks that are common in slum areas, in addition to the possible easy access to cheap confectionaries from factories situated in the area. Moreover, these children are disadvantaged due to poor access or lack of preventive and curative oral health services [15, 16]. The findings seem to agree with reports that urban slum dwellers have poorer health outcomes compared to their rural counterparts [13, 17].

The very high proportion of untreated teeth, accounting for 93.7% of the DMFT score, was consistent with the findings from other Kenyan studies [1, 2] and studies from other developing countries [18]. Untreated tooth decay has been shown to reflect a low utilization of preventive and curative dental services even where it is available, probably as a result of dental avoidance by parents and their children, lack of awareness by parents and low socio-economic status [16].

The child-OIDP index that was used in this study had previously been validated and found to have acceptable psychometric properties for oral health survey among Tanzanian [10] and Ugandan adolescents [11]. It was thus adopted for use in this study because there are no major

cultural differences between Kenya, Uganda and Tanzania. Children who were mentally and physically handicapped were excluded from the present study because they did not have the ability to cooperate and communicate effectively during the data collection process. Consequently, the prevalence of oral impacts of 63.3% on daily performance experienced by the school children during the past three months was similar to that reported amongst Ugandan adolescents of 62%, but was higher than the prevalence of 28.6% and 36.2% that was reported by Tanzanian [10] and South African [12] children respectively. However, a study of Thai children [8] reported much higher prevalence of oral impacts on their daily performance compared with the African counterparts in spite of enjoying easier access to oral health care. High prevalence of oral impacts of 88.7% was also reported in 12-year-old children in Brazil [19]. These variations could be explained by different study designs, cultures and socio-economic status hence making comparisons difficult.

In the present study, the most common daily performance affected by oral health conditions was cleaning teeth, a deviation from the previous studies where eating and enjoying food was the most prevalent daily performance affected [8, 10–12]. The reversal could be attributed to the study area being a slum, whose inhabitants were living in abject poverty, with priority being basic survival rather than concern about oral hygiene. The second most commonly affected daily performance in the present study was eating and enjoying food, usually the most common as reported in other studies [8, 10–12]. The effects on smiling at 12.6%, emotions at 11.3%, enjoying contact at 7.3% and studying at 5.8% were the least frequently reported in this study. Therefore, the impacts on emotional and social well-being were less frequently reported than the impacts on functional limitations, a similar pattern as reported in other studies [8, 10–12]. Although a similar pattern was noted in Ugandan children [11], whereby impacts on smiling, emotions, social contact and carrying school work were lower than impacts on eating, cleaning teeth and sleeping, their prevalence was much higher than that reported for the present study and other previous studies [10,12]. It was probable that the Ugandan study could have had much older children and a wider age range (13–19 years old) when compared to the other studies.

The difficulty with smiling was another aspect of daily life reported by the children in the present study, impacting on 12.6% of the children. The prevalence of this impact in the study of Thai children [8] was 40.1%, Tanzanian children [10] was 6.2% and among Ugandan adolescents [11] was 30%. The higher prevalence among the Thai children could have been related to their stage of dental development, in which those in the mixed dentition might have had a high occurrence of occlusal problems, such as rotations, spaces between teeth and crowding. The higher prevalence of impacts in the Ugandan adolescents could have been associated with their age and level of education, hence having more awareness.

In the present study, toothache was the main perceived cause of impacts on eating, sleeping, maintaining emotional status and studying. Even though bleeding gums had been perceived as a cause of difficulty in cleaning teeth by 84.2% of the children who reported difficulty in cleaning teeth, toothache still contributed to 5.1% of the perceived cause of that difficulty. These findings corroborate other studies which showed dental caries as the main determinant of toothache and/or dental pain [18]. The present study found an association between dental caries and oral health-related quality of life, corroborating other studies that had been done previously from other countries [19–22]. Children with higher DMFT scores were likely to report an impact on their daily performance unlike children who had lower DMFT scores, a finding that is consistent with reports from other studies that positively associated dental caries with subjective oral health indicators like difficulty in eating, sleeping, doing school work and affected play [18, 23].

The limitations of this study must be taken into consideration. The cross sectional design prevents establishing of any causal relationship between dental caries and OHRQoL. There is, therefore, need for further investigations, possibly cohort studies, in this population. In addition, the study design did not include taking radiographs; hence caries experience could have been under reported. Moreover, the participants in this study lived in circumstances of extreme poverty and it would have been desirable to include and control for more variables that could have impacted on their OHRQoL.

Despite the limitations, the study offers a relevant perspective for public health on the effects dental caries has on children's quality of life in a country where little importance is given to oral health on the assumption that oral diseases are inconsequential and having minimal relevance on a person's life. This assumption is especially dangerous to the underprivileged in our society, who are unlikely to have financial resources to seek preventive and curative oral health services privately. It is, therefore, desirable to institute comprehensive preventive and curative oral health services for children in Viwandani slum to help prevent and reduce untreated dental caries and the associated toothache and to improve their oral health-related quality of life.

CONCLUSION

In conclusion, dental caries affected the oral health-related quality of life of the children in Viwandani slum.

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Author Contributions

Immaculate Achieng' Opondo – Substantial contributions to conception and design, Acquisition of data, Analysis and interpretation of data, Drafting the article, Revising it critically for important intellectual content, Final approval of the version to be published

Arthur Musakulu Kemoli – Substantial contributions to conception and design, Analysis and interpretation of data, Drafting the article, Revising it critically for important intellectual content, Final approval of the version to be published

James Lwanga Ngesa – Substantial contributions to conception and design, Analysis and interpretation of data, Drafting the article, Revising it critically for important intellectual content, Final approval of the version to be published

Guarantor

The corresponding author is the guarantor of submission.

Conflict of Interest

Authors declare no conflict of interest.

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