Prevalence, Severity and Factors Associated with Dental Caries Among School Adolescents in Uganda: A Cross-Sectional Study

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Abstract

Dental caries is one of the most prevalent diseases in developing countries. However, there is limited data on the prevalence and factors associated with dental caries in Ugandan adolescents. The purpose of the present study was to describe the prevalence, severity of dental caries and to determine the factors associated with the disease among school adolescents in Uganda. A cross sectional study was conducted at two secondary schools from Kampala (n=197) and Mukono (n=209) districts, Uganda. At both schools, random sampling was used to select the participating classes and the 406 adolescents (11–19 years) eligible to participate in the research. Dental caries was examined using the Decayed, Missing and Filled Teeth (DMFT) index, and a questionnaire was used to collect other relevant data in form of an oral interview. The data were analyzed using STATA version 12. The data was declared as survey data and all analyses were done with svy command. The prevalence of caries was determined as a percentage of individuals with DMFT score 1. Modified Poisson regression models were utilized to assess the association between prevalence, severity of dental caries and independent variables. The overall prevalence of dental caries was 66.0% and mean DMFT score of 2.18±2.67. Dental caries prevalence and severity were significantly (p<0.05) associated with tooth cleaning device, age and history of previous dental visit. There was a high prevalence and severity of dental caries among adolescents, which emphasizes the urgent need to develop and design appropriate interventions to reduce the disease burden.

Keywords

adolescents; dental caries; prevalence; associated factors; severity

Introduction

Dental caries and periodontal diseases still create a major public health concern in spite of improvement in oral health globally. The World Health Organization (WHO) recognizes

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dental caries as a pandemic disease affecting 60–90% of school-aged children and a vast majority of adults (1). In many developing countries, the prevalence and severity of dental caries have been low until in recent years where the trend is changing (2–4). This increase in the prevalence and severity of dental caries has been attributed to inadequate exposure to fluorides coupled with the growing consumption of sugars (2).

Dental caries presents various challenges including a negative effect on people's quality of life, restricted school and work activities in adults. In children it affects dietary intake and subsequently may impair growth and development (2,5,6).

Globally, oral health problems continue to be among the most costly health problems to treat, resulting in high direct and indirect costs to individuals, families and governments. In most low-income countries, the cost of treating dental decay alone could easily exhaust a country's total health care budget for children (7). Conversely, the government investments in oral health care are low. Worse still, the dentist to population ratio is about 1 per 150,000 people; making the provision of dental health services difficult (8). For the case of Uganda, the government has had to deal with several pressing health issues. This has led to giving limited priority to less life-threatening conditions such as oral health (9). For instance, less than 0.1% of the Gross Domestic Product is allocated for the direct oral health care and the dentist to the population ratio is 1:158,000 people (10). With this insufficiency, resources are primarily allocated to emergency oral care and pain relief. Subsequently, majority (90%) of the dental caries remain untreated in low income countries (2, 4).

There is insufficient data on the oral health situation in Uganda (10). However, the available data shows that there is a rise in dental caries prevalence and experience among adults over the years (11–13). The recent survey reported prevalence rates of over 75% among adults in four out of the seven districts surveyed (12). For the adolescent age group, there is limited data available about the prevalence of dental caries and its associated factors.

Adolescence is a critical age important in oral health prevention, because practices and attitudes acquired during adolescence may last into adult life (14). In Uganda, adolescents (10–19 years) constitute a substantial percentage (26%) of the population with 78% of the adolescents (10–18 years) attending school (15,16). Schools provide an effective platform for promoting oral health. With this distribution, this study aimed to estimate the prevalence, severity and identify the factors associated with dental caries among school adolescents in Uganda.

Material and Methods

Study Design and Site

This was a cross sectional study conducted from February to March 2018 at two secondary schools. The schools are located in the urban setting of the two districts; Kampala and Mukono in the central region of Uganda. Kampala is the capital city of Uganda and the most populated urban center with a population of about 1,507,080 (2014).

Mukono district is located about 22.6 kilometers east of Kampala city and has a population of 596,804. In both districts, simple random sampling was used to select one school from the list of schools provided by the District Education Officer. Mukono High School was selected from Mukono district while Kitebi Secondary School was selected from Kampala district.

Selection of Study Participants

The schools were used as the study areas for adolescents aged 11 to 19 years (n=406). During the study period, about a total of 3,000 and 2,035 students were enrolled in senior 1 to 6 classes in Kitebi Senior Secondary School and Mukono High School, respectively. In both schools, there were 2 to 4 streams for each of the six classes. Cluster random sampling was used to select one stream from each of the six classes to participate in the study. In each school, all adolescent students were informed about the study and the eligible students aged 11 to 19 years were requested to participate in the study. In order to obtain uniform representation of classes, each class contributed on average 34 participants to get an estimated sample size (n=406). Simple random sampling was then used to select the 34 students using class lists. Students willing to participate and aged 18 to 19 years were taken through the consent form and signed. Those aged 11 to 17 years were given consent forms to take to their parents or guardians to read and sign; only students with signed consent forms were assented and enrolled into the study.

Determination of Sample Size

The sample size was calculated allowing for a 5% precision, a Z statistic of 1.96 for 95% confidence and an assumed prevalence of 40.2% based on study results of Kiwanuka and Åstrøm (17) in 10–14-year-old students in Kampala. The minimum sample size was estimated at 369 students to which a 10% adjustment (n=37) was added to cater for possible missing data, resulting in a total sample of 406 students.

Quality Control

Calibration of examiners: Before the main survey, four trained dentists were calibrated in recording dental caries in 20 students aged 11 to 19 years in order to standardize the clinical criteria and minimize inter-examiner variability. The data collected were excluded from the main survey. The Cohen's kappa values of the 4 dentists were 0.85, 0.86, 0.87 and 0.92, with no evidence of systematic error (p>0.5, Wilcoxon test).

Reproducibility Test: During the main survey, each examiner carried out duplicate examinations for dental caries on 10% (n=10) of randomly selected participants for the assessment of intra-examiner variability, which gave Cohen's kappa values of 0.85 to 1.0, with no evidence of systematic error (p>0.5, Wilcoxon test).

Data Collection Procedure

Oral Examination: Clinical examination in recording dental caries of the participants was carried out by four trained and calibrated dentists. Two dentists worked in pairs, one as an examiner and the other as a recorder. The recorder filled the observations onto the forms as dictated by the examiner. To avoid fatigue, they interchanged roles after examining every 10

participants. Examination was done under field conditions in daylight with a participant lying on a portable couch in a supine position in a tree shade in the school compound. Recording of dental caries was done using disposable gloves, mirrors and probes after wiping off soft food debris from teeth with gauze.

Dental caries was assessed by using the Decayed, Missed, Filled Tooth (DMFT) index as described by the World Health Organization (18). Decayed tooth was defined by presence of a lesion in a pit/fissure or on a smooth surface with a detectable softened floor, undermined enamel, softened wall or temporary filling. On proximal surfaces, the probe had to enter the lesion with certainty. When in doubt, the carious lesion was not recorded. Stained pits or fissures that caught the probe, but did not have undermined enamel, softened floor or walls were not included as carious lesions. A tooth was considered filled if it had a permanent restoration and it was considered missing due to caries if there was history of pain and or presence of a cavity prior to extraction (18).

Questionnaire: A structured questionnaire was administered to the participants by two trained research assistants after clinical examination inform of an oral interview in order to establish demographic, socioeconomic and behavioral characteristics. The questionnaire was adopted from the World Health Organization recommended form for oral health surveys with some modifications (18).

Construction of Independent Variables

Socioeconomic status (household wealth index): It was assessed based on ownership of selected household items. These household items have been used by the Uganda national demographic survey to measure household welfare and when combined with other indicators are to generate a household wealth index (16). The selected items include: radio, television, telephone, refrigerator, agricultural land, a means of transportation (bicycle, motorcycle, car or truck) and farm animals such as local cattle, exotic/cross cattle, horses/donkeys/mules, goats, sheep, pigs, or chickens. Possession of these household items was inquired in terms of (1) yes and (0) no. The household variables were combined using the polychoric correlation of the principal component analysis to construct the household wealth index. The household wealth index was divided into quartiles, with the fourth quartile representing the highest household wealth. The first and second quartiles were combined to represent the poorest with the third and fourth representing the richest in the study population as shown in Table 1.

Consumption of sugar containing snacks: Responses regarding the consumption of sugar containing snacks that is soft-drinks, biscuits or cakes were graded as follows; consumption of a sugar containing snack of once a week or less frequently as 'seldom or never' while consumption of sugar containing snacks several times a day to several times a week as 'frequent consumption' (Table 1).

Statistical Analysis

The data were analyzed using STATA version 12. Cohen's kappa statistics were used to assess inter- and intra-examiner variability. Cohen's kappa coefficients were used to assess

inter and intra examiner agreements. Wilcoxon Signed Ranks test for paired observations was used to check for intra-examiner systematic errors in recording caries. The main data set were declared as survey dataset and svy command was used for all results presented. The data were summarized using descriptive statistics. The prevalence of caries was determined as a percentage of individuals with DMFT score 1. Levels of severity of dental caries were categorized as DMFT score = 0, DMFT score = 1–3 and DMFT score 4. The mean DMFT of the study population and the Significant caries index (SiC) were also determined. Over dispersion was assessed via a comparison between a Poisson and negative binomial models. The estimates and the confidence intervals were similar therefore a modified Poisson model (with robust standard errors) was used to assess the association between prevalence of dental caries (DMFT=1) and independent variables. A Poisson model was used to assess the association of DMFT and independent variables. The variables were entered using the stepwise model building technique by including variables that had a p-value of less than 0.2. In addition, variables reported to be significant in literature but had a p-value greater than 0.2 were also included in the multivariable models. P-value less or equal to 0.05 was considered significant. The multivariate models were evaluated by using goodness of fit method to check whether the model fitted the data well, and obtained a p-values of greater than 5%.

Ethical Considerations

The study was approved by Makerere University, School of Medicine Institutional Review Board (SHSREC REF: 2017–039) as well as Uganda National Council of Science and Technology. Permission to carry out the study was obtained from the respective district and school authorities. Informed consent was obtained from participants aged 18 years and the parents or guardians of those aged 11 to 17 years. Informed assent was also obtained before the study. The nature of the study and the participants' right to accept or refuse to take part in the study were dully explained to the participants in accordance with the Helsinki Declaration (19).

Results

Demographic Characteristics

A total of 406 secondary school adolescents were enrolled into the study: 197(48.5%) and 209 (51.5%) from Kampala and Mukono districts, respectively (Table 1). The mean age of the study participants was 15.8 ± 2.1 years with 45.1% (n=183) in the range 11 to 15 years. More than 97.0% of the participants used a toothbrush and tooth paste to clean their teeth, but less than half (46.8%) cleaned their teeth two times a day (Table 1). Less than half (46.5%) of the participants had visited a dentist and 77.8% of them were due to pain while 7.4% were for regular check-up. 40 (9.9%) students did not know the highest level of education attained by their mothers (Table 1).

Prevalence and Severity of Dental Caries

The overall prevalence of dental caries was 66.0% and the mean DMFT score was 2.18 ± 2.67 (Table 2). The mean DT was 1.71 ± 2.25 contributing 78% of the mean DMFT scores. A significantly higher prevalence of caries (74.9%) was observed in adolescents aged 16–19

years than in those aged 11–15 years (55.2 %, p<0.05). Female participants had a higher prevalence of caries than their male counterparts (69.1% versus 61.1 %, Table 2). The SiC value was 5.13±2.62 and about 22.7% of the participants had DMFT scores   4 (Table 3). The DMFT score   4 increased with age: 13.1% in 11–15-year-old adolescents versus 30.5% in 16–19-year-old counterparts (Table 3).

Association Between Prevalence of Caries and Associated Factors

The prevalence of caries was significantly associated with oral hygiene practices, age and history of previous dental visit (p<0.05, Table 4). The prevalence of dental caries was significantly influenced by the tooth cleaning device and age (p<0.05). The adolescents who never used a toothbrush had 2.1 times the prevalence (CI: 1.33–3.337) of developing dental caries than those who use a toothbrush for cleaning (Table 4). The 16–19-year-old students had 1.3 times the prevalence (CI: 1.10–1.62) of acquiring dental caries than their younger counterparts. The male students had 0.88 times the prevalence (CI: 0.79–0.97) of acquiring dental caries than the females. Adolescents who had visited a dentist previously had 1.4 times the prevalence (CI: 1.17–1.58) of developing dental caries than those who never visited a dentist (Table 4). The frequency of consumption of sugar containing snacks, gender and socio-economic status did not significantly influence the prevalence of dental caries (p>0.05, Table 4).

Factors associated with severity of dental caries as determined by the DMFT were also assessed. Severity of dental caries was associated with age, frequency of cleaning teeth, and previous dental visit (p<0.001, p=0.037, p=0.067 and p=0.001) at bivariate analysis. However at multivariate analysis, age 1.87 (95% CI 1.37–2.53, P=0.001), use of a tooth brush 2.62(95% CI 1.325.22, P<0.011) and previous dental visit 2.02 (95% CI1.42–2.87, P=0.001) were significantly associated with severity of dental caries (Table 5).

Discussion

The results show that dental caries prevalence and severity were high among these adolescents. The overall prevalence was 66.0%, with a mean DMFT of 2.18(2.67) and a SiC value of 5.13(2.62). When compared to the past national survey results within adults, these results are in range. This high prevalence can be attributed to location of study population since this was undertaken within urban areas. Living in urban areas exposes to changes in dietary patterns with increased consumption of sugars. With the absence of established preventive community oral health programs, coupled with the high cost of dental care and delayed treatment against the few dental professionals, this statistic is not a surprise. For instance, 59% of the study population reported frequent consumption of sugars. More still, only 7% of this population reported going for regular dental checks.

The decay component (DT) was the primary contributor of the DMFT. The mean DT was 1.71(2.25) contributing 78% of index scores while the mean filled teeth (FT) was 0.02(.017) (Table 2). This further emphasizes the fact that most of the caries go untreated. The high percentage of untreated teeth is consistent with findings from previous studies in Uganda and other developing countries (1,12,20). A high number of untreated dental caries among school children have been attributed to limited access to dental care and unavailability of

equipment for the effective management of dental caries (8). Prevalence and severity of dental caries were significantly associated with mode of tooth brushing, increasing age and lack of a tooth brushing habit. The prevalence of dental caries was significantly influenced by the tooth cleaning devices (Table 4) where all adolescents (9/406) who did not use a toothbrush for tooth cleaning had dental caries. This presence of dental caries among all the adolescents who did not use toothbrushes could be explained by the fact that regular brushing of the teeth mainly after each meal is one of the methods for preventing the occurrence of dental caries. However, a high percentage (93.3%) of the participants reported cleaning their teeth at least once day and using toothpaste, an indication of fair oral hygiene practices generally among the adolescents. Nevertheless, the study limitation was that we did not investigate how tooth cleaning was related to meals.

The frequency of consumption of sugar containing snacks did not significantly influence the prevalence and severity of dental caries (p>0.05). This relationship might not have been captured due to nature of the study design. As a cross sectional study, the adolescents with pain or history of dental caries might have had a behavioral change after a dental visit. However, the frequency consumption of sugar undoubtedly contributes to the onset of dental caries and the associations have been confirmed by several studies (21).

It was also observed that, caries prevalence and severity was associated with increasing age (Table 4 and Table 5). This is similar to the reported increase with age seen in other studies (12,22). The marked upward slope of dental caries prevalence and severity with age in adolescence may be explained by the fact that, exposure to several risk factors of dental caries starts during adolescence; this is coupled with the absence of preventive programs of dental caries.

The prevalence of dental caries was significantly associated with history of previous dental visit (Table 4). However, this may be due the fact that majority (77.8%) of the participants had visited a dentist especially due to dental pain (Table 1) instead of going for routine dental checkups. Similar observations have been reported previously in Uganda and in several developing countries (1,23).

There was an increasing trend in severity of dental caries (DMFT) as the household wealth index changed from poor, middle to the rich. At bivariate analysis, this increase in the DMFT was significant across the socioeconomic strata however the rise was not significant at multivariate analysis. Dental caries prevalence did not differ significantly by household wealth index. These findings slightly differ from the results of other studies that have reported significant association of both dental caries prevalence and severity with socioeconomic status (24,25). Considered at an individual level socio economic status may influence dental caries in several ways. It may affect the degree of education, health values, lifestyle and access to health care services.

The limitations of the study include that dental caries was measured using only visual and tactile responses with no use of radiographs. It is therefore likely, that the prevalence of dental caries was under-estimated. In the study it was difficult to prove the association of dental caries and frequent consumption of sugars. This could have been due the study

design; it was a cross sectional study and the association could be proved by a case control or cohort study. The results of the study may not be representative for all adolescents in Uganda as both schools in the study were located in urban areas. But the results might be representative for the adolescent population in urban areas of Uganda for example Kampala and Mukono districts since about 78% of adolescents (10–18 years) attend school.

There was a high prevalence and severity of dental caries among adolescents. We therefore recommend preventive programs and cost-effective interventions to start at an early age targeting children and early adolescence (10–15 years) to address the rising epidemic and burden of dental caries in Uganda. Preventive approaches seem to be a sustainable alternative to tackle the seemingly overwhelming problem of dental caries. Oral health promotion should particularly be targeted to children and adolescents at school. Non dental personnel such as education professionals may be used to pass on oral health knowledge and influence choices of students. Policymakers should be aware of the role of fluoride in caries prevention and should press for fluoridation of community due to high levels of dental caries.

Resumo

A cárie dentária é uma das doenças mais prevalentes nos países em desenvolvimento. No entanto, existem dados limitados sobre a prevalência e os fatores associados à cárie dentária em adolescentes de Uganda. O objetivo do presente estudo foi descrever a prevalência e severidade da cárie dentária e determinar os fatores associados à doença em adolescentes escolares de Uganda. Um estudo transversal foi realizado em duas escolas secundárias dos distritos de Kampala (n = 197) e Mukono (n = 209), Uganda. Nas duas escolas, foi utilizada amostragem aleatória para selecionar as turmas participantes e os 406 adolescentes (11 a 19 anos) elegíveis para participar da pesquisa. A cárie dentária foi examinada usando o índice de dentes cariados, perdidos e obturados (CPOD), e um questionário foi usado para coletar outros dados relevantes na forma de uma entrevista oral. Os dados foram analisados no STATA versão 12. Os dados foram declarados como dados da pesquisa e todas as análises foram realizadas com o comando svy. A prevalência de cárie foi determinada como porcentagem de indivíduos com escore de CPOD 1. Modelos de regressão de Poisson modificados foram utilizados para avaliar a associação entre prevalência, gravidade da cárie dentária e variáveis independentes. A prevalência geral de cárie dentária foi de 66,0% e o escore médio do CPOD de $2,18 \pm 2,67$. A prevalência e severidade de cárie dentária foram significativamente (p<0,05) associadas ao dispositivo de limpeza dentária, idade e histórico de visita odontológica prévia. Houve alta prevalência e gravidade de cárie dentária entre os adolescentes, o que enfatiza a necessidade urgente de desenvolver e projetar intervenções apropriadas para reduzir a carga da doença.

Acknowledgements

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Table 1.

Frequency distributions of participants according to demographic characteristics and oral health behavior (N=406).

Variable	Category	n	%
Gender	Male	157	38.7
	Female	249	61.3
Residence	Kampala	209	51.5
	Mukono	197	48.5
Age	11–15 years	183	45.1
	16–19 years	223	54.9
	Primary or below	93	22.9
Mother's education	Secondary education	197	48.5
	Tertiary education	76	18.7
	Don't know	40	9.9
	Poor	164	40.4
Household wealth index	Middle	80	19.7
	Rich	162	39.9
	Twice or more a day	190	46.8
Frequency of cleaning teeth	Once a day	189	46.6
	Never/occasionally	27	6.6
	Tooth brush	397	97.8
Tooth cleaning device	Chewing Stick Only	4	1.0
	None	5	1.2
Use of toothpaste	Yes	396	97.5
	No	10	2.5
Frequent consumption of sugar containing snack	Never/Seldom	165	40.6
	Frequent consumption	241	59.4
Previous dental visit	Never	217	53.5
	Yes	189	46.5
	Dental pain	147	77.8
Reason for dental visit (n=189)	Routine check up	14	7.4
	Treatment follow up/ Advice	20	10.6
	Did not remember	8	4.2

Frequent consumption of sugar containing=taking one or more sugar containing snack every day or several times a day; used survey data analysis with svy command

Table 2.

Prevalence and mean DMFT scores of participants according to age and gender (N = 406)

Variables analyzed		Prevalence		DMFT Scores			
		Without caries DMFT=0 n(%)	With caries DMFT ≥ 1 n(%)	DMFT Mean(SD)	DT Mean(SD)	MT Mean(SD)	FT Mean(SD)
Age group (years)	11–15 (n=183)	82(44.8)	101(55.2)	1.43(2.00)	1.15(1.70)	0.26(0.62)	0.03(0.19)
	16–19 (n=223)	56(25.1)	167(74.9)	2.80(2.97)	2.18(2.52)	0.60(1.08)	0.01(0.15)
Gender	Female (n=249)	77(30.9)	172(69.1)	2.26(2.68)	1.79(2.32)	0.44(0.92)	0.03(0.21)
	Male (n=157)	61(38.9)	96(61.1)	2.06(2.64)	1.60(2.13)	0.46(0.92)	0.01(0.08)
Total		138(34.0)	268(66.0)	2.18(2.67)	1.71(2.25)	0.45(0.92)	0.02(0.17)

DMFT=decay, missing, and filled teeth. %=percentage; SD=standard deviation; used survey data analysis with svy command.

Table 3.

Frequency distribution of participants according to age groups and severity of dental caries (n = 406)

Age group	DMFT=0 n(%)	DMFT=1–3 n(%)	DMFT≥ 4 n(%)	With caries DMFT ≥ 1Mean(SD)	Sic N(92) Mean(SD)
11–15 (N=183)	82(44.8)	77(42.1)	24(13.1)	2.59(2.05)	4.49(2.00)
16–19 (N=223)	56(25.1)	99(44.4)	68(30.5)	3.73(2.88)	5.41(2.81)
Total	138(34.0)	176(43.3)	92(22.7)	3.30(2.65)	5.13(2.62)

DMFT=decay, missing, and filling teeth; SD=standard deviation; SiC=significant caries index (mean DMFT in the one-third of the population more severely affected by dental caries); used survey data analysis with svy command

Table 4.

Bivariate and multivariate modified poisson regression analysis of dental caries prevalence and associated factors among participants (N=406)

Variable	Prevalence			Unadjusted			Adjusted		
	Without Dental Caries n(%)	With Dental Caries n(%)	PR	Confidence interval	* p value	PR	Confidence Interval	* p value	
Age group									
11–15 years	80.872(44.8)	101(55.2)	1[a]						
16–19 years	56(25.1)	167(74.9)	1.18	1.10–1.28	0.00	1.34	1.10 – 1.63	0.009	
Gender									
Female	77(30.9)	172(69.1)	1[a]						
Male	61(38.8)	96(61.2)	0.91	0.72–1.16	0.415	0.88	0.79–0.97	0.017	
Household wealth index									
Poor	55(33.5)	109(66.5)	1[a]						
Middle	28(35.0)	52(65.0)	1.08	0.72–1.62	0.672	0.96	0.82–1.13	0.601	
Rich	55(33.9)	107(66.1)	1.22	0.92–1.63	1.151	0.95	0.78–1.18	0.654	
Frequency of cleaning teeth									
Twice or more a day	59(31.1)	131(68.9)	1[a]						
Once a day	69(36.5)	120(63.5)	0.82	0.68–0.96	0.96				
Never/Occasionally	10(37.0)	17(63.0)	0.86	0.47–1.57	0.595	0.79	0.52–1.19	0.230	
Use of brush									
Yes	138(34.8)	259(65.2)	1[a]						
No	0(0.0)	9(100)	1.60	0.96–2.66	0.067	2.12	1.33–3.38	0.005	
Frequency of taking sugar containing snacks									
Never/seldom	57(34.5)	108(65.5)	1[a]						
Frequent	81(33.6)	160(66.4)	1.08	0.85–1.36	0.488	0.98	0.856–1.13	0.764	
Previous dental visit									
Never	95(43.8)	122(56.2)	1[a]						
Yes	43(22.8)	146(77.2)	2.11	1.50–2.98	0.001	1.36	1.17–1.58	0.001	

PR- prevalence ratio, n-number, %-percentage

*
p values- used modified Poisson analysis; a reference value; used survey data analysis with svy command.

Table 5.

Bivariate and Multivariate Poisson Regression Analysis of DMFT and Associated Factors among Participants (N=406)

Variable	DMFT	Unadjusted			Adjusted		
	Mean (SD)	Rate ratio	95% Confidence interval	p value	Rate ratio	95% Confidence interval	p value
Age							
11–15 years	1.43 (2.00)	1[a]	1[a]	1[a]	1[a]	1[a]	1[a]
16–19 years	2.80(2.97)	1.95	1.40–2.72	0.001	1.87	1.37	0.001
Gender							
Female	2.26(2.68)	1[a]	1[a]	1[a]	1[a]	1[a]	1[a]
Male	2.06(2.64)	0.91	0.72–1.16	0.415	0.91	0.75–1.09	0.272
Household wealth index							
Poor	1.98(2.38)	1[a]	1[a]	1[a]	1[a]	1[a]	1[a]
Middle	2.14(2.71)	1.08	0.92–1.62	0.151	1.05	0.73–1.52	0.758
Rich	2.41(2.90)	1.22	0.92–1.63	0.151	1.10	0.80–1.52	0.516
Frequency of cleaning teeth							
Twice or more a day	2.41(2.95)	1[a]	1[a]	1[a]	1[a]	1[a]	1[a]
Once a day	1.97(2.36)	0.82	0.68–0.99	0.037	0.87	0.68–1.12	0.253
Never/Occasionally	2.07(2.54)	0.86	0.47–1.57	0.595	0.73	0.44–1.21	0.192
Use of brush							
Yes	2.15(2.65)	1[a]	1[a]	1[a]	1[a]	1[a]	1[a]
No	3.44(3.13)	1.60	0.96–2.66	0.067	2.62	1.32–5.22	0.001
Frequency of taking sugar containing snacks							
Never/seldom	2.08(2.38)	1[a]	1[a]	1[a]	1[a]	1[a]	1[a]
Frequent	2.25(2.84)	1.07	0.85–1.36	0.488	1.04	0.811–1.34	0.719
Previous dental visit Never							
Never	1.44(2.18)	1[a]	1[a]	1[a]	1[a]	1[a]	1[a]
Yes	3.04(2.90)	2.11	1.50–2.98	0.001	2.02	1.42–2.87	0.001

Rate Ratio-The DMFT ratio of each group versus reference group for each; n-number, %-percentage

*

p values- used Poisson analysis; 1-reference value; used survey data analysis with svy command.