

6-1-2022

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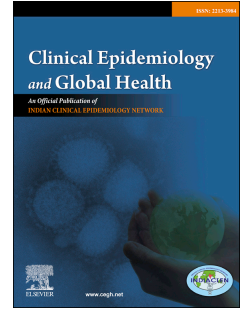
Omara, Hajir and Elamin, Amal, "Oral health status and related risk factors among adolescents attending high schools in Khartoum, Sudan: A cross-sectional study" (2022). *All Works*. 5156.
<https://zuscholars.zu.ac.ae/works/5156>

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PII: S2213-3984(22)00122-1

DOI: <https://doi.org/10.1016/j.cegh.2022.101080>

Reference: CEGH 101080

To appear in: *Clinical Epidemiology and Global Health*

Received Date: 3 November 2021

Revised Date: 11 May 2022

Accepted Date: 27 May 2022

Please cite this article as: Omara H, Elamin A, Oral health status and related risk factors among adolescents attending high schools in Khartoum, Sudan: A cross-sectional study, *Clinical Epidemiology and Global Health* (2022), doi: <https://doi.org/10.1016/j.cegh.2022.101080>.

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CRedit author statement

Manuscript title: Oral health status and related risk factors among adolescents attending high schools in Khartoum, Sudan: A cross-sectional study

Authors: Hajir Omara and Amal Elamin

Hajir Omara: Conceptualization, Methodology, Software, Formal analysis, Investigation, Data Curation and Writing - Original Draft

Amal Elamin: Software, Validation, Formal analysis, Data Curation, Writing - Original Draft, Writing - Review & Editing, Visualization and Supervision

1 **Oral health status and related risk factors among adolescents attending**
2 **high schools in Khartoum, Sudan: A cross-sectional study**

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8 **Running title**

9 Oral health status of Sudanese adolescents

10 **Key words**

11 Oral health, adolescents, DMFT, CPI, Sudan

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17 **Authorship**

18 Hajir Omar has contributed to the design of the study, data collection, data analysis and
19 manuscript writing.

20 Amal Elamin has contributed to the data analysis and manuscript writing. All authors have
21 approved the final manuscript.

22

23 Abstract word count: 250 words

24 Total word count: 3000 words

25 Total number of references: 30

26 Tables: Table 1, Table 2 (A and B), Table 3 (A and B), Table 4

27 Figures: Figures 1

Journal Pre-proof

1 **Oral health status and related risk factors among adolescents attending**
2 **high schools in Khartoum, Sudan: A cross-sectional study**

3 **Abstract**

4 Objectives: Effective dental services must be based on reliable evidence of oral diseases
5 status and treatment needs. The aim of this study was to assess oral health status and
6 associated risk factors among adolescents attending high school in Khartoum, Sudan.

7 Methods: A school-based survey was conducted among 420 adolescents (13-18 years old).

8 Participants completed a questionnaire about their socio-demographics and oral habits. They
9 received clinical examination, assessing their oral health status using the World Health

10 Organization (WHO) oral health survey for dentition and periodontal status; mean Decayed,
11 Missing and Filled Teeth (DMFT), and Community Periodontal Index (CPI).

12 Results: High dental caries prevalence of 91.1%, with mean DMFT of 3.3 (\pm 1.8) and

13 Significant Caries index (SIC) of 5.2 were found among the participants. Untreated decayed
14 teeth dominated the DMFT scores (DT=3.06 \pm 1.7). The results of CPI depicted that 96% of
15 participants had unhealthy periodontium, with majority of subjects (79.5%) having CPI

16 maximum scores of 2. Increased age and being enrolled in a public school were the main risk
17 factors associated with caries ($p=0.01$). Increased CPI scores were found to be significantly
18 higher among males ($p=0.006$) and among public schools' attendees ($p=0.039$). High
19 maternal education was associated with participants' healthier periodontium ($p<0.01$).

20 Conclusions: Sudanese adolescents have high prevalence of caries and unhealthy
21 periodontium, which imposes a need for preventive and treatment programs to improve their
22 oral health status. The significant associations between participants' oral health status and

23 their gender, school-type and age may suggest considering these when designing schools'
24 oral health programs.

25

26 **Introduction**

27 Oral health is an integral part, and has a close reciprocal associations with the
28 overall systemic well-being.¹ The WHO defines oral health as the standard of oral tissues
29 which enables an individual to eat, speak and socialize without active disease, discomfort or
30 embarrassment, thus contributing to general well-being.² This comprehensive definition
31 emphasizes the impact of oral diseases on the quality of life of the individual.³ Several
32 factors play a role in determining the oral health status, including a) biological e.g. host
33 susceptibility; b) behavioural, e.g. toothbrushing, quality of the nutrition, tobacco use, and
34 dental services utilization; c) socioeconomic factors e.g. level of education and income;
35 and d) macro-ecological such as fluoridation and sealants and accessibility to dental
36 services.⁴

37 The American Academy of Paediatric Dentistry recognizes adolescence as a period requiring
38 specific oral health attention due to (1) a potentially high caries rate caused by increased intake
39 of cariogenic-substances; (2) a tendency for poor oral hygiene, and altered nutritional habits;
40 (3) hormonal changes; (4) increased risk for periodontal disease and traumatic injury; (4)
41 increased aesthetic desire; and (6) potential use of tobacco and other drugs.⁵ Although these
42 physiological and socio-behavioural changes and practices may adversely affect adolescents'
43 oral health, but adolescence remains as an opportunity for improving oral health, as health
44 behaviours established during adolescence may last into adulthood, making this high risk age-
45 group an excellent target for oral screening and prevention programs.^{6,7}

46 Oral health surveillance is an essential approach to delineate diseases levels, trends, and
47 changes in prevalence and severity over time.^{3, 8} The WHO recommends evaluating the oral
48 health status by assessing the dentition and periodontal status. The dentition status can be
49 assessed using dental caries indices on either the tooth or surface levels (dmft/s and or
50 DMFT/S), and the periodontal status using CPI in which periodontal indicators (gingival
51 bleeding, presence of calculus and periodontal pockets) are used for this assessment.³ For
52 effective surveillance, the WHO suggests that clinical oral health surveys should be
53 conducted regularly every five to six years in the same community.³

54 Although dental caries and periodontal diseases are considered to be major oral health
55 problems globally, but they appear to be neither as prevalent nor as severe in African
56 countries as in the developed ones.⁸ Regionally, the prevalence and severity of oral diseases,
57 among adolescents aged 10–14 years from Uganda, Tanzania and Kenya revealed low
58 prevalence of caries and mean DMFT ranging from 0.3 to 0.7.⁹⁻¹¹ Nevertheless the profile of
59 oral disease is not homogenous across Africa, with well-established epidemiological
60 disparities within and between countries and regions, suggesting the need for each country to
61 periodically assess its oral health status.¹²

62 Few studies have investigated the oral health status of Sudanese population in the past
63 decades.^{13, 14} Untreated caries prevalence was found to be high (30.5% among the twelve
64 years old, and 87.7% among subjects ≥ 16 years old), and the periodontal status varied based
65 on the age group.^{13, 14} Elamin et al. reported that 16.3% and 8.2% of Sudanese high school
66 adolescents had at least one tooth with ≥ 4 and ≥ 5 mm periodontal attachment loss,
67 respectively.¹⁵ Overall, studies assessing Sudanese periodontal health status were
68 characterized by variations in assessment methodologies and findings (Table1).^{13, 14, 16-20}

69 In Sudan, oral health services are combination of public and private providers, with
70 substantial maldistribution between urban and rural areas. The lack of regular school-linked
71 preventive oral health programs, and population-linked recording systems hinders the tasks of
72 understanding the oral health status and the associated factors needed to offer a basis for
73 developing effective oral health interventions.⁸ Furthermore, similar to many developing
74 countries in Africa, oral health services are almost entirely curative and are poorly distributed
75 reaching only urban communities and those with higher income.¹²

76 In an effort to periodically assess the oral health profile of the Sudanese population, we
77 identified a gap in the literature related to the oral health status of Sudanese adolescents.
78 Therefore, the aim of this study was to assess oral health status and related factors among
79 Sudanese adolescent attending high schools in Khartoum, Sudan.

81 **Methods**

82 The target population was Sudanese adolescents aged 13 to 18 years old, attending public and
83 private high schools in Khartoum locality, Sudan. This locality consists of three
84 administrative units (Khartoum, Al-Shuhada and Khartoum-East), with a total population of
85 745.938 inhabitants. A total of 158 high schools; with 16410 students enrolled in the public
86 schools (55% boys and 45% girls), and 15343 students in the private schools (50% boys and
87 50% girls). A minimum sample size of 385 participants was calculated, using Cochran
88 formula ($n = \frac{Z^2 pq}{e^2}$).²¹

89 To obtain a representative sample of the study population, multistage stratified random
90 sampling design was performed.³ To achieve this, a list of all high schools in the locality was
91 obtained from the Ministry of Education, Sudan. Primary sampling units consisted of schools

92 and were stratified by school type (private vs. public)/ (boys' schools vs. girls' schools).
93 Twenty schools were randomly selected, as follows: five public boys' schools, five public
94 girls' schools, five private boys' schools and five private girls' schools. In the second stage,
95 21 students were randomly selected from the three academic grades in each school, seven
96 from each class, rounding the total sample size to 420 participants. The inclusion criteria for
97 this study were consenting, generally healthy students and who were also present at school on
98 the day of the examination. Students who had undergone prolonged use of medications or had
99 chronic diseases were excluded from this study.

100 Data were collected by means of questionnaires and clinical examinations. Participants were
101 interviewed to complete a full structured questionnaire which consisted of two sections: (a)
102 sociodemographic (e.g.: age, school type, parents' education levels and self-rated financial
103 status), and (b) oral health habits and practices (toothbrushing, oral hygiene aids, and dental
104 services visits).

105 For the oral health assessment, the WHO oral health survey guidelines and criteria (DMFT and
106 CPI) were used.³ All dental examinations were performed at schools, by one experienced
107 calibrated dentist (HO). The examination was conducted under field-conditions with the
108 participant seated on an office chair facing a window with natural sunlight. The dental
109 examination was carried out using plane-faced dental mirror, and 0.5mm ball-ended
110 Community Periodontal Index Probe (CPI probe) (WHO-probe, YDM Ltd., Tokyo, Japan).

111 The following were recorded for each participant: a) the WHO caries-scoring index for
112 permanent dentition (DMFT) to describe the dental caries status, and CPI (score 0: healthy;
113 score 1: gingival bleeding observed with no pocket and no calculus; score 2: gingival calculus
114 present and no pocket > 3 mm; score 3: pocket present 4 or 5 mm deep; score 4: pocket > 6mm)
115 to describe the periodontal health status.

116 The statistical software package SPSS version 24.0 was used for statistical analyses. The CPI
117 data were analysed according to WHO recommendations whereby participants were
118 categorized by maximum CPI score and the mean number of sextants was computed. Mean
119 DMFT was used to determine the extent of caries. The SiC was calculated, according to the
120 WHO formula by selecting the one third of the study participants having the highest DMFT
121 values.²² Chi square and Kruskal Wallis tests were used for testing associations between
122 indices and selected variables as appropriate. A multivariate logistic regression model was
123 applied and included variables that had shown statistical significance in univariate tests. A P-
124 value <0.05 was considered statistically significant.

125

126 **Results**

127 A total of 420 adolescents completed questionnaires and received clinical examinations.
128 Table 2 (A and B) describes the sample characteristics. Table 2A shows sociodemographic
129 characteristics of high school students participating in the study. Table 2B describes the
130 sample characteristics with regards to oral hygiene practices and dental habits. Majority of
131 participants brushed their teeth daily (61%), while 2.8% reported to brush their teeth
132 irregularly. Majority of participants (98.2%) were using toothbrush as the brushing tool,
133 whereas six participants reported to use Miswak and dental floss. Over third of the
134 participants (35.5%) never visited a dentist before and 38.1% of the participants self-rated
135 their oral health as good (Table 2B).

136 Tables 3 (A and B) describe the participants' periodontal health status. The percentage of
137 study participants with CPI maximum scores and the mean number of sextants with CPI-
138 scores is presented in Table 3A. Most of the subjects (79.5%) had a score of 2 (calculus) as
139 their highest CPI score, while only 6% had healthy periodontium (CPI = 0). When assessing
140 the participants' periodontal health status measured by CPI and divided by age group, gender

141 and school-type significant differences in CPI scores were found between genders, where
142 boys were found to have higher maximum CPI scores, i.e., scores 2 and 3, whereas girls were
143 found to have more of scores 0 and 1 ($p=0.006$) (Table 3B). Moreover, the percentage of
144 subjects affected by gingival bleeding and calculus (score 2) was significantly higher among
145 adolescents enrolled in public schools than those enrolled in private schools (82.7% vs 75.4%
146 respectively, $p=0.039$) (Table 3B). Analysis of the association between the
147 sociodemographic characteristics, oral practices and CPI scores revealed that adolescents
148 with mothers having higher educational level (i.e., university degree or above), have
149 significantly healthier periodontium than those with mothers who have lower education (high
150 school education or below) ($p<0.01$) (Table 3B).

151 Overall, only 37 subjects were found to be caries free (8.9%), indicating that the
152 prevalence of dental caries among high school students in Khartoum was 91.1%. A
153 significantly higher occurrence of caries was found among the older age group, i.e., the 16-18
154 years old ($p=0.013$) (Figure 1).

155 In the study sample, the mean DMFT was found to be 3.3 (± 1.8), and the SIC was 5.2.
156 Over 92% of the mean DMFT score was contributed by untreated decayed teeth ($DT=3.06$
157 ± 1.7). Only 23 subjects were found to have teeth with restorations contributing to a low mean
158 FT (0.2 ± 1.0), and 46 participants had undergone extractions ($MT=0.4\pm 0.9$).
159 Table 4 shows the caries experience among study participants described by DT, MT, FT and
160 mean DMFT scores divided by gender, age, and school type. The mean DMFT scores for 13-
161 15- and 16–18-year-old participants were 3.0 (± 1.7), 3.5 (± 1.9) respectively (Table 4). This
162 indicates that as the age of the subjects increased from 13 to 18 years old, caries significantly
163 increased ($p=0.01$). Moreover, the mean DMFT was significantly higher among subjects
164 attending public schools ($p=0.01$). The DT was significantly higher among public schools'
165 attendees than private schools' attendees ($p=0.007$), while the MT component was

166 significantly higher among subjects ages 16-18 years old than the younger age group
167 ($p=0.004$). Analysis of the association between the oral practices and dental caries revealed
168 that adolescents who visited the dentist once or more that year had significantly higher mean
169 DMFT 2.93 (± 1.78), than those who didn't have dental visits in the past year or never visited
170 a dentist before ($p=0.002$) (Table 4).

171 To examine the associations between the independent variables, multiple logistic regression
172 model was constructed, and the analysis found no statistical significant associations.

173

174 **Discussion**

175 In Sudan, like many other developing countries, oral diseases have been neglected and are
176 not prioritized by health planners, which may have been reflected on the overall oral health
177 status of the population.⁸ We assessed the oral health status and associated risk factors among
178 high school adolescents, in Khartoum, Sudan. The present study reported concerning neglect
179 of oral health among Sudanese high school students in Khartoum, where a high caries
180 prevalence of 91.1% was found among the assessed high school students. Untreated decayed
181 teeth dominated the DMFT scores in this study, indicating a high rate of unmet treatment
182 needs. Moreover, the periodontal health status was also alarming with 96% of participants
183 having unhealthy and gingiva and periodontium with CPI maximum scores ranging 1-4.

184 Global trends of dental caries indicate that although caries rates are declining worldwide,
185 the prevalence of the disease is still rather high in some countries²³. Over the past two decades
186 number of attempts -despite their scarcity- have been made to map the oral health status in
187 Sudan.¹³ In this study the mean DMFT was of 3.3 and SiC of 5.2 were found to be higher than
188 those reported in a study assessing the oral health status of WHO index age of 12 years old
189 students in Khartoum state, where authors reported a mean DMFT of 0.42 with SiC of 1.4.¹³
190 Despite the present study assessing slightly older age groups, yet it is indicative of increased

191 caries experience among adolescents in Sudan. Furthermore, the prevalence of caries reported
192 in the current study was found to be higher than those reported among Sudanese adults aged \geq
193 16 years (91.1% vs. 87.7% respectively).¹⁴ The alarming rise reported among the younger age
194 group in this study suggests an increasing trend of caries, with worsening of oral health
195 outcomes among adolescents in Khartoum over the past decade.¹⁴ These are also in agreement
196 with reviews from the African region indicating that there is a marked increase in the
197 prevalence of caries affecting children as well as adults, and may be related to well-known
198 issues of socioeconomics, lack of preventive efforts and dietary changes.⁸

199 In this study, the DT accounted for 92% of the DMFT value as it had a 3.06 contribution
200 to the mean DMFT, which may indicate an under-utilization of dental healthcare services.
201 These results are similar to the other studies, finding the decayed component to be the
202 major contributor to caries index scores.^{24, 25} In offering an explanation for the high DT
203 rates, it has been suggested that almost 90% of cases of caries go untreated among the
204 African people due to lack of financial affordability and unmet dental treatment needs.⁸
205 Moreover, it is suggested that the burden of African life outweigh the need to seek
206 treatments for dental caries.^{8, 26}

207 In this study, the periodontal health was assessed using the highest CPI score and revealed
208 that the most frequently observed condition was calculus with or without bleeding. This is
209 comparable with results from different regions in Sudan, where calculus was found to be the
210 most prevalent periodontal manifestation among Sudanese adults using different periodontal
211 indices.^{14, 16} What remains of great concerns is the high proportion of adolescents with
212 calculus in this study as well as the lower prevalence of those who have healthy periodontal
213 tissues compared to previous reports among the older age groups of 35-44 years (79.5% vs.
214 42.0% , and 6.0% vs. 36.1%, respectively) ¹⁴ marking a possible worsening of effective oral
215 hygiene practices among the Sudanese population. Furthermore, significantly poorer

216 periodontal health was reported among male participants and public schools' attendees in this
217 study. Others have reported male-gender as risk of poorer periodontal health, attributing it to
218 gender-related differences in hygiene behaviours and practices rather than true biological
219 differences between the sexes.¹⁵ Maternal education was found to be a protective factor for
220 periodontal health in this population. Several studies have shown that parental educational
221 level, in particular the mother's education, to significantly influence their children's oral
222 health status.²⁷ In theoretical framework involving predictors of children's oral health that
223 were grouped into community- family- and child-level influences, the authors demonstrated
224 the critical importance of the familial factors in determining the children's oral health.²⁷ The
225 participants' periodontal health status assessed by attachment loss in this study found fewer
226 young participants having shallow pockets (score 3), and no deep pockets (periodontal pocket
227 ≥ 6 mm) were recorded. This is in agreement with previous report assessing periodontal status
228 of 12 and 15-year-old Greek adolescents, where the majority had calculus with or without
229 gingival bleeding, and the occurrence of shallow and/or deep periodontal pockets was very
230 low (0.2%).²⁸ Conversely a higher prevalence of attachment loss were reported among 15- to
231 17-year-old students in Sudan, where 16.3% and 8.2% of the subjects had at least one tooth
232 with ≥ 4 and ≥ 5 mm attachment loss, respectively.¹⁵ Nevertheless, it is argued that the CPI
233 system may either underestimate or overestimate the prevalence and severity of periodontal
234 parameters.²⁹ Hence the direct comparison of the present findings for bleeding and calculus
235 with findings from other studies must be interpreted with caution.¹⁷

236 Our finding that those who visit dentists regularly have a higher DMFT is in agreement with
237 studies suggesting that dental services utilization practices maybe more focused on treatment
238 rather than on dental caries prevention.³⁰ In this study, toothbrushing with toothpaste together
239 with the use of Miswak were the most common reported oral hygiene practices. The
240 affordability of toothbrushes and Miswak, and the fact that they don't require a high level of

241 skill compared to other modern methods such as a flossing may explains these oral hygiene
242 practices among the participants.

243 **Conclusion**

244 The oral health status of Sudanese high school students signals a pending oral public health
245 crisis. In this study, the main risk factor associated with dental caries was increased age,
246 while male-gender adolescents had significantly higher CPI scores. Public school attendees
247 had significantly higher rates of dental caries and CPI scores. The significant associations
248 between participants' oral health status and their gender, school-type and age may suggest
249 considering these risk groups when designing schools' oral health programs. The lack of
250 preventive efforts and collapsing oral health system raises considerable fears that the dental
251 caries is likely to rise, especially among adolescents. This imposes a need for adopting for a
252 school-based health promotion approaches that are cost-effective, sustainable and that
253 includes a mix of preventive and curative care.

254

255 **Declaration of competing interest, and funding statement**

256 The authors declare no conflicts of interests. This research received no specific grant from
257 any funding agency.

258

259 **Ethical approval**

260 This study received full ethical approval from Sudan Medical Specialization Board (SMSB).
261 Approvals were also obtained from schools' managements. Prior to participation written
262 consents were obtained from all participants, and parents/guardians. Only consenting
263 participants were included in the study.

264

265

266 **Acknowledgements**

267 We thank the students, schools' managements/staff for participating in this study. We would
268 also like to thank Dr. Elsadig Eltayeb for his guidance.

269

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Table 1

Periodontal health status of adolescents and adults in Sudan reported in the literature (1966-2012).

Author/s and year	Region	Study sample (n)	Age (years)	Assessment method of periodontal health (Index)	Main periodontal health status findings
Emslie 1966 (20)	Butana, Gezira, Khartoum city and Kordofan river	995	4-60	Russell index (PI)	High prevalence of periodontal disease associated with poor oral hygiene. Three cases of periodontosis (currently known as periodontitis) were found among 645 (age group 15-19 years), yielding a prevalence of 0.47%.
Ali and Lie 1994 (18)	Khartoum city and El-Obeid city	264	15-64	CPITN	High prevalence of periodontal diseases among adolescents. 95.2% having pockets 4-5 mm. 4% having pocket depths 6 mm.
Yousif et al. 2008 (16)	Gezira Province (urban and rural) Central Sudan	649	Adults (age not specified)	Periodontal Index (PI)	Calculus was the most predominant periodontal problem in both the urban and rural areas. Periodontitis is a least prevalent condition in urban and rural areas (12.4% and 13.1% respectively).
Elamin et al. 2010 (15)	Khartoum State	1200	13-19	Gingival recession, probing depth, gingival bleeding and periodontal attachment loss was calculated. *	16.3% and 8.2% of the subjects had at least one tooth with ≥ 4 and ≥ 5 mm attachment loss, respectively. A significantly higher percentage of subjects of African tribal ethnicity had attachment loss ≥ 4 and ≥ 5 mm compared to Afro-Arab tribes (19.8% vs. 14.7%, $P = 0.02$; and 12% vs. 6.4%, $P = 0.004$, respectively).
Khalifa et al. 2012 (14)	Khartoum State	1888	adults aged ≥ 16	community periodontal index (CPI), and a validated tooth wear index.	In the 35-44 years age group 36.1% had healthy periodontal tissues, 10.9% bleeding, 42.0% calculus, 8.5% 4-5-mm periodontal pockets, 0.7% periodontal pockets of ≥ 6 mm, and 1.8% excluded sextants.

*Using the recommendation of the International Workshop for Classification of Periodontal Diseases and Conditions

Table 2A

Sample characteristics: The sociodemographic characteristics of high school students, Khartoum, Sudan ($n=420$).

Variable	n	%
Age group (in years)		
13-15	192	45.7
16-18	228	54.3
Sex		
Boys	222	52.9
Girls	198	47.1
School type		
Public	237	56.4
Private	183	43.6
Father's education		
No formal education	15	3.6
Elementary education	21	5.0
Secondary education/high school	131	31.2
Bachelor's degree	163	38.8
Post graduate studies	90	21.4
Mother's education*		
No formal education	18	4.1
Elementary education	71	16.2
Secondary education/high school	280	64
Bachelor's degree	51	11.6
Post graduate studies	18	4.1
Self-rated household financial status		
Poor	11	2.6
Average	307	73.1
Wealthy	102	24.3

*Two subjects did not report the mother's level of education.

Table 2B

Sample characteristics: oral hygiene practices and dental visits among high school students, Khartoum, Sudan ($n=420$).

Variable	n	%
Tooth brushing frequency		
irregularly or never	12	2.8
Once a day	256	61.0
≥Twice daily	152	36.2
Mouth cleaning/brushing device used		
Toothbrush	412	98.2
Wooden toothpicks	1	0.2
Dental floss	3	0.7
Miswak	3	0.7
Mouth wash	1	0.2
Type of toothpaste used		
Fluoride-free toothpaste	38	9.0
Fluoride toothpaste	382	91.0
Dental visits frequency (during the past 12 months)		
Never visited or received dental care before	149	35.5
Had not visited the dentist during the past 12 months	130	31.0
Once	69	16.4
Twice	26	6.2
≥3 time Three times	25	5.9
Self-rated oral health		
Poor	65	15.5
Average	7	1.7
Good	160	38.1
Excellent	63	15.0
Do not know	125	29.8

Table 3A

The periodontal health status of Sudanese high schools' participants: The percentage of CPI maximum scores and the mean number of sextants with CPI-scores ($n=420$)

CPI scoring Variables	n	CPI max (%)	Mean no. of sextants
Score 0 (Healthy)	25	6.0%	1.88
Score 1 (Bleeding)	56	13.3%	1.52
Score 2 (Calculus)	334	79.5%	2.58
Score 3 (pocket 4-5 mm)	5	1.2%	0.01

*None of the participants were score 4 (periodontal pocket ≥ 6 mm).

Table 3B

The periodontal health status of Sudanese high schools' participants measured by Community Periodontal Index (CPI) and divided by age group, gender, and school type ($n=420$).

Characteristic	CPI scores*				P-value
	Score 0 n (%)	Score 1 n (%)	Score 2 n (%)	Score 3 n (%)	
Age group					
13-15 years	12 (6.3)	19 (9.9)	159 (82.8)	2 (1.0)	0.292
16-18 years	13 (5.7)	37 (16.2)	175 (76.8)	3 (1.3)	
Sex					
Boys	10 (4.5)	21 (9.5)	186 (83.8)	5 (2.3)	0.006
Girls	15 (7.6)	35 (17.7)	148 (74.7)	0 (0.0)	
School type					
Public	12 (5.1)	29 (12.2)	196 (82.7)	0 (0.0)	0.039
Private	13 (7.1)	27 (14.8)	138 (75.4)	5 (2.7)	

*None of the participants were CPI score 4 (periodontal pocket ≥ 6 mm).

Table 4

Caries experience among study participants described by DT, MT, FT and mean DMFT scores, divided by gender, age and school type ($n=420$).

	Decayed (DT)				Missing (MT)				Filled (FT)				DMFT score			
	n (%)	\bar{x}	SD	P^*	n (%)	\bar{x}	SD	P^*	n (%)	\bar{x}	SD	P^*	n (%)	\bar{x}	SD	P^*
Gender																
Boys	193 (86.9)	2.9	1.9	0.17	24 (10.8)	0.2	0.5	0.93	12 (5.4)	0.1	0.4	0.9	195 (87.8)	3.2	1.9	0.1
Girls	188 (94.9)	3.2	1.6		22 (11.1)	0.2	0.5		11 (5.6)	0.1	0.6		188 (94.9)	3.4	1.7	
Age (years)																
13-15	170 (88.5)	3.2	1.7	0.12	12 (6.2)	0.2	0.3	0.004	9 (4.7)	0.1	0.4	0.5	171 (89.1)	3.0	1.7	0.01
16-18	211 (92.5)	3.2	1.8		34 (14.9)	0.2	0.6		14 (6.1)	0.1	0.6		212 (93.0)	3.5	1.9	
School type																
Public	215 (90.7)	3.3	1.9	0.007	30 (12.7)	0.2	0.6	0.18	9 (3.8)	0.1	0.3	0.08	216 (91.1)	3.5	1.9	0.01
Private	166 (90.7)	2.8	1.6		16 (8.7)	0.1	0.4		14 (7.7)	0.2	0.7		167 (91.3)	3.0	1.6	

Abbreviations: \bar{x} , Mean. SD, standard deviation

* P Significance evaluated by the chi-square test

