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Original Article

Dentistry Section

Prevalence of Dental Caries and Periodontal Diseases among Secondary School Students in Duhok, Kurdistan Region, Iraq

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ABSTRACT

Introduction: A healthy oral cavity is a vital state for a healthy living, which can be influenced by oral cavity diseases such as dental caries and periodontal disease. Dental caries and periodontal disorders are the major oral health problems and indicators of the oral health burden worldwide.

Aim: The study aimed to evaluate the prevalence of dental caries and periodontal diseases among secondary school students and their association with socio-demographic factors in Duhok, Kurdistan Region, Iraq.

Materials and Methods: A cross-sectional study was conducted on a randomly selected sample of 809 high school students (395 females and 414 males) aged 14-20 years from eight secondary schools using multistage random sampling in four quarters of Duhok city from December 2018 to May 2019. The dental caries status was assessed by the Decayed, Missing, and Filled Teeth (DMFT) Index and periodontal status was assessed by using the Gingival Index (GI) and Plaque Index (PI).

Results: The prevalence of dental caries was significantly higher (p=0.002) among males (93.5%) in comparison to females (86.8%). Also, the DMFT ≥5 among males (62.6%) was significantly higher than that (40.8%) among females (p<0.001). No significant association was detected between DMFT ≥5 and the socio-economic status (p=0.090). Likewise, the prevalence of moderate to severe gingivitis was significantly higher among males (63.5%) than females (55.2%) (p=0.016). However, the prevalence of moderate to severe gingivitis was higher among those living in low socio-economic quarters (63%) compared with those living in high socio-economic quarters (56.2%) of Duhok city (p=0.049).

Conclusion: The results of this study provide evidence of a high prevalence of caries and periodontal diseases among secondary school students aged 14-20 years in Duhok city. Mean caries and gingival indices were significantly higher in males in comparison to females.

Keywords: Gingival index, Oral health, Periodontal status

INTRODUCTION

Oral health is an integral part of overall health and has a significant impact on quality of life. Dental caries and periodontal diseases are the major oral health problems and indicators of the oral health burden worldwide. The prevalence and severity of oral diseases varies among various parts of the world and within the same country or region. A large number of epidemiological studies have shown the important role of socio-environmental and behavioural factors in oral disease and health [1-3]. Dental caries is the most common disease worldwide with an increasing prevalence in many low-income and middle-income countries [1]. Dental caries affect 97% of the world population over their lifetime. In total, 59% of children between the ages of 12-19 years would have at least one recorded cavity [2].

Similarly, periodontal diseases, consisting of gingivitis and periodontitis, have major public health importance due to the high prevalence rates and remarkable social impact. Recently, they have been linked to the population's general health [1,3]. Periodontal diseases also have a high prevalence rate and can affect up to 90% of the worldwide population. Numerous studies have shown that gingivitis prevalence increases significantly during puberty. The prevalence of gingivitis figures tends to rise from 50 to 99% during adolescence [3,4]. Adolescence oral health is affected by numerous factors; good oral health is often correlated with broader social and economic indicators [5].

Several epidemiological studies have been conducted in Iraq concerning dental caries [6-9] and periodontal diseases [7,10] in different age groups and different Iraqi cities. However, a previous study on prevalence and risk factors of dental caries using DMFS index was conducted in Zakho province [8], but there are no published epidemiological data on the caries experience and periodontal diseases among adolescent residents in Duhok, Kurdistan Region. Adolescents are targeted for similar studies, largely because this age group is marked by improvements in behaviour, including dietary habits and oral hygiene. The development of healthy habits can, therefore, affect oral health and create lifelong behaviour patterns [11]. The aim of this study was to establish baseline data for intervention program to reduce oral health problems.

MATERIALS AND METHODS

A cross-sectional study of students aged 14-20 years was conducted from December 2018 to May 2019 in Duhok city, Kurdistan Region, Iraq. Upon researcher's communication with the Department of Planning at the Duhok Directorate-General for Health in November 2018, the study population was drawn as follows: Duhok generally consists of two parts. The East is an old town with old buildings and is known to have a relatively low socio-economic standard. The West is a new city with better housing, characterised by higher socio-economic conditions. Accordingly, Duhok was divided into four quarters by the high way and Silave Street. Two were located in the relatively Low Socio-Economics Quarters (SEQs) and two in the High Socio-Economics Quarters (SEQs).

The school lists were prepared according to the information provided by the Directorate of Education. Two schools were randomly chosen from each quarter (one for males and the other for females) to get a sample of eight schools (Eight out of 46 governmental secondary schools). In the second stage, a random selection of three classes (4th, 5th and 6th grades) from each of the selected schools were

taken. The age distributions of students is those grades were 14-15, 16-17 and 18-20 years, respectively.

Sample size calculation: A sample size of 809 students (414 males and 395 females) was selected for the study; estimated from equation $N=(PQZ^2D)/E^2$ where, N=sample size, P=estimated prevalence of 50%, Q=100-P, Z=95% confidence level=1.96, D=design effect=2, E=accepted standard error=0.05 [12]. Sixteen students were excluded from the research as they refused to participate in the study.

Inclusion criteria

- Being healthy.
- Not suffering from systematic diseases.
- Not having a pathologic lesion in the oral cavity other than dental caries and periodontal disease.

Exclusion criteria

- Any drug use, including vitamins (within the last three months).
- Students with an orthodontic appliance.
- Pregnant and lactating women.
- Aged beyond the specified range (below 14 and above 20 years).

Scientific and Ethical approval for the study was granted by the Scientific Committee of College of Dentistry/Duhok University (approval no. 690). Also, clearance from the General Directorate of Education in Duhok was attained before visiting the selected schools by receiving a formal request from the College of Dentistry (approval no. 18064). The school authorities were contacted, and the study purpose was clarified to them. The aim was outlined to all students, and verbal informed consent was obtained from all the students in the presence of headmasters. Participants were notified that they could withdraw from the study at any time.

A pilot survey comprising 100 school students randomly selected from one public secondary school was conducted to assess the validity of the study, limitations in the research tools and protocol, and to identify potential problem areas. The age group, and other recruitment processes were carried out as per the study protocol. The eligibility criterion for the pilot study was that everyone studied at the 4th, 5th, and 6th standard in the selected school, all students were clinically examined and received a questionnaire. All these (100) students were not included in the final sample. They were evaluated for inter-examiner calibration on the same day of assessment and after one week for intra-examiner calibration for the clinical examination of dental caries, dental plaque, and gingival status. The Kappa value was 0.90 for inter-examiner calibration and 0.94 for intra-examiner calibration, reflecting a satisfactory level of accordance with World Health Organisation (WHO) criteria [13].

Questionnaire

A comprehensive literature search was performed depending on the study by Almousawi A et al., [9] with modifications. The development of the questionnaire took place in stages to ensure its validity. The initial draft questionnaire was formulated by researchers and distributed to an expert panel of five senior academic staff of different clinical specialities of the College of Dentistry, to assess the consistency, relevance and usefulness of the items and, as a result, excluded irrelevant, inadequate and inconsistent items to ensure the validity of the questionnaire. Internal consistency was assessed using Cronbach's alpha (0.805) coefficients for reliability testing. In order to determine face validation of the questionnaire, pre-testing during the pilot study was necessary to verify the feasibility and comprehensibility of the questionnaire, which resulted in an appropriate form with minor modifications based on feedback from school students. The time required to complete the survey questionnaire was 15 minutes.

The questionnaire included the following three sections: a section on demographic data (the case number, the date, the quarter, the school's name, age, and gender), another section on the smoking status of cigarette and/or Nargela: never smokers (including former smokers) and current smokers, smokers were assumed to be heavy smokers if they smoked more than 10 cigarettes per day or/and more than two Nargela a week, otherwise they would be considered light/moderate smokers [14]. The third section of the questionnaire included the clinical dental examination.

Clinical Dental Examination

The dental examination was performed by one of the authors (NH) who is a specialist dentist under standardised conditions using a disposable mouth mirror, calibrated periodontal probe, tweezers, tray, masks, and gloves in their schools on a regular classroom chair using daylight.

Dental caries status was reported using the DMFT index. The examination of dental caries was conducted and recorded according to the WHO criteria [13]. The examination was carried out in a systematic approach starting from the last upper right molar proceeding in an orderly manner from one tooth or tooth space till the last lower right molar. Only clinically visible extensive carious surfaces were detected, and this is consistent with the WHO recommendation for the definition of dental decay as "cavities with a softened dentin floor". For the purpose of this study, the students were divided into two groups; the High Caries Group (HCG) comprised students who had (DMFT ≥5), and the Low Caries Group (LCG) comprised students who had (DMFT<5). Adolescents with at least five decayed teeth needing restoration have been classified as active caries according to WHO criteria [13,15].

To determine the periodontal status of the participants in the current study; the following indices were recorded in the subsequent order: PI by Silness J and Loe H [16], and GI by Loe H and Silness J [17]. The examination method involved the assessment of four surfaces (buccal, lingual/palatal, mesial and distal) of six index teeth (18, 23, 26, 38, 43, 46). Dental PI and GI were examined on the basis of an analysis of the four surfaces of the index teeth, to assess the presence or lack of signs of the mentioned indices. The sites were probed with a calibrated periodontal probe, having to wait 10 seconds to confirm the presence/absence of gingival bleeding. The existence of dental plaque was assessed whether it was visualised with the naked eye or there was an accumulation of soft matter within the gingival margin and/or on the tooth and gingival pocket (score 2 and 3 in accordance with PI) and considered to be existing, if the characteristic sign was seen on atleast one site. The gingivitis was assumed to be present when at least one site reported bleeding on examination (scores 2 and 3 for the GI ranking) [18].

STATISTICAL ANALYSIS

Data were analysed using the Statistical Package for Social Sciences (SPSS, version 22). The p-value of ≤0.05 was considered statistically significant. Descriptive statistics were used in the form of mean (standard deviation), frequencies and percentages. The Chi-square test was used to measure the important correlation between socio-economic influences and smoking, on one hand, and oral health indices (caries, DMFT, PI and GI) on the other.

RESULTS

The total number of the studied sample was 809. The mean age±SD was 16.87±1.16 years, ranging from 14 to 20 years. The median was 17 years. [Table/Fig-1] shows that the highest proportion (61.7%) of the sample aged 16-17 years. The table also reveals that 32.9% of the females were aged 18-20 years compared with (21.7%) of the males (p<0.001). The mean age of females (17.1±1.1) was significantly higher than that of males (16.7±1.2) at (p<0.001).

[Table/Fig-2-a,b] reveals that the total caries-free students were (9.8%); while the prevalence of dental caries was 90.2%, which was significantly higher (p=0.002) among males (93.5%) in comparison to females (86.8%).

Age (Years)	Female		Male		Total		p-value†
	n=395	%	n=414	%	N=809	%	
14-15	12	3.0	78	18.8	90	11.1	<0.001
16-17	253	64.1	246	59.4	499	61.7	
18-20	130	32.9	90	21.7	220	27.2	

[Table/Fig-1]: Distribution of demographic characteristics by age and gender.
By Chi-square test. †p≤0.05 (Significant)

Parameters	With caries		Caries-free		Total	
	n	%	n	%	N	p-value†
Gender						
Female	343	86.8	52	13.2	395	0.002
Male	387	93.5	27	6.5	414	
Quarters						
Schools in low SEQs	348	89.5	41	10.5	389	0.48
Schools in high SEQs	382	91.0	38	9.0	420	
Smoking						
Non-smoker	576	91.6	53	8.4	629	0.023
Light-moderate smoker	102	87.9	14	12.1	116	
Heavy smoker	52	81.3	12	18.8	64	
Total	730	90.2	79	9.8	809	

[Table/Fig-2a]: Prevalence of dental caries by gender, socio-economic quarters, and smoking.
SEQs: Socio-economic quarters; By Chi-square test, †p≤0.05 (Significant)

Parameters	DMFT				Total	
	Low (<5)		High (≥5)			
	n	%	n	(%)	N	p-value†
Gender						
Female	234	59.2	161	40.8	395	<0.001
Male	155	37.4	259	62.6	414	
Quarter						
Schools in low SEQs	175	45.0	214	55.0	389	0.090
Schools in high SEQs	214	51.0	206	49.0	420	
Smoking						
Non-smoker	278	44.2	351	55.8	629	<0.001
Light-moderate smoker	69	59.5	47	40.5	116	
Heavy smoker	42	65.6	22	34.4	64	
Total	389	48.1	420	51.9	809	

[Table/Fig-2b]: DMFT score by gender, socio-economic quarters, and smoking.
DMFT Mean (±SD)=4.89 (±3.21); By Chi-square test, †p≤0.05 (Significant); SEQs: Socio-economic quarters

[Table/Fig-2b] also shows that the mean DMFT score was 4.89 (±3.21); DMFT ≥5 among males (62.6%) was significantly higher than that (40.8%) among females (p<0.001). No significant association was detected between the DMFT ≥5 and the SEQs (p=0.090). DMFT ≥5 was significantly (p<0.001) higher among non-smokers (55.8%) than among light-moderate and heavy smokers (37.45%).

No significant (p=0.133) association was detected between gender and PI categories, as presented in [Table/Fig-3]. Considering the socio-economic quarters and the PI outcomes, the table reveals that PI of fair and poor categories among students of the low SEQ schools (73.5% and 7.5%, respectively) were significantly higher compared to that of students from the high SEQ schools (69.3% and 4.5%, respectively) at p=0.018. No significant association was detected between smoking and the PI scores (p=0.178).

It is evident in [Table/Fig-4] that the prevalence of moderate to severe gingivitis was 63.5% among males and 55.2% among females (p=0.016). The prevalence was also higher among those living in low SEQs (63%) compared to those living in high SEQs (56.2%) of Duhok city (p=0.049). No significant association was detected between gingivitis and smoking (p=0.236).

Parameters	Plaque index						Total	p-value†
	Healthy		Fair		Poor			
	n	%	n	%	n	%		
Gender								
Female	91	23.0	274	69.4	30	7.6	395	0.133
Male	93	22.5	303	73.2	18	4.3	414	
Quarter								
Schools in low SEQs	74	19.0	286	73.5	29	7.5	389	0.018
Schools in high SEQs	110	26.2	291	69.3	19	4.5	420	
Smoking								
Non-smoker	147	23.4	450	71.5	32	5.1	629	0.178
Light-moderate smoker	28	24.1	78	67.2	10	8.6	116	
Heavy smoker	9	14.1	49	76.6	6	9.4	64	
Total	184	22.7	577	71.3	48	6	809	

[Table/Fig-3]: The plaque index (PI) and gender, socio-economic quarters, and smoking.
By Chi-square test, †p≤0.05 (Significant); SEQs: Socio-economic quarters

Variable	Gingivitis				Total N	p-value†
	Mild		Moderate/Severe			
	n	%	n	%		
Gender						
Female	177	44.8	218	55.2	395	0.016
Male	151	36.5	263	63.5	414	
Quarter						
Schools in low SEQs	144	37.0	245	63.0	389	0.049
Schools in high SEQs	184	43.8	236	56.2	420	
Smoking						
Non-smoker	259	41.2	370	58.9	629	0.236
Light-moderate smoker	43	37.1	73	62.9	116	
Heavy smoker	26	40.6	38	59.4	64	
Total	328	(40.5)	481	(59.5)	809	

[Table/Fig-4]: Prevalence of gingivitis by gender, SEQs, and smoking.
By Chi-square test, †p≤0.05 (Significant); SEQs: Socio-economic quarters

DISCUSSION

The sample used in this study is thought to be a representative of the population aged 14-20 years in Duhok as almost all such youth of all socio-economic standards attend schools in Duhok. The study was the first epidemiological study conducted among adolescents in Duhok city/Iraq concerning oral health status. The results of this study can be considered as baseline data to compare with other studies in the future and also produces reliable baseline data for the development of national or regional oral health programs. The DMFT index is well-established and the most commonly used. It has been used in dental epidemiology for over 70 years [19]. The WHO recommended its use for oral health surveys [13].

In the present analysis, the DMFT index using the WHO diagnostic criteria was used for two main reasons: firstly; the majority of the methodology for the published literature followed WHO guidelines for the detection of dental caries; and second; is that WHO excluded initial lesions from diagnostic requirements due to concerns about diagnostic reliability, citing attempts to classify initial lesions increases examiner variability, resulting in inaccurate results, therefore the current study adhered to the same approach for comparative purposes across global populations [20].

The prevalence of dental caries in this study was 90.2% with a DMFT score of (4.89±3.214) which is consistent with similar studies implemented in Al-Anbar governorate/Iraq [6]. This result is correspondingly similar to those published in the WHO report in the Eastern Mediterranean region in 2003, in which the region's average DMFT index was 2.0±1.3. Half of the countries had an index of 1.6, with values ranging from 0.4 to 5.9, and the prevalence of dental caries was 60-90% [21]. Other studies in Iraq as presented in [Table/Fig-5] [6-9], by comparison, have reported different caries experience targeting almost the same age group, 86.5% with a mean DMFT=(3.9±3.0) among 15-19-year-old Internally Displaced People (IDPs) students in Duhok [7], 92.5 % with a mean caries index of 7.47 in Zakho city [8], and 72.9% with a mean DMFT=(3.30±SE 0.091) in Kerbala governorate [9].

Variations in oral hygiene measures, dietary patterns and dental health facilities between governorates can be attributed to the disparity in the experience of caries between the current study and other Iraqi studies. Moreover, this research showed a higher prevalence of caries and DMFT scores among adolescents compared to studies from other Eastern Mediterranean region countries [Table/Fig-6] [11,15,22-30]. In Saudi Arabia, 79.7% and DMFT of 4 [22], 75% with DMFT 3.19±2.9 in United Arab Emirates [23], 85% with DMFT of 5.5 (±3.7) in Qatar [24], DMFT of 2.61 (±1.89) in Iran [25], and 53.3% DMFT of 1.95±2.67 in Israel [26]. Comparative analysis of DMFT ≥5 score with data from other countries revealed that in this study, the DMFT ≥5 value was 51.9% with a mean DMFT score of (4.89±3.214) lower than that reported among adolescents in Mexico City 61% with the mean DMFT score (5.96±3.98) [15], which might be a consequence of the limited access to health services.

Furthermore, in comparison with the international studies [Table/Fig-6] [11,15,22-30], the prevalence of caries and the mean DMFT of 4.89 were higher than 1.26 in India and 1.38 in Spain [11,27]. Whereas the DMFT score reported in Chile and Albania is close to that reported in the current study [28,29]. However, the highest prevalence was reported among Romanian adolescents 95.5% with a DMFT index of 3.13 [30]. The widely differing prevalence could be attributed to varying age ranges of participants and gender taken for the study, uniformity of selection of the sample, area selected, and the methodology used for the study. Moreover, the outcome of prevalence data could be affected by socio-economic, cultural, and geographical variables. Notably, gender analysis showed that males had a substantially higher DMFT scores relative to their female counterparts. Similar findings have been reported from other studies [7,22,25,30]. It was reported that girls were more concerned than boys about oral health issues and had better awareness about dietary habits and sugar intake [22,25,29,30]. Conversely, other researchers suggest that females had a considerably higher risk of unfavourable DMFT scores compared to males [6,8,11,24].

In this study, there was no statistically significant difference in DMFT values and socio-economic factors, results were in accordance with those identified in previous studies [8,30]. Another research found a higher prevalence of caries with high monthly income families than those with lower income; the author explained that high monthly income families can afford more sweets and snacks than low income families, which could lead to a high prevalence of caries in this population [25]. Other studies found controversial findings [22,24,26,28]. The proposed direct mechanism was greater access by the rich to sugars, which would increase the prevalence of dental caries among them. However, with industrialisation, sugar consumption has increased for all populations, not just for the rich [8,25]. Smoking and its contribution to dental caries is a controversial topic. The hypothesis that tobacco is a risk factor for dental caries did not obtain sufficient proof. According to the available findings of this study, tobacco smoking has not been reported as being associated with an increased risk of dental caries. This is aligned with a study conducted in Sweden that did not indicate a correlation between tobacco smoking and caries [31]. While findings from other studies suggest a positive association between smoking and dental caries [26].

The overall oral hygiene status as depicted by PI was healthy for 22.7% (PI score 0), and 71.3% had fair oral hygiene, which is higher than reported in Saudi Arabia 58.4% [22], and in Albania 43.9% had PI of 0 score indicating the absence of plaque [29]. Although 72.7% of adolescents in Mexico had poor oral hygiene [15], in Sharjah only

Author/Year [References]	Epidemiologic studies in Iraq	Sample size	Age	% of caries	Mean caries index (mean±SD)
Al-Ani N and El-Samarrai S [6] (2014)	Heet city/Al-Anbar governorate	872	12	90.2	5.85 ±0.168
Selivany BJ et al., [7] (2016)	Internally Displaced People (IDPs), living in camps/Duhok	384	15-19	86.5	3.9±3.0
Kassim HJ et al., [8] (2015)	Zakho city	400	16-18	92.5	7.47±4.52
Almousawi A et al., [9] (2019)	Kerbala governorate	28	18-24	72.9	3.30±0.091
Present study Hamonari et al., (2020)	Duhok city	809	14-20	90.2	4.89±3.214

[Table/Fig-5]: Selected research studies on caries prevalence and DMFT scores for local studies in Iraq [6-9].
SD: Standard deviation

Area	Author/Year [References]	Country	Sample size	Age (in years)	% of caries	Mean caries index (mean±SD)
Eastern Mediterranean region countries	Bahannan SA et al., [22] (2018)	Saudi Arabia	734	14-19	79.7	4
	Khadri FA et al., [23] (2018)	United Arab Emirates (UAE)	803	11-17	75	3.19±2.9
	Al-Darwish M et al., [24] (2014)	Qatar	2113	12-14	85	5.5 (±3.7)
	Pakpour AH et al., [25] (2011)	Iran	380	14-18	2 (moderate prevalence)	2. 61±1.89
	Yavnai N et al., [26] (2020)	Israel	702	18	53.3	1.95±2.67
Countries from different regions of the world	Goel R et al., [11] (2014)	India	2010	12-15	46.5	1.26±1.74
	González-Aragón Pineda AE et at., [15] (2020)	Mexico	421	12-14	61.1 (DMFT≥5)	5.96 ±3.98
	Obregón-Rodríguez N et al., [27] (2019)	Spain	1843	12-15	51.7	1.38
	Giacaman RA et al., [28] (2018)	Chile	1038	12-15	68	4.81
	Laganà G et al., [29] (2015)	Albania	1200	16-19	50	4.9
	Tudoroniu C et al., [30] (2020)	Romania	650	10-19	95.5	3.13±2.0

[Table/Fig-6]: Selected research on prevalence of caries and DMFT for different countries [11,15,22-30].
SD: Standard deviation

5% of 11-17-year-old had a ranking of 0 (healthy gums) [23]. The results also showed that PI ratings of poor category among students of low SEQs were significantly higher than those with high SEQs. This suggests that oral hygiene was better when SES was high, as previously reported by Hanoush S and Helail B [10]. As for smoking, the oral hygiene status in both groups was nearly equivalent, while smokers had slightly higher scores that were not significant, in line with Rösing CK et al., who identified signs of poorer oral hygiene in smokers compared to non-smokers [14].

The results of this study show that moderate and severe gingivitis was present among 59.5% of the studied students. Studies conducted in France and Israel yielded nearly the same results in this age group: 54.0% and 60.0% of the 15-19-year-old population had gingival bleeding, respectively [3]. Similar findings have been obtained in a recent study performed by Singh O et al., reported that 55.4% of students aged 11-14 years had moderate and severe gingivitis [5]. Results from other countries showed that 81.0% of Armenians and 72.0% of Croatians aged 15-19 years exhibited gum bleeding, whereas 44.0% of Albanians aged 16-19 years experienced such signs [3,29]. Several factors may be due to the difference in prevalence among these studies. Firstly, the different criteria used in various studies may be atleast partly the explanation for the discrepancy observed. The most commonly adopted index to calculate gingivitis is GI. However, the prevalence of this disease may be overestimated because it measures various forms of gingival inflammation, but it is known to be a basic index for gingivitis. Secondly, variations in gingivitis prevalence may be observed using various methodologies, the designs of the study; study populations sample sizes were different, as well as all studies were conducted in different years.

The study showed that a significant relationship exists between gingivitis severity and gender. Males were more likely than females to have moderate/severe gingivitis, the findings being consistent with those observed in previous research [4,7,10,18,29]. Another study suggests that females have optimal periodontal conditions because they are more concerned with aesthetics and appearance, thereby accessing health services frequently [22]. The study found that moderate/sever gingivitis was more prevalent among students in schools from lower SEQs in comparison to mild gingivitis, which was more prevalent among student in schools of high SEQs. This is in line with other studies [3,10,18]. This probably is due to superior oral cleanliness, more dental awareness, and better access to available health care among higher social groups.

Due to nicotine-induced vasoconstriction in smoker's gingiva and heavy gingival keratinisation, gingival bleeding has been reported to occur less in smokers [14]. In relation to tobacco smoking, no significant association was detected between gingivitis and tobacco smoking. This could be explained by biases in reporting smoking status since self-reporting was used to assign smoking status, as well as pointing to the relatively short period of potential exposure to smoking because of the young age of the participants. The strengths of the study included its study population, which is highly representative of the general population within that age group.

Limitation(s)

The study has limitations, including the nature of the cross-sectional design that limits constructing valid causal relationships between the observed associations. Along with the prevalence of dental caries and periodontal diseases, risk factors for dental caries, periodontal diseases, and oral hygiene behaviours should be evaluated.

CONCLUSION(S)

The prevalence of caries and gingivitis was high among males and students living in relatively low socio-economic areas. Results revealed that smoking was not associated with an increased risk of plaque and gingivitis. Furthermore, the results of this study emphasise that preventive and therapeutic measures should be considered among the surveyed adolescents, as part of the community-based preventive and therapeutic oral health programs.

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