Original Article

Oral Health Indices among Secondary School Students in Assiut Governorate, Upper Egypt

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Abstract

Background & Objective(s): There is limited published data on Egyptian oral epidemiologic health status especially among adolescents. This study aimed to evaluate oral health status and their associated variables among secondary school students in Assiut Governorate; Upper Egypt.
Methods: : A cross sectional study was conducted on 872 students using a representative sample from public, private and technical secondary schools. Data were collected using a self-administered questionnaire including inquires about sociodemographic data, oral health behaviors and self-perception of oral health. Oral health was assessed by Decayed Missing Filled Teeth index (DMFT), Simplified Oral Hygiene Index (OHI-S), and Basic Periodontal Examination index (BPE).
Results: Prevalence of oral health diseases was as follow; dental caries was 47.5%, gingivitis was 31%, while periodontitis was 15.7%. About 80% of the students owned a toothbrush; however 25% of them never perform teeth brushing. Unfavorable OHI-S score was significantly positively correlated with worse DMFT and BPE scores. Concurrently, BPE index was significantly positively correlated with DMFT index. Females had higher risk for unfavorable DMFT scores compared to males. Increased age, female gender, enrollment in technical schools, and bad/ unknown self-perception of oral health were significant predictors of worse periodontal scores. The significant predictors of worse oral hygienic scores were increased age, enrollment in technical schools, and bad/ unknown self-perception of oral health.
Conclusion: Considerable proportions of students suffered from oral health disorders. Unfavorable oral health indices were related to female gender, technical school enrollment, increasing age and bad/unknown self-perception of oral health. Oral health indices are compatible with each other; where healthier oral hygiene condition is correlated with better dental and periodontal oral health statuses. Superior periodontal status is correlated with favorable dental condition.

Keywords: Oral health, Secondary school students, Egypt.

INTRODUCTION

Oral health is a basic indicator of general health, wellbeing and quality of life.[1] It is defined as a state of being free from oral and para oral pain, oral diseases and disorders that limit an individual's capacity in biting, chewing, smiling, speaking and psychosocial well-being.[2] Although dental caries and periodontal diseases are largely preventable or can be treated in their early stages, they are included among the main seven oral disorders responsible for most of the oral disease burden.[1] Oral hygiene refers to the practice of keeping the mouth, teeth, and associated periodontal tissue clean and healthy[3] Oral hygiene in addition to other factors as, socioeconomic condition, education, self-interest in preserving good oral health, nutrition and availability of skilled oral health services, are direct contributors of optimum oral health.[4] Decayed/Missing/Filled Teeth (DMFT), Simplified Oral Hygiene (OHI-S) and Basic Periodontal Examination (BPE) are standard indices used for the assessment of different aspects of oral health. DMFT is a simple and widely used index in epidemiologic surveys of dental decays. It evaluates dental health condition based on the

number of carious, missing and filled teeth[5], while, OHI-S offers rapid method for assessment of oral cleanness of the population. It has two components debris index and calculus index and scored on six tooth surfaces; four posterior and two anterior.[6]

As the detection and diagnosis of periodontal diseases is a fundamental component of oral health care, assessment of periodontal tissue is recommended to be part of routine oral examination.[7] The BPE is considered a simple, rapid and effective method that provides an overview on the periodontal status. The mouth is divided into six sextants and the worst score in each sextant is recorded.[8] The British society of periodontology recommended using BPE for only screening and not for diagnosis. Its value is to indicate the level of additional needed examination and offers basic guidance on the required treatment.[9]

Dental caries is the most common chronic disease among youth. Monitoring prevalence of caries is key to preventing and controlling oral diseases. Variable prevalence rates of dental caries were reported. The prevalence of dental caries was shown to be 53.8% among American youth aged 12–19 was [10], 78.3% among Lithuanians adolescents [11], 78.9% among Saudi secondary school students[12] and 15.4% among Nigerian secondary school students.[13]

Published epidemiological data on Egyptian adolescents' oral heath are limited especially in upper Egypt. Results of a study used convenient sample of 967 adolescents from two secondary schools in Cairo, reported the prevalence of dental caries with enamel lesion was 51.4% [14]. The objectives of the present study were assessment of oral health status using DMFT, OHI-S, and BPE indices among secondary school students in Assiut city; Upper Egypt, portraying students' oral health behaviors as well as exploring the association of measured oral health indices with personal characteristics and oral health behaviors.

METHODS

A cross sectional study was conducted during the academic year 2017-2018 among 872 secondary school students in Assiut city; capital city of Assiut Governorate. Assiut city is the largest settlements of Upper Egypt. It is lies on the west bank of the Nile River, about 375 kilometers south of Cairo.

Sample size was estimated using the EPI info statistical package Version 7. The parameters used to estimate the minimum required sample size included; a proportion of dental caries (51.4%)[14], 95% confidence level, 5% margin of error, and taking in consideration design effect 2. The estimated sample size was 768 students. After adding 13.5% as nonresponse rate (based on pilot study results), it was raised up to 872 students.

The secondary education in Egypt includes two main subcategories; general secondary education (either private or public schools) and vocational (technical) education e.g.

industrial, commercial or agricultural.[15] Multistage sampling procedure was applied for recruitment of the studied population. First stage was proportionate random sample to choose the proportion of public, private and technical school categories in the studied sample, second stage was random selection of schools and classes within each category, and then voluntary recruitment was done for all students in the selected classes who attended school on the survey day.

Administrative approvals to conduct the study were obtained from the Central Agency for Public Mobilization and Statistics (CAPMAS) and Egyptian Ministry of Education. Before data collection, ethical clearance for the study was obtained from Assiut Medical Ethical committee, Faculty of Medicine- Assiut University. The study conformed to the international guidelines of research ethics and that of declaration of Helsinki. The researchers ensured the ethical considerations in the study by explaining the aim of the study to participants before filling the questionnaire, obtaining written informed consent from students who welcomed to participate in the study and their guardians and ensuring confidentiality of the studied subjects by removing students' names from data entry file.

Fieldwork took place during the period from October 2017 to January 2018. Data was collected from students by two main tools.

First tool was a self-administered semi-structured questionnaire in Arabic language. The questionnaire included two main sections. First section included socio-demographic variables such as age, gender, residence, school type, and parents' education and occupation. Second section included personal behaviors such as daily sweet/ snack consumption, drinking carbonated soft drinks, having tooth brush, daily frequency of tooth brushing, duration of brushing and using dental floss and miswak. Also, the second section inquired about self-perception of oral health (teeth and gum heath).[16]

Second tool was oral health examination for all study participants. All examinations were performed by a highly skilled dentist (the dentist researcher) under artificial light and assisted by a health insurance nurse in the school. All teeth present in the mouth were examined for absence or presence of dental caries using disposable dental mirror and explorer no 17. Also, evaluation of the periodontal condition (healthy, diagnosed as gingivitis or diagnosed as periodontitis) was done with a specially designed, color coded, calibrated periodontal probe.

Students' oral health status was evaluated using three standard indices: Decayed Missing Filled Teeth index, Simplified Oral Hygiene index, and Basic Periodontal Examination.[5, 6, 9]

Prior to data collection, a pilot study was conducted on 30 students from 3 schools (not the selected studied schools). These students were not added to final studied sample and no modifications were needed for the used questionnaire. To ensure quality of collected data, the researchers existed in the classes during process of data

collection, explained to the studied students in details how to mark their responses in questionnaire, clarified any misunderstood points for students, reviewed all filled questionnaires and asked the students to complete their missed data.

Data analysis was undertaken using SPSS version 16. Categorical data were presented in form of frequencies and percentages while mean and standard deviation/ standard error of mean were used to express numerical data. After testing data normality, non-parametric tests were performed. Mann Whitney and Kruskal–Wallis tests were applied when appropriate. Spearman's correlation was used to explore the correlation between two skewed variables. To identify predictors for oral health indices, three multi variable linear regression models were used. The level of significance was considered at P value < 0.05.

RESULTS

The total number of the students was 872. Concerning students' sociodemographic characteristics, their ages ranged from 14 to 22 years with a mean of 16.04 ± 0.986. Females represented 50.5% of the studied students. Nearly half of the students (51.8%) were from technical schools, while the private schools constituted 19.6%. The majority of the students (72.7%) were urban residents. Concerning

father education, 45.5% of their fathers had university education or more, 33.8% had secondary or upper intermediate education and 9.4% had basic education. Illiterate fathers and those who only read and write constituted 11.4%. Regarding father occupation, 33.1% of the fathers were professionals, 28.8% were employees, 23.2% were skilled /unskilled workers, 5.3% had free business and 9.5% who do not work. Concerning mother education, 38.5% had university education or more, 37.3% had secondary or upper intermediate education and 9.7% had basic education. Illiterate mothers and those who only read and write represented 14.4%. Housewives formed 62.3% of students' mothers, professionals were 20.6%, employees were 13.5%, and skilled /unskilled workers were 3.5%. Oral health behaviors of the studied students are displayed in Table (1). Nearly 80% of the students reported that they had their own toothbrush. Only 25.6% of the students brushed their teeth two or more times per day and with 41% brush teeth in two minutes' duration. Regarding other methods of teeth cleaning, 10.6% and 23.3% of the students used dental floss and miswak respectively. About half of the students (49.2%) were consuming snacks or sweets once or more daily, while the majority (83.5%) reported consumption of carbonated soft drinks. Overall, 59.3% of the students perceived their oral health as good or very good.

Table 1: Oral health behaviors and self-perception of oral health among studied secondary school students in Assiut, 2018

| Oral health behaviors/self-perception of oral health	Secondary school students (n= 872) n (%)
Having own toothbrush	
Yes	696 (79.8)
No	176 (20.2)
Frequency of teeth brushing	
Less than once per day	139 (15.9)
Once per day	299 (34.3)
Twice or more per day	223 (25.6)
I never brush my teeth	211 (24.2)
Brushing duration	
1 minute	171 (25.9)
2 minutes	271 (41.0)
More than 3 minutes	219 (33.1)
Dental floss use	
Yes	92 (10.6)
No	780 (89.4)
Miswak use	
Yes	203 (23.3)
No	669 (76.7)
Frequency of daily sweet/ snack consumption	
Never	10 (1.1)
Sometimes	433 (49.7)
Once or twice per day	279 (32.0)
More than twice per day	150 (17.2)
Whether usually drinking carbonated soft drinks	
Yes	728 (83.5)
No	144 (16.5)
Self-perception of oral health	
Very good	118 (13.5)
Good	399 (45.8)
Bad	126 (14.4)
Don't know	229 (26.3)
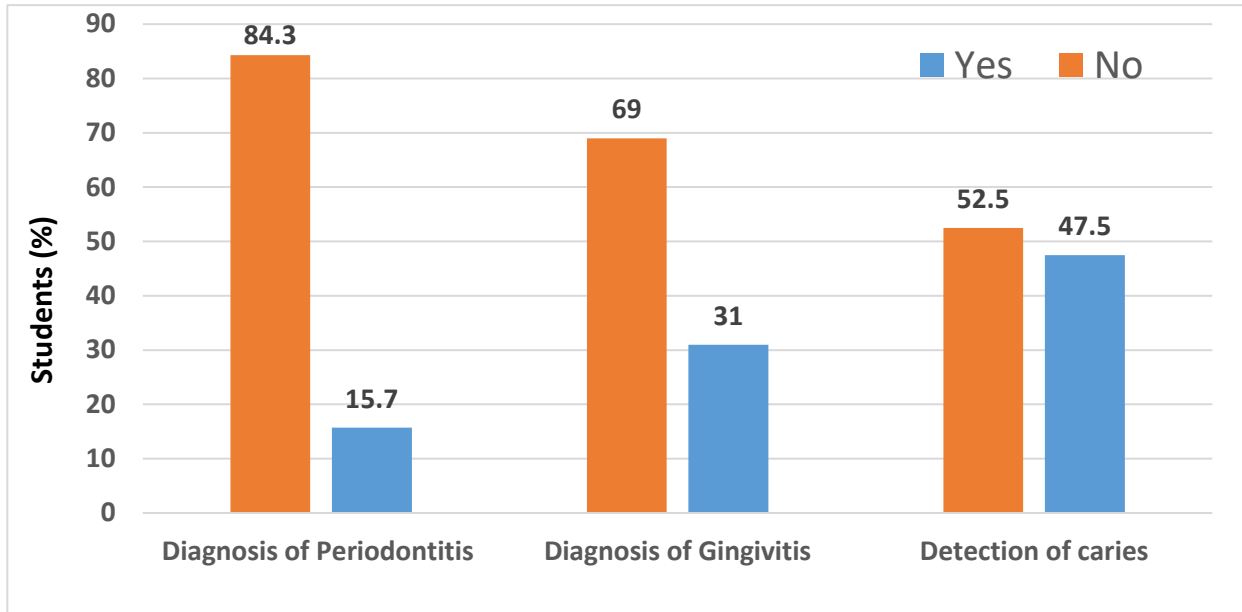
Figure 1: Oral health parameters among studied secondary school students in Assiut, 2018

Table 2 reported mean values of assessed oral health indices among studied students, where mean of DMFT index was 1.73 ± 0.08, while that of BPE was 0.68 ± 0.016 and OHI-S index was 1.53 ± 0.02. The prevalence of periodontitis, gingivitis and caries among the studied students were 15.7%, 31% and 47.5% respectively as illustrated in Figure 1.

Table 2: Oral health indices among studied secondary school students in Assiut city, 2018

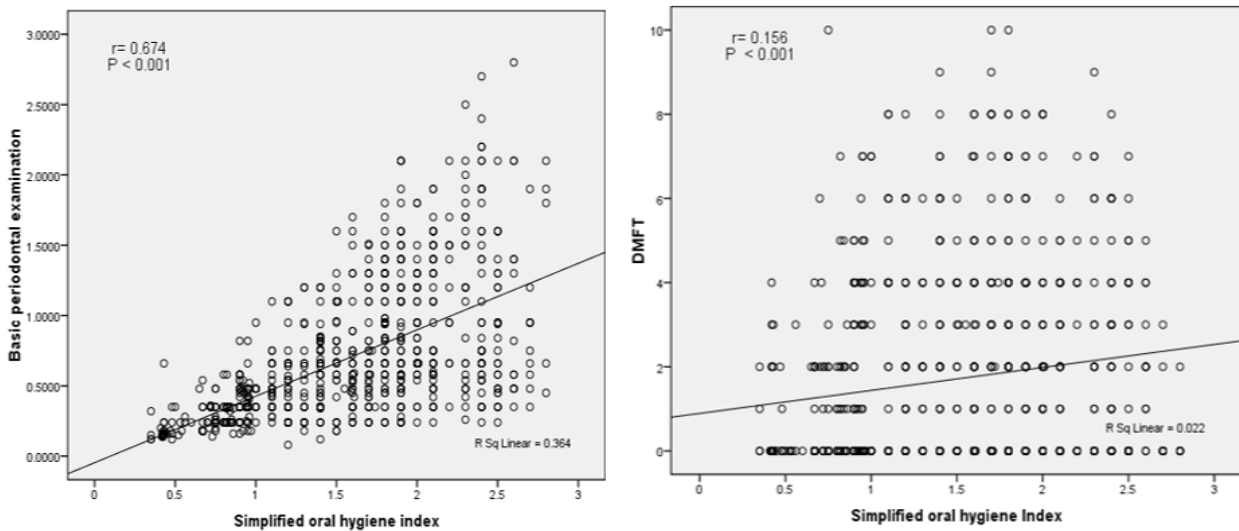| Oral health indices	Mean ± SE (Range)
Decayed/Missing/Filled Teeth (DMFT)	1.73 ± 0.08 (0 – 10)
Basic periodontal examination (BPE)	0.68 ± 0.016 (0.08 -2.80)
Simplified oral hygiene index (OHI-S)	1.53 ± 0.02 (0 -3)

Figure 2: Correlation of OHI-S with BPE and DMFT among studied secondary school students in Assiut, 2018

Table 3 showed correlates of examined oral health indices among secondary school students. Female students had significantly higher mean value of DMFT compared to male students. However, females had significantly better oral hygiene status compared to males. No significant relation was detected between gender and BPE (p= 0.272). Rural residents had significantly worse periodontal and oral hygiene conditions compared to urban residents. DMFT index was not significantly associated with students' residence (p= 0.098). Technical schools' students had significantly unfavorable DMFT, BPE, and OHI-S scores in comparison to students of private and public school ($p \leq 0.001$). Students whose parents attained university/ post university education and those with professional parents' occupation had the best periodontal and oral hygiene statuses ($p < 0.001$). Similarly, significantly lower mean values of DMFT were observed among students whose mothers received university/ post university education and those with skilled/ unskilled mothers' occupations. DMFT was not significantly related to either students' father education or occupation. (p= 0.093, 0.078 respectively). Students who perceived their oral health as bad had significantly the worst oral health indices; DMFT, BPE and OHI-S ($p < 0.001$). Students who reported brushing their teeth had significantly better oral hygiene than those who were not brushing their teeth ($p < 0.001$). However, no significant relations were observed between teeth brushing and DMFT or BPE indices. Students who never or sometimes consumed sweet/snacks had significantly worse periodontal and oral hygiene conditions compared to those who consumed them once or more per day. Consumption of carbonated soft drinks was not significantly associated with DMFT, BPE or OHI-S index ($p > 0.05$). Table 4 described the predictors of assessed oral health indices among studied secondary school students. Females had significantly higher risk of increased DMFT index compared to males (p= 0.004). Increasing age, being female, enrollment in technical education and bad or unknown self- perception of oral health significantly predict worse periodontal health scores ($p < 0.05$). Technical school students, those with bad/unknown self-perception of oral health and higher age were significantly at higher risk for unfavorable simplified oral hygiene index scores. Figures 2 and 3 showed the correlation between different measured oral health indices; BPE, DMFT and OHI-S. Significant positive correlations were detected between simplified oral hygiene index on one hand and DMFT and basic periodontal examination indices on the other hand ($p < 0.001$) (Figure 2). Also, basic periodontal examination was significantly positively correlated with DMFT ($p < 0.001$) (Figure 3). Significant positive correlations were detected between age on one hand and DMFT (r= 0.081, $p < 0.001$), BPE (r= 0.140, $p < 0.001$) and OHI-S (r =0.161, $p < 0.001$) on the other hand.

Table 3: Correlates of oral health indices among studied secondary school students in Assiut, 2018

Variable	DMFT Mean± SEM	p	BPE Mean± SEM	p	OHI-S Mean± SEM	p
Gender						
Male	1.37 ± 0.10	<0.001	0.66 ± 0.02	0.272	1.57 ± 0.03	0.026
Female	2.08 ± 0.11		0.69 ± 0.03		1.48 ± 0.03	
Residence						
Urban	1.67 ± 0.09	0.098	0.62 ± 0.02	< 0.001	1.44 ± 0.02	< 0.001
Rural	1.87 ± 0.14		0.82 ± 0.03		1.77 ± 0.04	
School type						
Private	1.68 ± 0.17	0.001	0.59 ± 0.04	< 0.001	1.19 ± 0.04	< 0.001
Public	1.34 ± 0.13		0.55 ± 0.03		1.40 ± 0.04	
Technical	1.96 ± 0.11		0.78 ± 0.02		1.72 ± 0.03	
Father education						
Illiterate/ read and write	1.82 ± 0.23		0.81 ± 0.05		1.71 ± 0.06	
Primary/ preparatory education	1.85 ± 0.24	0.093	0.81 ± 0.06	< 0.001	1.68 ± 0.06	< 0.001
Secondary/ upper intermediate education	1.94 ± 0.14		0.74 ± 0.03		1.70 ± 0.03	
University/ post university	1.52 ± 0.11		0.56 ± 0.02		1.32 ± 0.03	
Father occupation						
Professional	1.48 ± 0.12		0.56 ± 0.02		1.33 ± 0.03	
Employee/ Free business	1.73 ± 0.13	0.078	0.70 ± 0.03	< 0.001	1.56 ± 0.04	< 0.001
Skilled worker/ Non-skilled worker	2.01 ± 0.17		0.77 ± 0.04		1.70 ± 0.04	
Doesn't work	1.84 ± 0.26		0.77 ± 0.06		1.65 ± 0.07	
Mother education		0.007		< 0.001		< 0.001
Illiterate/ Read and write	1.77 ± 0.18		0.86 ± 0.05		1.73 ± 0.05	
Primary / Preparatory education	2.38 ± 0.28		0.78 ± 0.06		1.68 ± 0.06	
Secondary/ upper intermediate education	1.86 ± 0.14		0.69 ± 0.03		1.62 ± 0.03	
University/ post university	1.41 ± 0.11		0.56 ± 0.02		1.32 ± 0.03	

Table 3: Correlates of oral health indices among studied secondary school students in Assiut, 2018 (cont.)

|						
Mother occupation						
Professional	1.40 ± 0.15		0.53 ± 0.03		1.29 ± 0.05	
Employee	1.62 ± 0.19	0.010	0.66 ± 0.04	< 0.001	1.51 ± 0.06	< 0.001
Skilled / Non-skilled worker	1.16 ± 0.46		0.62 ± 0.10		1.41 ± 0.12	
Doesn't work/ housewife	1.89 ± 0.10		0.73 ± 0.02		1.61 ± 0.03	
Self-perception of oral health						
Very good	1.16 ± 0.17		0.57 ± 0.04		1.34 ± 0.06	
Good	1.56 ± 0.11	< 0.001	0.62 ± 0.02	< 0.001	1.48 ± 0.03	< 0.001
Bad	2.32 ± 0.22		0.82 ± 0.04		1.73 ± 0.05	
I don't know	1.98 ± 0.16		0.75 ± 0.03		1.58 ± 0.04	
Teeth brushing						
brush my teeth	1.74 ± 0.09	0.635	0.65 ± 0.02	0.052	1.46 ± 0.02	< 0.001
I never brush my teeth	1.69 ± 0.16		0.74 ± 0.03		1.72 ± 0.04	
Frequency of snacks/sweets consumption		0.500		0.003		0.010
Never/ Sometimes	1.70 ± 0.11		0.72 ± 0.02		1.58 ± 0.03	
Once or Twice or more per day	1.76 ± 0.11		0.62 ± 0.02		1.47 ± 0.03	
Whether usually drinking carbonated soft drinks		0.327		0.352		0.495
Yes	1.70 ± 0.08		0.68 ± 0.02		1.53 ± 0.02	
No	1.86 ± 0.19		0.66 ± 0.04		1.49 ± 0.05	
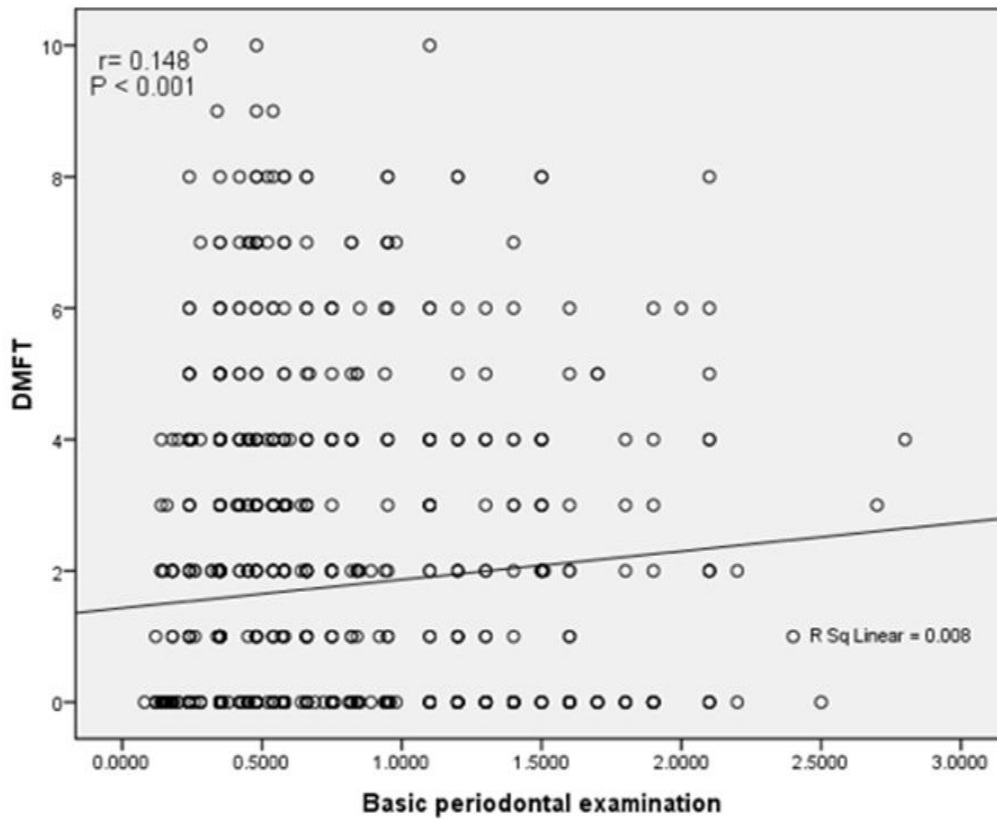
Figure 3: Correlation between BPE and DMFT among studied secondary school students in Assiut, 2018

Table 4: Predictors of oral health indices among studied secondary school students in Assiut, 2018

	DMFT		BPE		OHI-S	
	β	*p*	β	*p*	β	*p*
	R square= 0.061 F=1.837		R square= 0.161 F=5.375		R square= 0.173 F=5.856	
Age in years	0.062	0.604	0.092	< 0.001	0.086	0.004
Gender (female)	0.759	0.004	0.201	< 0.001	0.043	0.520
School type (technical)	0.413	0.294	0.173	0.034	0.259	0.010
Residence (rural)	- 0.068	0.824	0.073	0.244	0.085	0.268
Father education (less than university)	- 0.659	0.139	- 0.084	0.363	0.085	0.451
Father occupation (non-professional)	0.028	0.938	- 0.060	0.413	- 0.120	0.183
Mother education (less than university)	0.491	0.268	-0 .008	0.930	0.031	0.781
Mother occupation (non-professional)	0.143	0.260	0.019	0.458	- 0.015	0.631
Snacks/sweets consumption (ever)	- 0.145	0.646	- 0.028	0.669	- 0.014	0.861
drinking carbonated soft drinks (yes)	- 0.300	0.766	0.334	0.108	-0.071	0.781
Teeth brushing (never)	0.015	0.955	- 0.029	0.603	0.066	0.335
Self-perception of oral health (bad/don't know)	0.323	0.191	0.161	0.002	0.190	0.003

Adjusted linear regression models
Reference groups school (private and public schools), gender (male), residence (urban), father education (university or more), father occupation (professional), mother education (university or more), mother occupation (professional), Snacks/sweets consumption (never), drinking carbonated soft drinks (No)

DISCUSSION

At present, few studies have been carried out on the prevalence of dental disease and its associated risk factors, making it difficult to create a detailed dental epidemiological picture in Egypt.[14, 17] The present study aimed to provide an overview on oral health status of secondary school students to partly fill the present gap of knowledge. In the present study, the prevalence of dental caries among studied secondary school students was 47.5 %. Nearly similar proportion of dental caries with enamel lesion (51.4%) was detected among secondary school students in Cairo[14] and higher proportion (62.8%) was observed among preparatory school students in Menoufia governorate located in Lower Egypt.[17] Student diagnosed with dental caries represented about 79% of Saudi public secondary school students [18]. The prevalence of dental caries among 18-year-old adolescents in 10 Lithuanian countries was 78.3%.[11]

Adolescents are affected by variable periodontal ailments and conditions. Gingivitis is common, particularly around puberty.[19] In the present study, Gingivitis was present among 31% of the studied students, which is lower than that reported in other studies capturing students of the same age group. Gingivitis was detected among 58.3% of Jordanian public school students.[20] Also, 79% of Brazilian school students had slight gingival inflammation and gingival bleeding.[21] The Greece national Oral survey reported that 72.8% of adolescents had gingivitis.[22]

The prevalence of periodontitis varies in different regions of the world based on the used definition and the studied subjects.[23] The prevalence of periodontitis in the current study was 15.7%. About 89% of Iranian high-school students aged 15-19 years had less than perfect

periodontal health.[24] Among 18-year-old Lithuanian school students, 77.1% exhibited gum bleeding on probing and had supra gingival and/ or sub gingival calculus.[25] The prevalence of aggressive periodontitis among Indian adolescents aged 15-18 years was 0.36% while chronic periodontitis was 1.5%.[23] Less than ten percent of young populations in Latin America are affected by periodontitis.[26]

Flossing once a day and teeth brushing twice daily are essential behaviors to help in preventing the risk of all oral infections.[27] Although flossing was reported to be associated with a lower prevalence of periodontitis [28], only 10.6% of the studied students reported using floss and a lower percent (5.9%) was reported among Saudi students [18], while higher percent was detected among Iranian high school students (37.3%).[24]

Eighty percent of the students in the current study have an own toothbrush. Unfortunately, one quarter of them reported performing teeth brushing at least twice per day as recommended.[27] Similarly, about 20% of Iranian high school students reported brushing their tooth 2 times or more per day [24]. However, higher proportions were detected among school students in Jordan[29] and much higher proportion were reported by either male (73%) or female (89%) adolescents aged 15 years in England, Wales and Northern Ireland.[30]

About three quarters of students owned a teeth brush reported performing this in 2 minutes or more as recommended[31], variability in proportion was observed in other studies either lower percent (57.4%) was detected among Malaysian secondary school students[32] or higher proportion (87.2%) was observed among school children in India.[33] In the current study, increased age was a significant predictor for periodontal and oral hygienic

conditions. It was consistent with results of adult dental health survey in United Kingdom. It showed decline in oral health with age, where the prevalence of inflammatory periodontal disease tends to increase with age.[34] Similarly, the youngest Saudi adolescents < 16 years were more likely to have healthy gingiva in contrast to older age category.[18]

In the present study, female gender had significantly higher risk for worse BPE scores ($p < 0.001$). Variation in the reported sex dominance for periodontal diseases was observed. Periodontal disorders were more prevalent among female high school students in Iran[24], while among Lithuanian adolescents, males had higher susceptibility for periodontal diseases.[25] In the current study, females had significantly higher risk for unfavorable DMFT scores compared to males. In agreement with Lithuanian adolescents, higher mean values of DMFT were observed for girls compared to boys.[11] This could be explained by earlier eruption of teeth in girls, resulted in longer exposure of their teeth to the cariogenic oral environment, and easier accessibility of girls to food supplies and frequent snacking during food preparation. Moreover, the biochemical composition of saliva and overall saliva rate are modified by hormonal fluctuations during puberty, and menstruation, making the girls oral environments is significantly more susceptible for cariogenic status compared to that of males.[35]

In the present study, residence was not significant predictor for any of measured oral health indices. In the same line, residence has no significant effect on periodontal status among Lithuanian adolescent aged 18 years[25] or oral hygiene index among 15-year-old adolescents in central Chile.[36] Residence has significant impact on DMFT among Spanish school students, where rural residents had higher caries prevalence compared to urban residents[37] while, the opposite was observed among Tibetan high school students as the students in urban areas had the higher DMFT scores.[38] Education in Egypt is strongly associated with social status. The differences in the likelihood of joining different secondary education tracks are strongly affected by socioeconomic background. The probability of joining the general secondary education instead of vocational/ technical education is consistently goes up with wealth.[15] The effect of social class disparities on oral health condition was detected in this study. Technical school students had higher probability to the worst scores of BPE and OHI-S indices. In agreement, other studies showed better oral health conditions with higher social level.[22, 39]

A logic observation in this study is students who perceived their oral health as bad had significantly worse periodontal and oral hygiene scores. In accordance, self-perception of poor/ fair oral health status was significantly associated with worse examined dental parameters and need for dental treatment among Brazilian adolescents aged 15 to 19 years.[40] European Federation of Periodontology reported that both periodontal diseases and dental caries have shared the same risk factors, social determinants and similar preventive approaches. Oral hygiene practices are effective to prevent both of them.[41] In the current study, there was significant correlation between measured oral health indices assessed tooth, periodontal and oral hygiene conditions, where BPE index was significantly correlated with DMFT index. Concurrently, OHI- S index was significantly correlated with DMFT and BPE indices. Similarly, significant correlation was detected between DMFT and OHI-S indices measured among children aged 10-15 years in Republic of Kosovo.[42] Nigerian male adults with poorer oral hygiene significantly exhibited poorer periodontal status and severe tooth wear lesions.[43]. Among Saudi school children, OHI-S index was significantly associated with DMFT index and periodontal condition.[18]

Strengths and limitations

The strengths of the study include that the results were extracted from highly representative sample of secondary school students. Furthermore, secondary school students have permanent dentition. However, the study has limitations, including nature of cross-sectional design, that limit constructing valid causal relationships between the observed associations.

CONCLUSION AND RECOMMENDATIONS

Considerable proportions of secondary school students suffered from oral health disorders. Unfavorable oral health indices were related to female gender, technical school enrollment, increasing age and self-perception of poor oral health. Oral health indices were correlated with each other; where healthier oral hygiene conditions are correlated with better dental and periodontal oral statuses. Superior periodontal status is correlated with favorable dental condition. In the Egyptian health insurance of school students, dental screening is a basic component of screening program for students at their entrance to secondary educational level as it provides care for the needed cases. There should be an emphasis on providing qualified oral health services for both sexes with priority for technical schools' students because of their vulnerability for oral health disorders.

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