CROSS-SECTIONAL STUDY

Prevalence and Severity of Gingivitis in High School Students in Gaza Strip - Palestine: Cross-sectional Study

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Abstract

Background: There are limited data about the epidemiology of gingivitis in Gaza Strip, Palestine. The aim of the current study was to determine the prevalence and severity of gingivitis among high school students in Gaza strip.

Methods: Cross-sectional study was conducted. A total of 408 students from both genders aged between 15-19 years old were selected from different areas of Gaza Strip by multistage sampling method (simple random for selecting the school, and stratified random sampling for student selection). Data of study were obtained through (periodontal examination kit and questionnaire). The data were collected in question-naire filled by self-administration that consist of three sections; personal data, student general health conditions and oral hygiene practices. Before data collection, permission was obtained from the Ministry of Education. The schools were informed about the purpose of the study and its goal. The written informed consent from the student himself were obtained.

Result: Average age of sample units was (16.92 ± 0.78) years old. The percentage of males was 42.9%. According to the governorate distribution of the sample, 18.4% of them were from North Gaza, 38% were from Gaza City, while 15.4% were from Middle Camps, 18.3% from Khanyounes, and 9.8% from Rafah. The main findings of the current study revealed the prevalence rate of gingivitis among high school students was 97.1%. According to gingival index (GI), the average of GI was (1.5±0.80), where 28.5% of gingivitis cases were mild cases, while 44.5% of them were moderate, and 27% were of severe gingivitis. There was no significant difference in the average of gingival index according to gender (t=1.35, P=0.178), where the average of GI among males was (1.6+0.8), while that of females was (1.5+0.18). According to sociodemographic factors, there were no differences in averages of GI except for governorates (F=3.7, P=0.05), and for Paternal educational level (F=3.1,P=0.027), where the highest average of GI was that of those live in Gaza city (1.63+ 0.77), and North Gaza (1.63+ 0.82) andand those whose fathers of illiteracy (1.73+ 0.95) and basic (1.66+0.78) educational levels. Moreover, there was statistically high significant direct correlation between GI and PI (R=0.63, P=0.000).

Conclusion: The results of the current study revealed that GI average of high school students in North Gaza and Gaza City was the highest in Gaza Strip, and this finding need more investigation in future study to explain the reason of this significant difference in GI average according to governorates. Also, the findings of this study confirmed that the paternal educational level is considered as a risk factor for gingivitis, where the students whose fathers of low educational level have high probability to complain from gingivitis than those whose fathers of high educational level.
INTRODUCTION

Health has an essential role to play in health, and in order to create a healthy community, we have to build a healthy population. This requires increasing the health awareness of all individuals, and one of the most important forms of body health is the oral health. Oral health as a single unit is an integral part and essential element of general health and for well-being status as reported in the World Health Organization (WHO) Rodan et al. (2015). The health of periodontium is one of the most important forms of oral health. Alveolar bone, cementum, periodontal ligament, and gingiva are the main elements of periodontium. All of these components function together as a single unit to provide the necessary support to preserve the teeth in function in spite of their different composition and structure Newman et al. (2015).

The attachment apparatus “the other name of periodontium”, undergoes definite changes and alterations with aging and it constitutes a developmental, biologic, and functional unit. In addition, morphologic changes related to functional and oral environment alterations are occurred Lindhe et al. (2008). Oral diseases are ranging from small cavities in teeth to huge tumors and cancers, all of them are serious threats to health as general and oral health as special. One of the most prevalent oral diseases which gets its roots early in childhood is periodontal disease. The destructive processes will progress in both soft and solid tissues together, the result will be losing teeth if they are not treated on time as a consequence of these diseases. The current classification of periodontal diseases is based on their extent (generalized versus localized), severity (slight, moderate, or severe), rate of progression (aggressive versus chronic), and localization (i.e., contained within the gingiva, as in gingivitis, or further involving periodontal bone loss, as in periodontitis) Newman et al. (2015).

Gingivitis is characterized by bleeding, swelling, redness of the gum, it is described as an inflammatory reaction upon the pro-inflammatory cytokines that modulate the balance between humoral and cell associated immune responses Shimada et al. (2013) and Carvajal et al. (2016). Inadequate oral hygiene is the principle cause of this disease and it is reversible with good oral home care and professional treatment Dhakal et al. (2015). According to the definition of periodontitis and the population study, the prevalence of periodontal diseases varies in different regions of the world, and there are indications that they may be more prevalent in developing countries than in developed Ababneh (2012). Previous multiple epidemiological studies found that the prevalence of gingivitis for adult patients varies from approximately 50-100% & N Idrees et al. (2014).

The prevalence of gingivitis in Saudi Arabia was 100% as had been shown in previous recent study among the adult subjects aged between 18 and 40 years old & N Idrees et al. (2014). While in North of Jordan 75.8% of patients had chronic gingivitis Ababneh (2012). In India a recent study has shown that 71.11% of school children aged between 8-16 years old suffered of mild to moderate gingivitis Singh (2014). Another study which performed school children in Tehran aged between 9-13 years old was shown that 87.7 % of them had gingivitis Jessri et al. (2013). On the other hand, periodontal status of Greek 12 year’s old population who had bleeding on probing were 41.5 %. (28). The prevalence of gingival inflammation in South America among 18-19 years old patients was 97.5% Carvajal et al. (2016).

This study focused on gingivitis as it is the starting point of all periodontal diseases. The experimental gingivitis studies demonstrated that there is a one-to-one relationship between the development of gingivitis and the developing dental plaque. So, while it has been known for many years that the etiologic agent is plaque, the factors contributing to patient susceptibility are still not fully understood. The initial experimental gingivitis studies showed that the plaque accumulation rates and/or differences
in the species of bacteria present in the plaque are the causes that will develop the gingivitis Lindhe et al. (2008) . Decreased teeth loss for all age groups is a result of improvements and advancements in preventive dentistry and increased health awareness. In particular, greater health expectations and increased life expectancy may lead to changes in demand from older individuals for periodontal treatment.

There are little known about the prevalence and severity of gingivitis in Palestinian students in high schools, so it is important to study their oral health, oral hygiene attitude, and behavior to help the dentist to plan the adequate strategy to improve the body health as general and oral health as special.

2 | METHODS

Study Design
The study is cross-sectional, descriptive and analytical.

Study Population and Sample
The study population consisted of all high school students in Gaza Strip during period of data collection. The sample was 408 students. This study was carried out at all high schools in five Governments of the Gaza Strip. Students were selected by multistage sampling method; the first stage was selection of the schoolboy simple random method, then selection the students from the selected schools by stratified sampling method.

Eligibility Criteria
The subjects were eligible for participating in the current study when they met the following inclusion criteria: both gender, age between 15 to 19 years and good general health without any systemic disease. The subjects had been excluded from the study if they met any of the following exclusion criteria: use of antibiotics within the last 2 weeks prior to examination, pregnant students, student with orthodontic appliance, and those with any systemic disease.

Study Tool and Data collection techniques
The students were invited to complete the Arabic version of questionnaire. This questionnaire was established by (dental student researchers) and was designed to be suitable with the study purpose which was filled by self-administration. The questionnaire covered the necessary details like: socio-economic, demographic data, general history.

Periodontal Examinations
Oral hygiene and gingival status were examined by using PI and GI respectively and they applied on each surface of 28 teeth and the wisdom teeth were excluded. Plaque Index (PI) to assess dental plaque. and Gingival Index (GI) to assess gingival inflammation. To examine the oral hygiene and gingival status, (periodontal diagnostic kit that includes mirror, tweezers, probes and periodontal probe), autoclave, sterilization bags, coats, gloves, facemasks, cups, suction tips, wrapping, napkins, and trays were needed.

Data Management and Data analysis
The researchers used the Statistical Package for Social Science (SPSS) version 22. Descriptive data of frequency, mean, standard deviation were performed for numerical and continuous variables, where qualitative variables were presented by frequency tables and percntages. ANOVA, t-test, regression test and correlation test were used to extract the relation between the prevalence and demographic variables at significance level < 0.05.

Ethical consideration
All students were informed about the objectives and details of the study. It was clear for all participants that there would be no penalty for non-response and that the examination had been done by using the usual sterile dental mirror and periodontal probe. Only students who signed the written consent, had been included in the study and they had been assured of the privacy of all information obtained. It was clear for them that the collected data will be used for scientific purposes only.

3 | RESULTS

3.1 Characteristics of sample
The sample of the current study is 408 patients. The average age of the patients is (16.92 + 0.77) years. About 175(42.9%) of them were males and 233(57.1%) of them were females. The sample was
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distributed according to the number of high school students in each governorate in Gaza Strip, also 9.9% of the sample were smokers and 90.1% of them were non-smokers as shown, their distribution is shown in table (1).

TABLE 1: Summary of students' characteristics in Gaza Strip

<table>
<thead>
<tr>
<th>Variables</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>175</td>
<td>42.9%</td>
</tr>
<tr>
<td>Female</td>
<td>233</td>
<td>57.1%</td>
</tr>
<tr>
<td>Age (years)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Years of students</td>
<td>408</td>
<td>16.92+ 0.77</td>
</tr>
<tr>
<td>Governorates</td>
<td></td>
<td></td>
</tr>
<tr>
<td>North Gaza</td>
<td>75</td>
<td>18.4%</td>
</tr>
<tr>
<td>Gaza</td>
<td>155</td>
<td>38.0%</td>
</tr>
<tr>
<td>Middle zone</td>
<td>63</td>
<td>15.4%</td>
</tr>
<tr>
<td>Khan-Younis</td>
<td>75</td>
<td>18.3%</td>
</tr>
<tr>
<td>Rafah</td>
<td>40</td>
<td>9.8%</td>
</tr>
<tr>
<td>Smoking</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Smoker</td>
<td>40</td>
<td>9.9%</td>
</tr>
<tr>
<td>Non-Smoker</td>
<td>368</td>
<td>90.1%</td>
</tr>
<tr>
<td>Total</td>
<td>408</td>
<td>100.0%</td>
</tr>
</tbody>
</table>

3.2 Prevalence and severity of gingivitis and oral hygiene measurements in high school students in Gaza Strip in Palestine

Of the total 408 patients examined, 396 patients among them had the gingival inflammation and bleeding on probing and they from 97.1% of the overall prevalence. Among the total sample the prevalence of healthy, mild, moderate and severe gingivitis was 2.9%, 27.7%, 43.1%, and 27.0% respectively as shown in figure (1).

The results also showed that the mean of PI which reflects oral hygiene measurements was (1.92) and indicate that most of patients (54.2%) had fair oral hygiene measurements, while (1.5%) of them had excellent oral hygiene measurements, (24.8%) of them had good oral hygiene measurements, and the rest (19.6%) had bad oral hygiene measurements as shown in figure (2).

3.3. Relationship between the gender, and prevalence of gingivitis

The result showed that the percentage of females having gingivitis ) 58.09% (was comparatively higher than the males ) 41.91% ( . The figure (4.3.1) shows the relationship between the gender and prevalence and severity of gingivitis in Gaza Strip.
3.4. Relationship between the sociodemographic status and prevalence of gingivitis

According to sociodemographic factors, there were no differences in averages of GI except for governorates (F=3.7, P=0.05), and for paternal educational level (F=3.1, P=0.027), where the highest average of GI was that of those live in Gaza city (1.63+ 0.77), and North Gaza (1.63+ 0.82) and those whose fathers of illiteracy (1.73+ 0.95) and basic (1.66+0.78) educational levels as shown in Figure (4,5).

3.5. Relationship between gingival index and plaque index

Moreover, there was statistically high significant direct correlation between GI and PI (R=0.63, P=0.000) as shown in figure 4.6.1, so it is possible to expect the score of GI among the patients in relation to PI according the following equation:

\[ GI = 0.38 + 0.74 \times PI \]

The present study is a cross-sectional investigation, which was conducted among high school students. The current study aimed to assess the prevalence and severity of gingivitis in high school students in Gaza Strip. The most students were female, it is similar of previous study in Jordan conducted by Rodan et al. (2015). The main finding of our study clarified the overall prevalence of gingivitis 97.1% of students who mean aged 17 years and 43%, 27% had gingivitis of moderate, severe severity. Those results are similar to the results of other parts of the world of similar cultural and socioeconomic status. This result consistent with a study conducted by Tantawi and Agl (2018) that shown the total prevalence of gingivitis was 74% and it was agree among Egyptian pediatric school was 71%, although a greater portion had moderate/severe gingivitis (20.4%) Kolawole et al. (2011) compared with students in our study (43% and 27%). The prevalence of gingivitis in our study were very similar to that reported among students aged 12 years in Medina, Saudi Arabia (83% and 71%) Bhayat and Ahmad (2014).

A recent survey in India of school children aged 8–16 have shown that 71% of school children aged 8–10 suffered of gingivitis of mostly mild to moderate
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severity (Singh, 2014). Also, another study in Tehran it was exposed that 87.7 % of pediatric school of age 9–13 years had gingivitis Jessri et al. (2013) (Jessri et al. 2013). On the other hand, a study on 12 year’s old population has revealed that 41.5 % had bleeding on probing Vadiakas et al. (2012) . A study from Danube Delta Biosphere Reserve clarified the Gingival bleeding was 32.8 % of the pediatric who aged 6–12 years Jipa and Amariei (2012) .

In epidemiological studies, the level of oral cleanliness and the level of Gingival inflammation were widely evaluated by measure Gingival index and plaque index Al-Haddad et al. (2013) . This assessment is properly reproducible, very easy for uses and the investigations can be carried out rapidly with a great reproducibility and least need of training. In the current study mean of Plaque Index reflects oral hygiene measurements was (1.92) and indicate that most patients (54.2%) had fair oral hygiene measurements, while (1.5%) of them had excellent oral hygiene measurements, (24.8%) of them had good oral hygiene measurements, and the rest (19.6%) had bad oral hygiene measurements. Also, the mean of Gingival Index for the overall participants was 1.55. Moreover, there was statistically high significant direct correlation between GI and PI (R=0.63, P=0.000). Those findings were interpreted that school children of this mean age 17 years had fair oral hygiene with mild gingivitis. These results were dissimilar with another study conducted by Rodan et al. (2015) that shown the mean gingival index and plaque index was 0.77 and 0.61 respectively.

Regarding gender variations, there was no significant difference in the average of GI (t=1.35, P=0.178), where the average among males was (1.6+0.8), while that of females was (1.5+0.18). This result was consistent with a study conducted by Rodan et al. (2015) that found the difference was statistically non-significant, (p = 0.636 for PI and 0.790 for GI) between both genders. But these results are still lower than results obtained in this study. The higher findings may be clarified by the difference in the age group among the children, as a previous study of the gingival health status among children between the ages of 5 and 12 years founded highly increased mean of prevalence and severity of gingivitis among children aged 12 years if compared with pediatric aged 5 years as the plaque index increased also Al-Haddad et al. (2013) .

According to smoking, 10% of our participants described smokers and it wasn’t associated with have more severe gingivitis. This finding consistent with a study in Saudi Arabia which clarified 11.7% of school children aged 13–15 years reported smokers Al-Zalabani and Kasim (2015) (Al-Zalabani and Kasim, 2015). Another study in Saudi Arabian informed the prevalence mean was 20% of ever smoking among school students aged 14-19 years Al-Makadma et al. (2015) . The more prevalence in that study may be result to have older students. Our finding consistent with another study among school children aged 19 years where the gingivitis levels among non-smokers and smoker students were approximately the same Romao and Wennström (2007) . The authors explain that the reason there was no difference to the misclassification was that students would answer this question in a self-reported manner to determine smoking status. In addition to the short period of potential exposure to smoking due to the young age of the participants.

Regarding to address, there were significant differences in averages of GI for governorates (F=3.7, P=0.05), and for paternal educational level (F=3.1, P=0.027), where the highest average of GI was that of those life in Gaza city and North Gaza in addition those whose fathers of illiteracy and basic educational levels. The economic nature of the family life in Gaza and North Gaza highly as different to others governorates. The nature of pediatrics’ nutrition depend on sugary drinks daily, ice cream and sweat that lead to have gingivitis more than others. Our findings can be generalized to those with others same in backgrounds to the students in this study, namely 17 years Palestinians with graduated educated parents who come from the more advantaged groups of community. Other investigators have described superior gingival and oral health among pediatrics of highly educated parents Farah and Ghandour (2009) . Applied to the current location, this means that the gingival health of the overall people of Palestinian students of the same age group might be worse than this study has shown, which increases a concern that requirements to be addressed through health education.
The current study had some limitations, first: the design as a cross-sectional study, time sequence could not be proved; therefore evidence of causality requirements more longitudinal researches. Secondly, the prevalence of smoking in our study might have been underestimated because it was self-reported method. But the schools included in this study was randomly selected and the students from the selected schools were also selected by stratified random sample. This results randomly method in selecting students from private and public high schools in several regions may allow generalization of conclusion of this study in Palestine.

## 5 | CONCLUSION

The results of the current study revealed that GI average of high school students in North Gaza and Gaza City was the highest in Gaza Strip, and this finding need more investigation in future study to explain the reason of this significant difference in GI average according to governorates. Also, the findings of this study confirmed that the paternal educational level is considered as a risk factor for gingivitis, where the students whose fathers of low educational level have high probability to complain from gingivitis than those whose fathers of high educational level. The recommendations of the current study are to organize educative oral health programs for school students, parents, and their school teachers especially in Gaza city and North Gaza to increases dental awareness and to enhance oral hygiene methods by demonstrating the correct frequency, method and duration of regular teeth brushing mouth rinsing, and flossing and their importance. Intersectoral coordination with education, government sectors and development of public health policy has profound effect in improving the health of the community people and to improve the paternal knowledge about the complications of neglect of children’s oral health. It is hopeful that the results of this study to be helpful for other researchers to detect the causes and risk factors which play a major role in initiation of periodontal diseases and the proper ways for its prevention in Gaza Strip.

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## REFERENCES


