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Assessment of Periodontal Pathogens and Gingival Health Improvement after School-based Educational Program among Secondary School Students

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Abstract

Objective: Determining the prevalence of subgingival plaque bacteria before and after school-based education program in order to assess the effectiveness of oral health school-based instruction program on gingival condition.Methods: The research, which was conducted in April 2022, included (52 subjects as a test group and 44 subjects control group) from three Mosul City, Iraq, government schools who were between the ages of 13 and 18. The control group did not get any education, whereas the test group received fifteen minutes tutorial from a dentist and a hands-on session on oral inspection and tooth-brushing practices. The dental plaque Index was used at the first visit before the start of the education programs and at day 15. Bleeding for probing index was used to identify the inflamed site of the gingiva, and subgingival plaque samples were taken with paper points and transferred to 4 ml of enriched thioglycolate. IBM SPSS statistic, version 21 software was used to analyze the data using nonparametric methods. Mann-Whitney U test and Wilcoxon signed rank sum test were used in pairs to compare the data. Statistics were deemed significant if P 0.05. Results: The program of oral health had a significant impact on GI, PI, and bacterial counting records when test groups were compared at the beginning and end of the 15-day period. It also had a significant impact on PI and bacterial counting records when test groups were compared to control groups after the course, but had no significant impact on GI.Conclusion: The findings indicated that appropriate knowledge and habits about oral health were created in order to actively help and preserve these among school children.

Keywords
Secondary school pupils, periodontal infections, gingival index, plaque index, education program.

The quantity of dental plaque is directly correlated with the severity of gingival inflammation, which is a direct consequence of irritation and an absolute outcome of bacteria in the plaque (1). Since gingivitis is a sort of reversible inflammation, it has the potential to be the beginning of periodontitis, but it sometimes resolves to a healthy state without progressing to that condition (2).

Periodontitis is a widespread oral health condition that affects everyone in the globe (3) and is the main cause of tooth loss (4). Periodontal disease and tooth caries are two major factors in dental health surveys. Irreversible periodontal diseases are chronic inflammatory processes of tooth tissue attachment that cause pockets to develop, connective tissue attachment loss, and the

degradation of alveolar bone (5).

Teenage years are a vital time for improving one's health (6). As age has a significant impact on the development of relatively consistent patterns of excellent oral habits that are adopted early in childhood, these habits are difficult to change as adults (7, 8). Adolescents must get the majority of the focus while working to improve oral health due to the development of excellent eating and oral hygiene practices throughout this stage of life (9). There is evidence that adolescents who practice good oral hygiene habits now will have better dental health as adults than those who don't (8). Therefore, attaining great dental health later on may be accomplished by focusing on oral health education (6). The most frequent periodontal diseases in this age range that cause gingival bleeding are plaque and calculus (10,11), which may be assessed by many indicators for the identification of periodontal disorders.

In order to improve habits and attitudes related to oral health among teenagers, we should set aside limited funding for programs promoting oral health in schools. This will help to raise the level of knowledge. According to several research, oral health in other developing nations tends to be better among teens, probably as a result of their effective school-based oral hygiene programs (12).

This epidemiological study was conducted to determine the periodontal condition of students in secondary schools in Mosul, Iraq, due to the lack of effective programs and elementary-level studies for oral health in our nation. The major goal of the study was to identify the spread of periodontal disease in secondary school students between the ages of 13 and 18 and to assess the efficacy of an educational program on teenage oral health. Clearance from the General Directorate of Education in Mosul was attained before visiting the selected schools by receiving a formal request from the College of Dentistry .

Subjects and methods

Sample design

Three schools and three classrooms from each grade—1 through 5—were randomly selected. In such courses, the age distribution of the pupils ranged from (13 to 18) years, respectively. Test and control groups were created from the samples. The control group included 44 healthy teenage students ,whereas the test group included 52 healthy adolescent students (both male and female). A dentist was present in the lecture room for the test group receiving the power point presentation. The lesson covered the development and traits of dental plaque, signs and causes of gingival inflammation, techniques for brushing teeth, and the impact of sugary foods on gingival inflammation and tooth decay. The test group received toothbrushes and toothpaste at the same time, while the control group received no educational materials

Dental clinical assessment The dental examination was performed by one of the dentists in a routine setting while using tweezers, a disposable mouth mirror, gloves, masks, disposable periodontal probes, daylight, and a typical classroom chair. Plaque index (PI) (13), and gingival index (GI) (14) were developed in order to analyze the periodontal health of the students in this research. The examination method involved the assessment of four surfaces (buccal, lingual/palatal, mesial and distal) of six index teeth (the upper right first molar, upper right lateral incisor, upper left first premolar, lower left first molar, lower left lateral incisor and lower right first premolar). Dental PI was inspected on the fundamental of an examination of the four surfaces of the index teeth and given a score from 0 to 3. PI was determined using different scores , score 0= no plaque on the tooth surface, score 1= film layer of plaque, no visualization, only by probe, score 2= plaque seen by visual inspection and by running probe, and score 3= abundance amount of plaque exceed cervical third of crown. while GI means bleeding occurs after careful inserting of the periodontal probe in the gingival sulcus, starting e.g. disto-bucally, the probe is carefully inserted into gingival sulcus and running it to the buccal and mesial tooth surfaces, this is done for every tooth. Probing is identically performed at palatal/lingual sites. The periodontal probe that insert in gingival sulcus, and having to wait for 10 seconds to affirm the existence or absence of bleeding in

gingiva. At baseline and at the 2-week follow-up, the same examiner conducted clinical examinations of every participant in the classroom. The limitation that encounterd the work was the abscenc of some students inthe next visits.

Biological specimens: Cotton was used to remove the supragingival plaque after the clinical examination was finished and before a sample of the subgingival plaque was taken. To avoid salivary contamination, teeth were carefully isolated. Single sterile paper points size 50 (Alph-Dent Company, USA) were inserted for 30 seconds into the subgingival buccal surface of the upper left lateral incisor to collect subgingival plaque samples from the patients. The same inspector then attended the bacterial checks after the clinical inspection. The paper points were placed and removed using sterile tweezers, and then immediately placed in sterilized screw-capped vials containing 4 ml thioglycolate broth as the transporting medium. The samples were then transported immediately to the laboratory, where the broth was shaken for 30 seconds and serially diluted (1:10, 1:100, until 1:100000) (15) in thioglycolate broth. On the surface medium of the brain heart, 0.1 ml of each preparation of diluted saliva sample was applied in a uniform manner. Visible colonies were counted on the petri dish using a magnifying glass and were denoted as the number of colony forming units (CFU) after 48 hours of incubation at 37°C (candle jar) incubation.

Statistical analysis

IBM SPSS statistic, version 21 software was used to analyze the data using nonparametric methods. Mann-Whitney U test and Wilcoxon signed rank sum test were used in pairs to compare the data. Statistics were deemed significant if P 0.05.

Results

The research comprised 96 adolescents, both male and female, ranging in age from 13 to 18 years Table (1). In this expermintal study the periodontal parameters (plaque index and gingival index) were used in the Wilcoxon statistical test to compare test groups, the results showed that the periodontal parameters in the test group after the educational program decreased when compared to the test group before oral health education, and the difference was highly significant (P 0.000). In test groups, the comparison of bacteria counts before and after oral health education revealed a very significant difference (P 0.000), as shown in Table (2), figure (1,2,3).

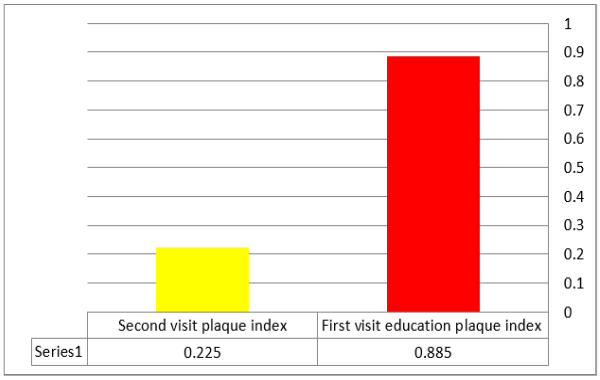

Figure (1): comparison for plaque index between test groups before and after oral health education

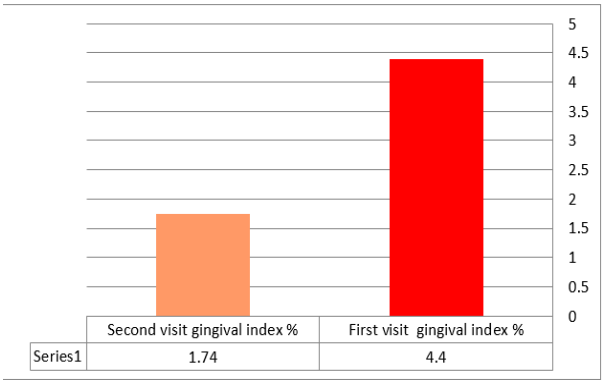

Figure (2): comparison for gingival index between test groups before and after oral health education

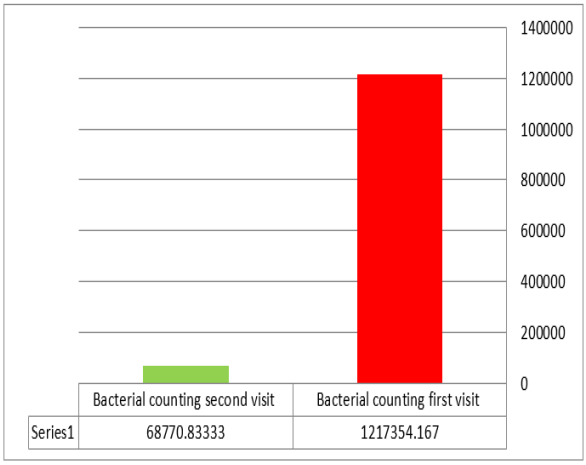

Figure (3): comparison for bacteria counting between test groups before and after oral health education

Table (1) Discription of the study and control groups

Group	Total Numbers	Male Numbers	Female Numbers	Age Group
Study	52	22	30	13-18
Control	44	24	20	15-18
Total	96	46	50	--------

Table (2) Wilcoxon signed rank test compare between first and second visit of test group and of control group

After education gingival index % - Before education gingival index %	After education plaque index - Before education plaque index	Bacterial counting after education - Bacterial counting before education	
-5.299[b]	-5.791[b]	-3.721[b]	Z
.000	.000	.000	Asymp. Sig. (2-tailed)

Following an oral health education program, a comparison of the test and control groups' periodontal indices:

Man-Whitney test U After an educational program, a test was conducted to compare the results of the test group with the control group. Following the administration of an oral health education program for the test group, the comparison of periodontal parameters (plaque index and gingival index) between the test and control groups revealed a decline in these parameters, with a significant difference in PI (p=0.006) at 5%, as shown in Table (3). A notable difference was also seen in the sample's median, as shown in Figure (4). Although there was considerable variation in the samples' medians, as seen in Figure (5), there was no significant variation in GI (p=0.075) at the 5% level, as shown in Table (3). Additionally, there is a significant difference in the mean of the samples between the test group on the second visit and the control group on the second visit (p=0.010) at 5%, as shown in Table (3). Figure(6)

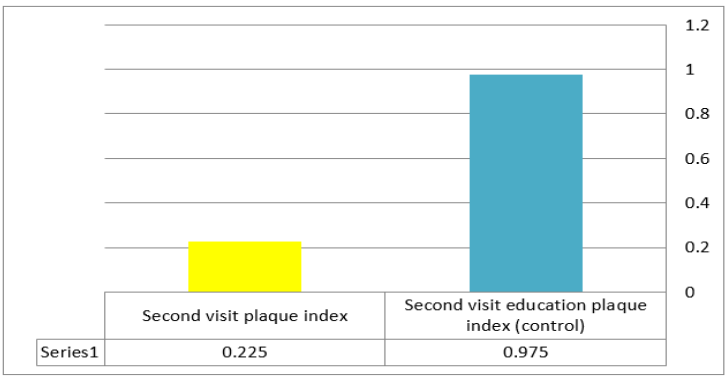

Figure (4): comparison for plaque index between test and control groups after oral health education

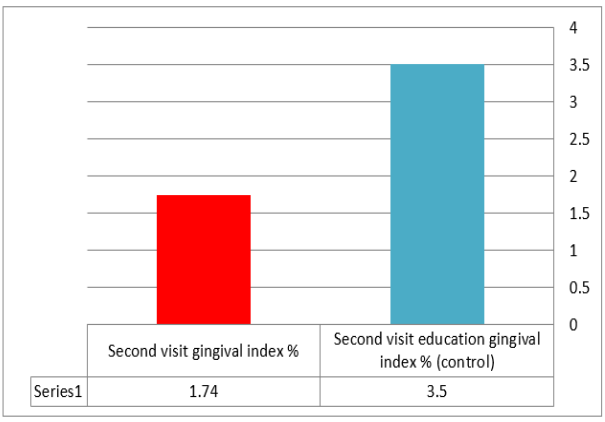

Figure (5): comparison for gingiva index between test and control groups after oral health education

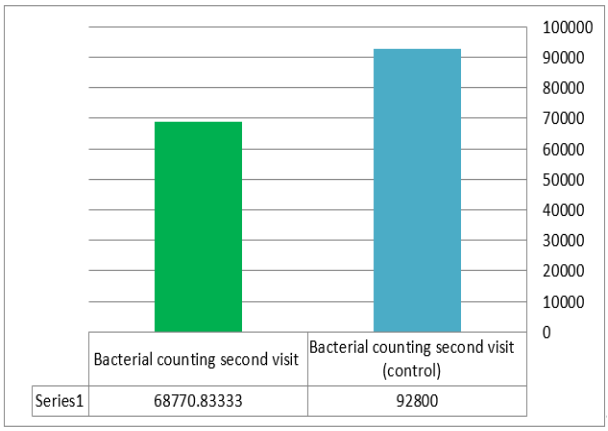

Figure 6): comparison for bacteria counting between test and control groups after oral health education.

a. Wilcoxon Signed Ranks Test b. Based on positive ranks.

Table (3) Mann-Whitney U Test for test and control groups post oral health education for periodontal indices

Test Statistics[a]			
	Bacterial counting	Plaque index	Gingival index
Mann-Whitney U	289.000	278.500	354.000
Wilcoxon W	1465.000	1454.500	1530.000
Z	-2.572	-2.724	-1.780
Asymp. Sig. (2-tailed)	.010	.006	.075
a. Grouping Variable: code			

Discussion

Secondary school students were included in this research because they had the capacity to care for themselves and all of their permanent teeth had fully erupted. Our findings showed that the oral health studies program had a substantial and discernible impact on the oral health of secondary school students, and it may be considered a conservative and cost-effective teaching strategy. Wilcoxon Affirmed Rank Test table (2) comparing the post- and pre-treatment groups revealed a substantial improvement in oral hygiene practices and knowledge, as well as a reduction in plaque buildup, gingival inflammation, and subgingival bacterial plaque counts over the course of two weeks. This effect may be fully attributed to the effect of dental self-examination training combined with health education. Children who get daily instruction in self-checkups may effectively monitor and assess their oral health condition. Our findings are consistent with those of Worthington et al. (16), D'Cruze et al. (17), and Haque et al. (18) who identified the development of oral health and teeth brushing skill as a short-caption impact of OHE. In a research on the effects of OHE on adolescent oral hygiene and gingival health, Haque et al. (18) and Umiyeti et al. (19) found that behavioral arbitration dramatically reduced plaque scores.

U Mann-Whitney The comparison test between the test group and the control group after the educational program revealed significant differences on the plaque index and on the counting of subgingival plaque bacteria, which may be due to activities involving direct tooth brushing technique. However, the test revealed no significant differences on the gingival index between the test group and the control group after the educational program, and this result was due to gingivitis in this age group being caused by plaque and hormonal factors in addition to other factors. Studies examining the gingival condition have found a broad variety of benefits; some showed a significant increase in the gingival index score after the intervention, while others showed little to no impact in preventing gingival inflammation. According to these findings, learning-related improvements in oral health knowledge, behaviors, and techniques for brushing teeth and maintaining oral hygiene are insufficient to improve the contributors' oral health.

Conclusion

The prevelance of periodontal disease was highly among adolescent due to the deterioration of toothbrushing behaviors and accumulation of plaque on the teeth. So according to this findings, reactive speaking along with explanations, lectures, and closely monitored tooth-brushing techniques were developed to actively support and uphold proper knowledge and practices among schoolchildren.

Acknowledgment

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