

The effectiveness of different methods of teaching dental health on the incidence of plaque and gingivitis

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ABSTRACT

This study was conducted to evaluate the effects of various methods of delivery of dental health education. A sample of (223) secondary school students in Mosul City were randomly allocated to one of the following modes of dental health education: Professional instruction (by the dentist), self-educational manual (by a booklet) and audio-visual method (by video film), in addition to a control group where no dental health education was given. Three clinical dental examinations were carried out to evaluate the presence of dental plaque and gingival health, one prior to the programme (baseline examination) and two examinations following the programme at six weeks and three months later to the baseline examination.

The results indicated a very high significant reduction in the plaque and gingival index scores for the three experimental groups, which was maintained on these low levels three months after the baseline examination.

The results were achieved with a minimum of time, cost and personals, and do confirm the effectiveness of dental health education alone in improving gingival health. Therefore, these methods seem to be highly valuable and efficient for teaching dental health to the students in Iraqi schools.

Key Words: Dental health education, self-education, audio-visual, gingival health, dental plaque.

الخلاصة

أجريت هذه الدراسة لتقييم فعالية وسائل مختلفة من التشقيف الصحي الفموي. تم اختيار عينة من (٢٢٣) طالب وطالبة من المدارس المتوسطة في مدينة الموصل. وزعت هذه العينة عشوائياً على إحدى الوسائل التعليمية الأربعة: تشقيف صحي بواسطة طبيب الأسنان، وسيلة التشقيف الذاتي (بوساطة كتيب) والوسيلة السمعية-البصرية (بوساطة فلم فيديو) بالإضافة إلى مجموعة ضابطة أو مراقبة حيث لم تحصل على أي تشقيف صحي. أجريت ثلاث فحوص فموية سريرية لتقييم وجود الصفيحة الجرثومية وصحة اللثة باستخدام المؤشرين (PI I) و (GI). تم القيام بالفحص الأول قبل تقديم البرنامج التشقيفي، أما الفحص الثاني والثالث فقد أجريا بعد ستة أسابيع وثلاثة أشهر من الفحص الأول. أظهرت النتائج تحسناً معنوياً عالياً جداً في كلا المؤشرين (PI I) و (GI) لمجاميع التجريبية الثلاثة، كما أشارت الدراسة إلى أن هذه المجاميع الثلاثة قد حافظت على المعدل المنخفض للمؤشرين أعلاه بعد ثلاثة أشهر من الفحص الأول.

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تم الحصول على هذه النتائج بأقل ما يمكن من الوقت والكلفة والجهد البشري والذي يؤكد كفاءة التثقيف الصحي الفموي لوحده لتحسين صحة اللثة؛ ولدى ضوء ذلك تبدو هذه الوسائل ذات أهمية وفعالية بالغتين لتقديم التثقيف الصحي الفموي للطلبة في مدارس العراق.

INTRODUCTION

Gingival and periodontal diseases are the most widespread dental diseases in the world ⁽¹⁻³⁾ and are more prevalent in developing countries ^(4,5) including Iraqi population ^(6,7) and appear at an early age ^(8,9).

The most effective means of promoting oral health and to prevent periodontal disease are those health care practices performed by the people themselves ⁽¹⁰⁾. However, the effectiveness of their cleaning is frequently inadequate and it must be the objective of health education to improve effectiveness of oral hygiene practices ⁽¹¹⁾.

Oral health education is an essential activity for promoting, establishing and maintaining optimal oral health and preventing oral diseases.

So, the aim of this study was conducted to evaluate the effectiveness of three different methods of dental health education (professional instruction, self – teaching and video film) on secondary school students to improve gingival health.

MATERIALS AND METHODS

Eight secondary schools were selected from Mosul City, four for males and four for females. From each school, one class from a second grade was randomly selected. Each two classes (one for males and one for females) were considered as a group. Therefore, four groups were obtained and randomly allocated to different methods of dental health education (three experimental groups and one control). These groups were: -

- 1) **Lecture Group:** The dental health education has been given by professional (dentist).
- 2) **Booklet Group:** The dental health education has been given by self – teaching method (booklet).
- 3) **Video Group:** The dental health education has been given by audio – visual method (video film).
- 4) **Control Group:** the students in this group have not exposed to a dental health education programme, but received the same dental examination.

The same informations were given to the students in the three experimental groups through these different methods; one method for each group, and separately for males and females subgroups. The scientific informations have been given in six lectures by professional and video methods as follow: -

- ⊕ **Lecture 1:** Types, functions and structure of teeth.
- ⊕ **Lecture 2:** Periodontal disease (appearance, causes and prevention), dental plaque, teeth brushing, the use of dental floss, toothpicks and disclosing agent.
- ⊕ **Lecture 3:** Dental caries (appearance, causes and prevention), sugar and dental caries.
- ⊕ **Lecture 4:** The role of fluoride in preventing dental caries, the methods by which the fluoride could be used.
- ⊕ **Lecture 5:** Visiting the dentist.
- ⊕ **Lecture 6:** Review of lectures.

The lectures have been given to the students in the classroom under the previous topics; one lecture per day, two lectures per week. In addition, there has been demonstration on teeth brushing, flossing and the use of toothpicks and disclosing tablets. Also, there has been participation by the students to brush their teeth and to identify dental plaque and dental caries.

The video film has been made in the College of Dentistry, University of Mosul, lasted about one hour and a half. It contains the same information used in the booklet and professional instructions.

The booklets have been distributed to all of the students in the group, containing the same information used by professional instructions and video film. It contains pictures and labeled diagrams to simplify the subjects. They have been put in Arabic language, and the students have been instructed to read one topic at each time to follow the lecture and the video film.

Clinical dental examinations were carried out in the classrooms under natural daylight using plane mouth mirrors and WHO periodontal probes. Three examinations were carried out:

A – Baseline Examination: Before the education programme.

B – First Examination: After cessation of the programme about six weeks after the baseline examination.

C – Follow – up Examination: About six weeks after the first examination.

Indices used were plaque index (PI) by Silness and Loe⁽¹²⁾ to measure plaque accumulation, and gingival index (GI) by Loe and Silness⁽¹³⁾ to evaluate the gingival health. Six teeth were selected for the examination. These are (12), (16), (24), (32), (36) and (44). Four surfaces of each tooth (buccal, mesial, distal and lingual) were assessed. The frequency of tooth brushing was reported before and after the programme.

Analysis of the data included calculation of the mean and standard deviation for plaque and gingival indices. Also use t-test to determine the significant differences in the mean plaque and gingival indices scores between baseline, first and follow-up examinations in the same group; and use one way ANOVA and LSP to compare the differences among the four groups.

RESULTS

The size of the sample has been (233) students, [114 (51.2%) males and 109 (48.8%) females]. They have been distributed on the four groups (table 1). Generally speaking, lecture, video and booklet groups have been termed experimental groups.

At the baseline examination the mean plaque scores for the lecture, video and booklet and control groups were (1.63), (1.66), (1.71) and (1.68), respectively (table 2). There were no significant differences between them (table 3). After the programme at first examination, all experimental groups showed very high significant reduction in the mean plaque scores (0.47), (0.27) and (0.37), respectively (table 2); and they maintained the improved level at the follow-up examination. While the control group reported very slightly reduced in mean score to (1.58) and this reduction has been not significant from the baseline examination. The differences between all the experimental groups and the control group have been significant (table 3). The

results revealed that video group showed more reduction in the mean score and have been statistically significant from the booklet and lecture groups. Also, there have been significant differences between booklet and lecture groups (table 3).

Table (1): Distribution of the students on the groups by sex

Group	Females	%	Males	%	Total	%
Lecture	25	45.4	30	54.5	55	24.7
Video	28	50.9	27	49.1	55	24.7
Booklet	29	50.0	29	50.0	58	26.0
Experimental	82	48.8	86	51.1	168	75.4
Control	27	49.1	28	50.9	55	24.6
Total	109	48.8	114	51.1	223	100

Table (2): Mean plaque index before and after the programme

Group	Baseline (A)		First (B)		Follow-up (C)		t-test	
	Mean	± SD	Mean	± SD	Mean	± SD	A-B	B-C
Lecture	1.633	0.245	0.471	0.161	0.504	0.161	<0.001	N.S
Video	1.660	0.346	0.271	0.166	0.285	0.146	<0.001	N.S
Booklet	1.711	0.358	0.370	0.169	0.384	0.151	<0.001	N.S
Control	1.684	0.298	1.580	0.332	1.538	0.300	N.S	N.S

Table (3): Differences in the mean plaque index scores among the four groups in the three clinical examinations

Group	Number	Baseline		First		Follow-up	
		Mean	LSD	Mean	LSD	Mean	LSD
Lecture	55	1.633	A	0.471	C	0.504	C
Video	55	1.660	A	0.271	A	0.285	A
Booklet	58	1.711	A	0.370	B	0.384	B
Control	55	1.684	A	1.580	D	1.538	D
F-value		0.62		428.79		466.65	
Pooled SD		0.316		0.219		0.199	
p		0.600		0.001		0.001	

Groups with the same letter differ not significantly from each other.

At the baseline examination, there were significant differences between males and females in different groups (table 4). At the first examination, both sexes in all the experimental groups reported significant lower mean plaque scores compared with the baseline examination. Females in the lecture, video and control groups have had lower mean scores than the males. These differences have been significant in the lecture and control groups and not significant in the video group, while males in the booklet group have had lower but not statistically significant than females. At the follow-up examination, they have maintained mean values close to the first examination. Females in all the four groups have reported lower mean scores than males.

Table (4): Differences in the mean plaque index scores between females and males before and after the programme

Group	Sex	Baseline	t-test	First	t-test	Follow-up	t-test
Lecture	Females	1.487	<0.001	0.363	<0.001	0.420	<0.001
	Males	1.756		0.561		0.575	
Video	Females	1.738	N.S.	0.251	N.S.	0.251	N.S.
	Males	1.580		0.292		0.321	
Booklet	Females	1.813	<0.029	0.408	N.S.	0.362	N.S.
	Males	1.609		0.332		0.407	
Control	Females	1.495	<0.001	1.465	<0.009	1.392	<0.001
	Males	1.868		1.692		1.680	

Table (5) shows the frequency distribution of the plaque index scores before conducting the programme, the most frequent score have been (2) [ranged from about (49.6%) to (55.5%)] and score (3) [(5%) to (9.6%)] and very small percent for the score (0) [(0.5%) to (2.6%)]. Following the programme, there has been a marked change in the frequency distribution of the scores in the three experimental groups.

Table (5): Percentage of frequency distribution of plaque index scores

Group	Baseline Examination				First Examination			
	0	1	2	3	0	1	2	3
Lecture	1.13	39.46	54.24	5.15	52.95	46.95	0.075	0.00
Video	2.65	38.10	49.62	9.62	57.72	42.27	0.00	0.00
Booklet	1.22	36.27	52.87	9.62	63.72	35.70	0.57	0.00
Control	0.53	37.19	55.53	6.74	0.15	49.16	43.10	7.57

The mean gingival scores at baseline examination were (1.62), (1.49), (1.57) and (1.66), respectively (table 6). There were significant differences between some groups (table 7). After the programme, there was a very high significant reduction in the mean gingival score for the three experimental groups (0.45), (0.36) and (0.42),

respectively; while the control group reported a slight change but significant. This improved mean gingival health in the three experimental groups was maintained at the follow-up examination. The difference between the experimental and control groups was very highly significant. Also, the video group showed better improvement than the other groups and it was significant than lecture group.

Table (6): Mean gingival index before and after the programme

Group	Baseline (A)		First (B)		Follow-up (C)		t-test	
	Mean	± SD	Mean	± SD	Mean	± SD	A-B	B-C
Lecture	1.623	0.173	0.455	0.129	0.512	0.153	<0.001	<0.001
Video	1.493	0.308	0.365	0.189	0.349	0.141	<0.001	N.S
Booklet	1.579	0.249	0.421	0.162	0.409	0.150	<0.001	N.S
Control	1.668	0.136	1.571	0.225	1.504	0.212	<0.5	N.S

Table (7): Differences in the mean gingival index scores among the four groups in the three clinical examinations

Group	Number	Baseline		First		Follow-up	
		Mean	LSD	Mean	LSD	Mean	LSD
Lecture	55	1.623	BC	0.455	B	0.512	B
Video	55	1.493	A	0.365	A	0.349	A
Booklet	58	1.579	AB	0.421	AB	0.409	AB
Control	55	1.668	C	1.571	C	1.504	C
F-value		5.91		577.76		592.46	
Pooled SD		0.226		0.179		0.166	
p		0.001		0.001		0.001	

Groups with the same letter differ not significantly from each other.

At the baseline examination, females in the lecture and control groups have had significant lower mean gingival scores than males, while males in the other two groups have had significant lower scores than females (table 8). At the first examination, both sexes reported a significant reduction in mean scores for all groups. The females reported lower score than males and it was significant in lecture and video groups.

Table (8): Differences in the mean gingival index scores between females and males before and after the programme

Group	Sex	Baseline	t-test	First	t-test	Follow-up	t-test
Lecture	Females	1.548	<0.002	0.385	<0.001	0.447	<0.002
	Males	1.685		0.514		0.567	
Video	Females	1.698	<0.001	0.269	<0.001	0.268	<0.001
	Males	1.281		0.464		0.434	
Booklet	Females	1.731	<0.001	0.404	N.S.	0.378	N.S.
	Males	1.421		0.438		0.440	
Control	Females	1.619	<0.007	1.529	N.S.	1.423	<0.004
	Males	1.714		1.612		1.582	

Table (9) shows the frequency distribution of gingival index scores. The results indicated that, before conducting the programme, the most frequent score was (2) [ranged between (55%) to (66%)] and a very small frequency for the score (0) [(0.3%) to (6%)]. After the education programme, there has been marked improvement in the experimental groups, the most frequent score has become (0) [(55%) to (63%)].

Table (9): Percentage of frequency distribution of gingival index scores

Group	Baseline Examination				First Examination			
	0	1	2	3	0	1	2	3
Lecture	1.81	34.31	63.63	0.22	55.15	44.16	0.68	0.00
Video	6.21	37.87	55.68	0.22	63.86	35.68	0.45	0.00
Booklet	2.87	37.21	59.05	0.86	58.04	41.73	0.21	0.00
Control	0.30	33.03	66.06	0.60	0.75	41.21	58.03	0.00

The study reported that there were highly significant changes in tooth brushing frequency in the experimental groups after dental health education programme compared with the control group (table 10).

Table (10): Percentage of tooth brushing practice before and after the programme

Group	Not brush		Infrequently		Once daily		Twice daily	
	Before	After	Before	After	Before	After	Before	After
Lecture	12.7	0.0	23.6	14.5	34.5	30.9	29.0	54.5
Video	9.0	3.6	29.0	14.5	32.7	49.0	29.0	32.7
Booklet	8.6	0.0	24.1	5.1	36.2	36.2	31.0	58.6
Experimental	10.1	1.1	25.5	11.3	34.5	38.6	29.7	48.8
Control	10.9	9.0	29.0	30.9	30.9	32.7	29.0	27.2

Chi-square test between the experimental and control groups was:

$$\chi^2 = 102.13$$

$$d.f = 7$$

$$p < 0.001.$$

DISCUSSION

The concept of preventing, rather than curing disease is gaining acceptance in many countries. One of the principal messages in this strategy is the improvement of educating and encouraging people to be responsible for their own health⁽¹⁴⁾.

Dental health educational programmes have been directed toward children to help them develop sound health practices. This approach includes improving dietary habits, good oral hygiene, making periodic visits to the dentist, learning effective dental preventive methods, learning about dental diseases and the impact they have on the individual and the family. The school setting enables the learning process to begin at an early age and to be reinforced continually and it also offers the advantage of using means of effective communication ranging from individual to group programmes with lectures, audio-visual aids, booklets and health fairs.

At the baseline examination, the high score of plaque and gingival indices among the students confirm the results of other studies carried out on Iraqi school students⁽¹⁵⁻¹⁷⁾. These scores have very highly significantly reduced for the three experimental groups following the dental health education programme, which is in accordance with other studies⁽¹⁸⁻²⁰⁾, and confirms the finding of others^(21, 22) that reported the improve of dental health can be brought by oral health education alone, aimed simply at improving oral cleanliness. The percentage of reduction in plaque index scores for the lecture, video and booklet groups were (71.1%), (83.6%) and (78.3%), respectively, compared with (6.1%) for the control group; while the reductions for the gingival index were (71.9%), (75.5%) and (73.3%), respectively, compared with the control group (5.7%). The differences between the experimental and control groups were very highly significant.

The ability of the students to maintain the improved level of plaque and gingival health six weeks after cessation of the educational programme indicates that the students have kept on daily oral home care practice. This was in agreement with other studies^(20, 23), while other studies reported a relapse towards baseline scores^(24, 25).

The booklet and video film methods have reported significant reduction in plaque and gingival scores after the dental health educational programme (first

examination) and maintained the same level of the scores after ceasing the programme (follow-up examination) and the reductions were significant compared to the scores of the control group.

These findings suggest that these simple methods of dental health education can achieve good standards of oral hygiene and gingival health at low cost of the programme, save time and can reach large number of school students.

When this programme was compared with other effective programmes in improving gingival health, as professional mechanical teeth cleaning programmes⁽²⁶⁻²⁸⁾, the latter programmes have found to be very expensive and time consuming and requiring specially trained skillful dental personals.

Plaque and gingival index scores have reduced in the control group at the first and follow-up examinations. Although the reductions have been very slight, it means that there has been a positive response among these students. This could be explained that the clinical examination can act as a motivation and stimulate the students to take home care practices. This is in agreement with other studies^(20, 23).

Before the programme, the mean plaque and gingival index scores for female students were slightly lower than that for males in the lecture and control groups; while the opposite was true in the video and booklet groups. Following the programme, females in all the four groups reported slightly lower scores than males. This might be due to the fact that females care more about their health and appearance. Many studies reported the same results^(9, 29), while other studies found no significant difference between both sexes^(16, 20).

Regarding plaque and gingival index scores, before the programme the score (2) was the most frequent one. This means that the plaque accumulation could be seen by naked eye and gingivitis was of moderate severity. Following the programme, the score (0) has been the most frequent and the score (3) has disappeared. This means that most of the teeth surfaces are free from plaque, and healthy gingiva is prevalent. This is in agreement with other studies^(16, 20).

At baseline examination, (10.1%) and (10.9%) of the students in the experimental and control groups stated not to brush their teeth and most of the remaining students stated once daily teeth brushing. The result following the programme has indicated a significant reduction in the percentage of students in the experimental groups who do not brush their teeth and a significant shift in the frequency of teeth brushing to twice daily. This finding is in agreement with other studies^(20, 30). So, the improvement of oral hygiene and gingival health of the students was to increase the frequency of tooth brushing and thoroughly remove of dental plaque. This was due to effect of different methods of dental health education.

Therefore, school based health education programmes can be effective in learning good oral hygiene habits and improving the periodontal health status of teenagers.

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