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THE EFFECTIVENESS OF DENTAL STUDENTS

AND DENTAL HYGIENE STUDENTS

IN TEACHING PREVENTIVE

DENTISTRY TO ADULTS

by

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ABSTRACT

The purpose of this study was to investigate the effectiveness of dental students and dental hygiene students in their teaching of prevention. Forty new periodontal patients were randomly chosen and assigned to twenty second year hygiene students and twenty third year dental students. Three variables were investigated: (1) patients' knowledge of oral hygiene; (2) patients' practices of oral hygiene as assessed by a questionnaire administered before and after initial preventive treatment and again at a six-month recall appointment; and (3) patients' plaque index as recorded by students performing a visual check on oral cleanliness. In addition, the student's attitude toward his role as an educator was assessed by a questionnaire administered prior to any patient contact. The patients' responses were evaluated to determine any changes in knowledge and improvement in preventive habits over the six-month period. The plaque index was used to correlate the patient's actual oral hygiene with his reported oral hygiene practices.

The results demonstrated that dental students and dental hygiene students were equally effective in the teaching of correct oral hygiene procedures. The teaching program itself was effective in that all patients showed a significant improvement in their oral health by the end of the study.

The results of the student questionnaire showed that the hygienists did feel that the task of teaching was more important than did the dental

students although both groups responded favourably in their attitudes toward teaching prevention.

The plaque index at follow-up was most influenced by pre-test knowledge score and by habits at the conclusion of the initial treatment period. Such socio-economic characteristics as age and educational level had little influence on the adoption of correct oral hygiene practices.

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CHAPTER ONE

INTRODUCTION

In the last decade vast amounts of time, money and energy have been expended on the promotion of preventive dentistry, but only a fraction of the public practises prevention effectively. The dental profession must assume responsibility for this lack of total public acceptance of preventive practices. Although the dental profession is concerned with promoting prevention, sufficient research has not been done to accomplish the behavioural changes necessary for the success of such a program. By introducing dental hygienists as a part of the dental team, the profession has acknowledged the importance of patient education, yet the teaching of prevention largely remains a spare-time activity for both the dentist and the hygienist while the paramount concern has remained on restorative dentistry. It is the responsibility of dental schools to change this emphasis by identifying methods of patient motivation and education and to transmit these findings to their students.

The training of dental students has traditionally focussed on restoration, but must be redirected to focus on prevention of dental disease. The training of hygienists, on the other hand, has always been concerned with prevention. Because the whole of a hygienist's training is prevention-oriented, she would be expected to be a better teacher

of this concept than the dentist. This study was designed to investigate the potential of hygienists in fulfilling the role of educator in teaching preventive practices. If she is as effective as the dentist in this role, then there are several advantages to having a hygienist do all the preventive education. More of the public would be better served, the cost would be lower, and the dentist would be free to perform more diagnostic and clinical dentistry.

PURPOSE AND HYPOTHESES

The purpose of this study was to evaluate the effectiveness of the dental hygiene student versus the dental student in the teaching of preventive dentistry. Three general hypotheses were investigated:

1. Dental hygiene students are more effective teachers of preventive dentistry than are dental students.
2. Dental hygiene students have more favourable attitudes toward the educator role than do dental students.
3. Socio-economic factors inherent in the patient influence the learning of prevention.

SAMPLE

The sample for the study was chosen randomly from the incoming periodontal patients to the Faculty of Dentistry at the University of British Columbia in September, 1972. Forty patients were chosen and randomly divided into two groups with twenty assigned to the second-year hygiene

class and twenty assigned to twenty of the third year dental students who were randomly chosen from a class of forty. All patients were to receive oral hygiene instruction and prophylactic treatment and they were all adults ranging in age from 18 to 45. They had not received periodontal treatment at the school before, nor from a private dentist as far as could be determined.

VARIABLES

Information was obtained from patients at three points in time: when they first contacted the assigned student, when the program of instruction was completed, and six months after instruction. Upon each occasion data were sought from the patient regarding his oral hygiene knowledge and practices. A plaque index representing the percentage of teeth covered by plaque was determined by the student at each visit. At the first visit, selected socio-economic data were collected from the patients, including age, sex, educational level, marital status, and occupation.

The attitude of the student toward the educator role was determined by an attitudinal scale administered at the time of the first contact with the patient.

INSTRUMENT CONSTRUCTION

Two instruments were constructed to obtain the desired information from patients and students.

Patient Questionnaire

Knowledge of oral hygiene practices was tested with twenty True-False questions which were developed from material taught in the periodontal department of the Faculty of Dentistry. This cognitive aspect was designed to assess patient knowledge regarding oral hygiene practices and periodontal disease. In a pilot study conducted prior to the main study, ten respondents scored between 3 and 18 correct on the twenty item test. A Kuder-Richardson Formula 12 reliability coefficient of .66 was computed on the initial administration of the test with patients in the sample, and the test was therefore deemed sufficiently reliable for use in the study.

Oral hygiene practices were assessed with ten multiple-choice questions derived from nine behavioural objectives that students are expected to attain. Responses to these ten items were taken to represent oral hygiene practices followed by the patient in the home. Practice scores were found to range from 1 to 8 in the pilot study.

A third section of the patient questionnaire was used at the first visit only. It obtained information regarding five socio-economic characteristics as identified earlier. The Blishen socio-economic status scale (15) was used to standardize the occupation of the patients as a numerical score.

Student Questionnaire

A semantic differential attitude scale was used to determine the students' attitudes toward the educator role. This consisted of ten paired objectives descriptive of various feelings about the educator role. A seven-point rating scale was applied to each set of adjectives so that the overall score could range from 10 to 70 points.

In addition to the questionnaire which was completed once, the students recorded a plaque index upon each contact with a patient. That index represents the percentage of teeth covered by plaque.

DATA COLLECTION

The patient questionnaire was administered at three different sessions. The first was on September 14, 1972 before the patient had any contact with the assigned student. The second administration occurred three weeks later on October 3, 1972, by which time the students had completed their oral hygiene instruction and preventive prophylactic treatment. The third administration was early in March 1973, at the six-month recall appointment. The third instrument was administered at the beginning of the appointment prior to any review of the material presented earlier.

The student questionnaire was administered once at the September 14 appointment. A plaque index was recorded at each appointment.

Due to the difficulty in following patients over a six-month period, five of the original forty were lost during the period of the

study. By the time that the third patient questionnaire was administered, 17 hygiene patients and 18 dental patients remained.

DATA ANALYSIS

Patient Questionnaire and Plaque Index

The knowledge and habits sections of the questionnaire were scored separately and the means and standard deviations found for each test session. The plaque index was tabulated in the same manner. t-tests were applied to each group to determine changes with time for knowledge, habits, and plaque index, and also to determine if there was a significant difference between the dental group and the hygiene group.

A multiple regression analysis was conducted using the plaque index follow-up as the dependent variable with independent variables including the three habits scores, the three knowledge scores, the pre and post plaque index scores, age, sex educational level, socioeconomic status and marital status to determine which factors influenced the oral hygiene of the patient.

Student Questionnaire

A total score out of seventy was determined, and this figure was used to compare means of the two groups using a t-test. In addition, the group mean and standard deviation was found for each pair of adjectives. In this way t-tests could be used to compare the attitudes of the dental students and the hygiene students on each item.

CHAPTER TWO

LITERATURE REVIEW

Health planning is becoming a subject of vital concern for Canadians who now look upon health care as a right and not a privilege. Health costs are soaring at such a rate that, projected to the year 2,000, they could consume 100% of the gross national product (81).

Aspart of this trend, the public is now demanding total dental care. If government institutes a dental care plan on a purely restorative basis neither the financial nor the manpower needs could possibly be met. Consequently a denticare system must not be considered if its main emphasis is not prevention.

Fortunately dental research has shown that caries and periodontal disease can be prevented. It is now known that dental plaque is the cause of both caries and periodontal disease. If this plaque is thoroughly removed once in every twenty-four hours, disease can be prevented.

LEARNING DOMAINS AND PREVENTION

The principal goal of dentistry, then, is the teaching of prevention and preventive dentistry is an innovation which must be taught to everyone. The concept of prevention involves three types of learning: psycho-motor, cognitive, and affective.

Psycho-motor learning requires careful instruction, supervised practice, and reinforcement. In the initial instruction the learning tasks must be defined and taught in sequential order. The proper techniques of brushing and flossing must first be demonstrated using models of a patient's own mouth. Then the patient must practise under supervision to ensure that he is doing everything correctly. After he has practised on his own at home for a few days, he should be checked again at the office to catch any errors and to reinforce the whole procedure. Psycho-motor learning therefore takes time and cannot be accomplished in one appointment.

Along with the psycho-motor learning should come the cognitive learning component. A patient is more apt to practise good preventive measures when he is aware of the causes and the consequences of periodontal disease. Of the three kinds of learning affective probably is the most difficult to accomplish. Without an attitude change a person cannot be expected to go through a relatively complicated time-consuming ritual day after day. Each patient must be motivated to want to save his teeth for the rest of his life (33). To effect an attitude change is very difficult and involves repeated exposures to the topic (6). Attitude change is most effectively accomplished through conversation, where the patient has a chance to ask questions and to debate points he does not understand (14, 19, 29). Kreisberg

(54) found that attitude changes resulted from changes in practices. However, his studies were mainly with children where parents had initiated the preventive habits and the necessary attitude changes followed. These findings seem doubtful in the adult situation where there is no one to constantly enforce the habit change.

In a recent study conducted at the University of Minnesota, Zacki (90) compared the student's own attitude towards prevention with his knowledge of prevention and his personal oral hygiene habits. This study comprised three hundred and ninety-eight dental students. A test was given to the students to demonstrate how they could apply their knowledge to a specific preventive dental health problem. The students' personal oral hygiene habits were also examined using the simplified vermilion and green Oral Hygiene Index. Their attitudes towards oral hygiene procedures were then assessed by a questionnaire. The findings showed a statistically significant correlation between the student's attitude towards prevention and his own personal oral hygiene and there was correlation between the student's knowledge about prevention and his degree of personal oral hygiene. This investigation seemed to indicate that, by the fourth year, the class was divided into two groups, thus giving a bi-modal distribution of those who did believe in prevention and those who did not.

Educational research has shown (57, 84) that the best method of effecting an attitude-change is by direct discussion on a one-to-one level so that the patient, through his participation, positively reinforces his learning. Many informative papers have been written on the need for patient motivation (3, 14, 16, 22, 23, 28) but very little research has been done in this area.

Stople (82) conducted a clinical study to determine if an intensive course of dental health instruction would significantly improve the oral hygiene of a group of elementary school children. The study involved fourth, fifth and sixth grade students, and indicated that the level of knowledge of oral health can be improved significantly through dental health education, but attitudes about oral hygiene and the practice of oral health principles are changed very little. This conclusion is strengthened by Mogley and Pointer (72) who stated that "factors other than teaching and audio-visual aids exert greater influence on changes in concern for dental health." Insight must be gained therefore about dental attitudes and the factors which influence the acceptance or rejection of dental health education before dental health education can change significantly the habits that affect the practice of oral hygiene. Stople's study supported the above conclusions and further concluded that:

1. An improvement in oral hygiene occurs during school years with instruction in oral health but this improvement is not retained, and
2. Intensive instruction in dental health significantly improves the knowledge of oral health but appears not to be significantly better than that of instruction by graded text books in the classroom.

Ferris (37) lists the underlying principles of patient educational psychology as:

1. People learn best when they have an understanding of the goals of the training and the behaviour expected;
2. People learn best when they actually participate in the learning situations;
3. Learning proceeds most rapidly when there is immediate feedback on performance;
4. Material should be presented as fast as the learner's progress permits;
5. Performance that meets the standard should be reinforced.

PREVENTION AS AN INNOVATION

Too much emphasis may be placed on cognitive learning. The public is becoming very knowledgeable about periodontal disease and

its causes and prevention. However, something appears to be lacking in our teaching in the affective and psycho-motor domains for the general public is still not practising prevention despite a relatively high level of knowledge.

The adoption process has been described by Everett M. Rogers (73) as "the mental process through which an individual passes from first learning about an innovation to final acceptance." This process should be distinguished from the diffusion process which is the spread of a new idea from its source of invention or creation to its ultimate users or adopters. Since 1955, the adoption process has been refined to include five stages which Beal, Rogers and Bohlen, (9) studied. They concluded that these stages were a valid conceptualisation of the adoption process.

Both Rogers (73) and Lionberger (59) have further defined five stages in the adoption process and these have been generally accepted for purposes of research. Their stages are as follows:

1. Awareness: a person first learns about a new idea, product or practice.
2. Interest: a person becomes interested in new ideas and seeks additional information about them to determine possible usefulness and applicability.
3. Evaluation: a person weighs the information and evidence

accumulated in previous stages, mentally applies the idea to his present and anticipated future situation, and then decides whether or not to try it.

4. Trial: the individual uses the innovation on a small scale in order to determine its utility in his own situation.
5. Adoption: the individual decides that the innovation is good enough for full-scale and continued use and a complete change is made with that in view.

Since the concept of prevention is an innovation its adoption should follow the five steps noted above. Stages 1 and 2 can best be achieved by use of mass media campaigns. However, stages 3, 4 and 5 have to be achieved at the individual level.

Rowntree's paper (76) describes how to design a public campaign in a community in order to make everyone aware of the concept of preventive dentistry and the necessity ultimately to adopt such preventive practices, beginning with mass media campaigns and subsequently focussing at the individual level. At present the teaching of prevention has been well publicised to the general public so that stages 1 and 2 are already accomplished. The focus of teaching prevention must now move to the individual level in order to achieve the adoption of the innovation.

Considerable research has been undertaken on the effect of social

class on the adoption of innovations. Kreisberg and Treiman (53) found that the higher the socio-economic bracket, the greater the frequency of dental visits. They also found that education and income, separately and together, are highly correlated with preventive dental care. On the other hand, Freeman and Lambert (38) found a "statistically significant correlation between the income of the family and the extent to which mothers engaged in preventive dental practices but no direct statistically significant relationship between the adult preventive behaviour and education." Another factor relating socio-economic status to preventive dentistry is stated by Graham (45): "Social classes will accept innovations to the extent that the innovational features and cultural characteristics of the classes are compatible."

Because they vary in many respects of their culture, different classes may adopt a given innovation in varying degrees. Their self-perception is essentially the same as Festinger's theory of cognitive dissonance and seems to be compatible with the observations of others concerned with attitudes and behaviour, (10, 28). In other words, people tend to follow certain health practices which they feel suit their socio-economic status. Adoption by the individual usually is effected in the dentist's office through the efforts of the dentist, the hygienist and assistants in a team approach. Even though the

team approach has proven successful, it is not widely practised in dental schools as patients tend to be funnelled either through the hygiene department or the periodontal department.

INSTRUCTION IN PREVENTION

At the University of B.C., the dental hygiene students and the dental students are both taught the same techniques for home-care instruction; thus, they have the same basic information about the causes and control of periodontal disease. The actual home-care instruction includes the nine following behavioural objectives:

1. Using staining tablets for the purpose of detecting the presence of plaque.
2. Using a multi-tufted, soft-bristled toothbrush.
3. Using a fluoride toothpaste.
4. Using a gentle, rotary action to brush the teeth.
5. Brushing down into the gingival crevice, using a vibrating stroke.
6. Systematically covering the mouth by dividing the dental arch into a number of areas.
7. Brushing thoroughly at least twice daily; immediately after breakfast and before retiring at night.
8. Using un-waxed dental floss to cleanse the interproximal area.

9. Using a horizontal sawing and vertical sweeping motion of the floss in each inter-proximal area.

The knowledge and techniques of prevention are taught in two or three appointments. During the first appointment with the patient, the student explains the importance of keeping the teeth clean and does a complete prophylaxis. He then demonstrates the proper techniques of brushing and flossing to the patient and sends him home. On the second visit, disclosing tablets are used to show the patient what areas he has neglected to clean properly and the oral hygiene instruction is repeated. This completes the preventive treatment. The patient is not seen again until a six-month recall appointment when his progress is rated.

CHAPTER THREE

ANALYSIS OF DATA

The data obtained on three administrations of the patient questionnaire and student attitudes toward the educator role were analyzed as described in chapter one. In this chapter, the characteristics of the sample are first described and then the attitudes of the two groups of students are compared. Results of the patient knowledge and habits measures as well as the plaque index are compared for the two groups of patients at three points in time. The chapter concludes by analysing the combined influence of all the variables studied in relation to the final plaque index in order to identify factors making the greatest contribution toward the ultimate condition of the patient's teeth. Throughout the analysis, the .05 level of significance was used to determine whether hypotheses were to be accepted or rejected.

Characteristics of the Sample

The population consisted of adult patients ranging in age from 18 to 45, with 8 under twenty-five, 16 aged 25 to 35, and 11 aged over 35. The mean age was 31.0. There were 20 males and 15 females in the sample, of whom only 8 were married. Many of the

patients were university students, a fact which is reflected in the average educational level of 13.9 years, with a standard deviation of 3.2.

To obtain a measure of socio-economic status, the Blishen-Index (15) was used. In the case of students, occupational objective was used in lieu of occupation. The average index for the group was 43.8 with a standard deviation of 12.9, somewhat higher than the British Columbia overage of 38.7. No statistically significant difference between dental students' patients and dental hygiene students' patients was observed.

Student Attitudes

On the student questionnaire, there was no significant difference between the mean attitude score of dental students (39.7) and hygiene students (37.5) when the overall averages were compared. (Table I).

TABLE I. ATTITUDE SCORES FOR DENTAL AND HYGIENE STUDENTS

GROUP	MEAN	S.D.
Dental Students	39.67	4.16
Hygiene Students	37.53	2.45

$t = 1.86$, d.f. = 33, $p > .05$

To investigate the students' attitudes further, means, standard deviations, "t" values and probabilities were calculated for each set of paired adjectives. There was a tendency for dental hygiene students to obtain more positive scores than dental students. Furthermore, there was somewhat more agreement amongst the dental hygiene students on the importance of teaching prevention.

Analysis of the adjective pairs shows that they may be divided into three groups. One group involves a value judgement of preventive teaching: important, useful, large, valuable and successful. A second group describes the students' subjective feelings about teaching prevention: interesting, pleasant, relaxed and active. Finally, a simple-complex pairing refers to a cognitive aspect of the task. Table 2 shows that both groups of students made consistently positive

TABLE 2.

ITEM MEANS FOR DENTAL AND HYGIENE STUDENT ATTITUDE

QUESTION	DENTAL STUDENTS		HYGIENE STUDENTS		DIFFERENCE BETW. MEANS	"t" VALUE	"t" PROBABILITY
	MEAN.	STD. DEV.	MEAN.	STD. DEV.			
1. Important- Unimportant	5.61	0.50	6.00	0.00	.39	3.29	0.01
2. Useful- Useless	6.28	0.83	6.88	0.33	.29	2.87	0.01
3. Interesting- Boring	5.11	1.02	5.35	0.70	.12	0.82	N.S.
4. Large- Small	5.44	2.12	6.53	0.62	.53	2.08	0.05
5. Valuable- Worthless	5.56	0.62	6.00	0.00	.21	3.06	0.01
6. Pleasant- Unpleasant	6.22	0.81	6.35	0.49	.07	0.58	N.S.
7. Relaxed- Tense	4.83	1.15	5.00	0.71	.08	0.52	N.S.
8. Active- Passive	6.22	0.94	6.18	0.81	.02	0.15	N.S.
9. Successful- Unsuccessful	3.22	1.99	5.00	0.87	.87	3.46	0.01
10. Complex- Simple	4.83	2.07	3.94	1.56	.43	1.45	N.S.

Note: To avoid halo effect, the positive and negative poles were reversed on some questions in the administration of this questionnaire. However, on this table high scores indicate a positive rating.

appraisals of preventive practices, and had consistently positive reactions to the task.

However, in comparing dental with hygiene students, it can be seen that there was significant differences on items 1, 2, 4, 5, and 9, the five questions in the value judgement group, and the hygienists gave more positive responses in each case. Thus, while all students reacted positively toward the teaching task, the hygiene students grasped the importance of teaching prevention to a significantly greater degree than did the dental students.

Patient Knowledge

From the analysis of the knowledge data, no significant difference was found between the two groups of patients at any point in time. However, there was a significant increase in knowledge scores with time. (Figure I.) The mean scores at the pre-test were 12.7 and 13 for the dental and hygiene students respectively; the corresponding scores for follow up were 15 and 16. The dental students would appear to have imparted more knowledge to their patients; however, this difference is not significant at the .05 level. It is interesting to note that the change in patient knowledge from pre to post test in the hygiene group was not statistically significant. However, it must have been reinforced at the post test appointment because the change in knowledge

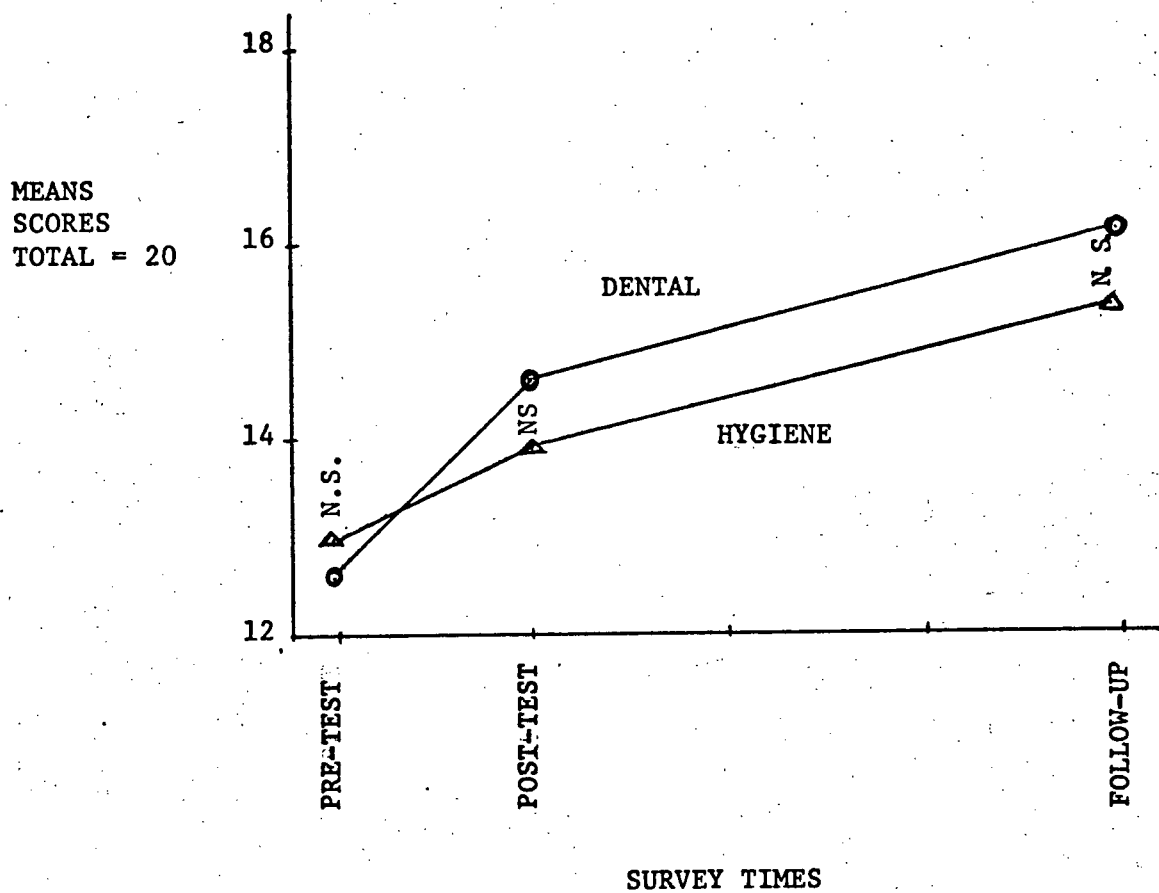


FIG. 1 KNOWLEDGE MEANS CHANGES WITH TIME

from post to follow-up appointments was significant at the .001 level. (Tables 3 and 4).

Patient Habits

Analysis of the habits data shows a similar pattern except that there was a significant difference in the habits scores between the two groups on the pre-test, with the hygienist group having a mean of 4.6 while the mean for dental patients was 3.2. However, this difference was eliminated at the post-test appointment. It would seem that the dental students may have had patients with slightly more severe gingival pathology. Some students changed patients at the last moment, thus disturbing the random distribution. This may account for the slight discrepancy in scores at the pre-test level.

Like the knowledge scores the habits scores also improved significantly with time. (Figure 2). The mean for the dental group went from 3.2 to 6.7 between the pre-test and follow-up, a difference significant at the .001 level. The hygiene group went from 4.6 to 7.0, a change that was significant at the .01 level. (Tables 5 and 6).

Plaque Index

As a further check on patient habits, a plaque index score was taken by the students on their patients at each appointment. This

TABLE 3. COMPARISON OF PATIENT KNOWLEDGE SCORES FOR DENTAL AND HYGIENE STUDENTS.

Scores	Patients of Dental Students		Patients of Hygiene Students		"t"	P
	MEAN	STD. DEV.	MEAN.	STD. DEV.		
PRETEST	12.72	2.65	13.00	4.64	0.216	>.05 (N.S.)
POST TEST	14.61	3.20	13.94	3.85	0.558	>.05 (N.S.)
FOLLOW UP	16.17	2.12	15.35	3.12	0.807	>.05 (N.S.)

Degrees of Freedom: 33

TABLE 4. CHANGES IN PATIENT KNOWLEDGE SCORES OVER TIME

	Patients of Dental Students		Patients of Hygiene Students	
	"t" Value	P	"t" Value	P
PRETEST VS. POST TEST	2.72	<0.01	1.29	>0.05 (N.S.)
PRETEST VS. FOLLOW UP	5.54	<0.001	3.09	>0.001
POST TEST VS. FOLLOW UP	2.479	<0.02	3.17	>0.001

DEGREES OF FREEDOM - 33

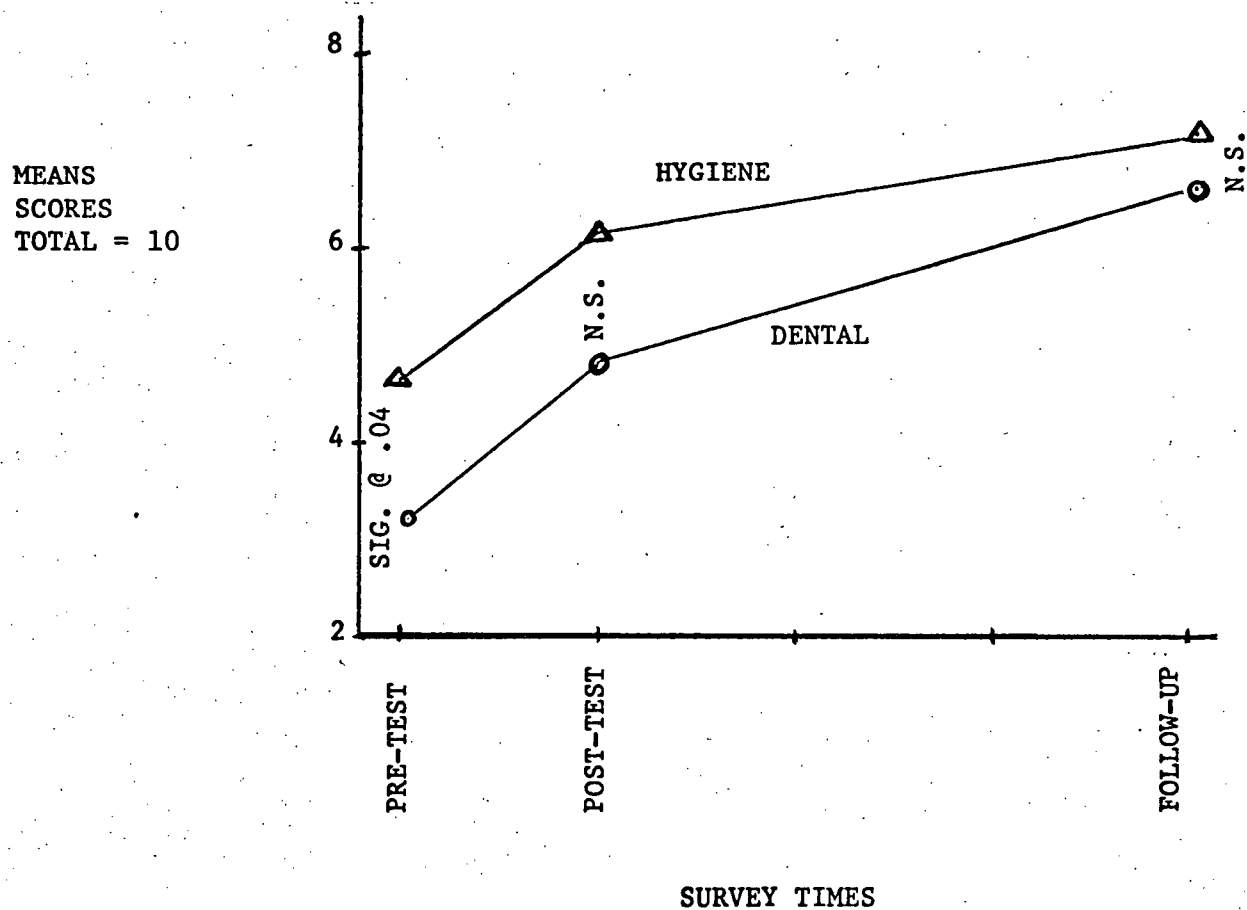


FIG. 2 HABITS MEANS SCORES CHANGES WITH TIME

TABLE 5. COMPARISON OF PATIENT HABIT SCORES FOR DENTAL AND HYGIENE STUDENTS

Scores	Patients of Dental Students		Patients of Hygiene Students		"t" Value	P
	MEAN	STD. DEV.	MEAN	STD. DEV.		
PRETEST	3.22	1.40	4.65	2.34	2.17	0.04
POST TEST	4.89	2.35	6.18	2.74	1.49	> 0.05 (N.S.)
FOLLOW UP	6.61	1.88	7.06	2.82	0.55	> 0.05 (N.S.)

DEGREES OF FREEDOM: 33

TABLE 6. CHANGES IN PATIENT HABIT SCORES OVER TIME

	Patients of Dental Students		Patients of Hygiene Students	
	"t" Value	P	"t" Value	P
PRETEST VS. POST TEST	2.95	<0.01	2.30	<0.05
PRETEST VS FOLLOW UP	6.24	<0.001	3.23	<0.01
POST TEST VS FOLLOW UP	3.02	<0.01	1.69	>0.05 (N.S.)

DEGREES OF FREEDOM: 33

index is expressed as the percentage of tooth surfaces covered by plaque and debris, so that oral hygiene improves as the score decreases. The dental students' group was significantly better than the hygiene group at both the pre and post appointments. However, this must be considered in light of the large standard deviation in these scores and the small sample size. Another point of interest is that the dental students saw a great improvement from pre to post appointment with means going from 81 to 27.9 percent, while the hygienists' group mean moved only from 71 to 44 percent. (Figure 3). Yet by the six month follow up appointment the dental group had slipped back to 30 percent and the hygiene group had progressed to 34 percent. By this time, there was no significant difference between the two groups. There was significant improvement with time for both groups; thus, the visual check of oral hygiene agrees with the patient's increase in knowledge and professed increase in oral habits. (Tables 7 and 8).

A multiple regression analysis was performed using the final plaque index as the dependent variable and all other variables as independent variables. The hygiene and dental groups were run separately and then together. (Table 9).

For the dental group, the analysis included only one step and the significant factor was the second plaque index rating with an R^2 value of 54.6. This indicates that approximately 55 percent of the

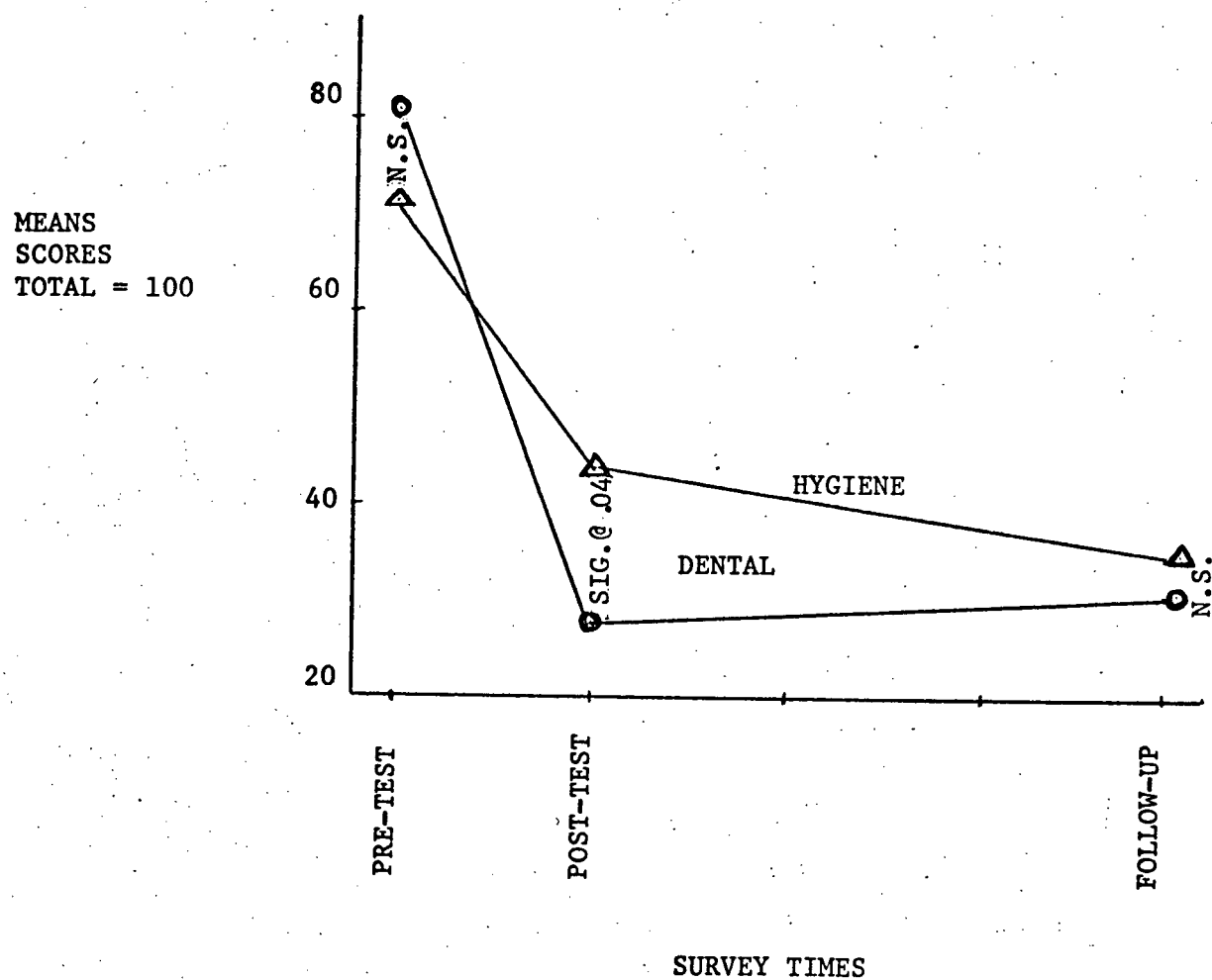


FIG. 3 ORAL HYGIENE INDICES MEANS CHANGES WITH TIME

TABLE 7. COMPARISON OF PATIENT PLAQUE INDICES FOR DENTAL AND HYGIENE STUDENTS

Scores	Patients of Dental Students		Patients of Hygiene Students		"t" Value	P
	MEAN	STD. DEV.	MEAN	STD. DEV.		
PRETEST	81.33	14.27	71.06	22.40	1.56	> 0.05 (N.S.)
POST TEST	27.94	12.98	44.00	25.50	2.26	< 0.05
FOLLOW UP	30.39	11.30	34.47	29.75	0.52	< 0.05

DEGREES OF FREEDOM: 33

TABLE 8. CHANGES IN PATIENT PLAQUE INDICES OVER TIME

	Patients of Dental Students		Patients of Hygiene Students	
	"t" Value	P	"t" Value	P
PRETEST VS. POST TEST	3.40	<.01	5.66	<.01
PRETEST VS. POST TEST	3.79	<.01	6.11	<.01
PRETEST VS. FOLLOW UP	2.66	<.01	2.45	<.05

DEGREES OF FREEDOM: 33

TABLE 9. MULTIPLE REGRESSION: ANALYSIS OF VARIABLES

GROUP	DEPENDENT VARIABLE	STEP	STEPWISE SIGNIFICANT VARIABLES	STEPWISE R ² VALUE	F. PROB.
Dental	Plaque Index Follow up	1	Plaque Index Post	0.546	0.001
Hygiene	Plaque Index Follow up	1	Hab. Fol.	0.847	0.000
		2	Plaque Index Post	0.903	0.019
		3	Blishen	0.934	0.027
Total	Plaque Index	1	Hab. Fol.	0.654	0.000
		2	Plaque Index Post	0.810	0.000
		3	Know. Pre	0.834	0.042

Note: The following variables were entered:

Sex, Age, Educational Level, Blishen Index, Marital Status, Knowledge Pre-test, Knowledge Post-test, Knowledge Follow up, Habits Pre-test, Habits Post-test, Habits Follow up, Plaque Index Pre-test, Plaque Index Post-test, Plaque Index Follow up.

variation in the final plaque rating was accounted for by the second plaque rating.

The analysis for the hygiene group ran three steps, yielding habits follow up, plaque index post, and Blishen Index. The R^2 value for the third step was 93.4, indicating that those factors were responsible for some 93 percent of the variation found in the patients of the hygiene students.

When the two groups were run together the analysis again ran three steps, yielding habits follow up, plaque, index post, and knowledge prescore with an R^2 of 83.4, indicating that those three factors were responsible for 83 percent of the variation of the final plaque index of the patients of both groups combined.

CHAPTER FOUR

SUMMARY, DISCUSSION AND CONCLUSIONS

This chapter comprises a brief summary of the procedure and results of this study and a discussion of the results in relation to other similar studies and ends with conclusions relevant to the purpose and hypotheses of the study.

SUMMARY

Forty patients were randomly selected from the incoming patients to the periodontal department at the University of British Columbia. These patients had not received previous oral hygiene instruction from a dentist or hygienist as far as could be determined. Patients were randomly assigned to twenty second-year hygiene students and twenty third-year dental students. By the end of the study the number of patients had dropped to thirty-five.

The dental students and dental hygiene students had received the same instruction from the periodontics department regarding preventive practices. Consequently, their methods of teaching were similar although their backgrounds in other areas of dentistry were obviously different.

Three instruments were used in the study. A patient questionnaire was designed to ascertain the patient's knowledge of preventive practices and his present oral hygiene habits. A third section

comprising five socio-economic questions was included to see if the adoption of correct oral hygiene procedures was related to age, sex, years of education or social background. The second instrument was the Plaque Index score which was recorded by the student for his patient at each visit. This test required a visual examination to determine the percentage of tooth surface covered by plaque and debris. The third instrument was a student questionnaire designed to investigate the student's attitude towards the importance of teaching prevention.

The patient questionnaire was administered three times over a six-month period. The first administration was prior to any contact with the students and is referred to as the pre-test throughout this study. The second administration was at the second appointment and is called the post-test. The final test was done at the six-month recall appointment and is referred to as the follow up test. The Plaque Index was recorded at the same appointments as the patient questionnaire was administered and is, therefore, designated in the same way as pre, post and follow up. The student questionnaire was administered once at the pre-test appointment.

The data from the patient questionnaire, Plaque Index scores, and student questionnaire were analysed through the use of t-tests. Reliability of the instrument was tested using the Kuder Richardson

Formula 21 method (36). Plaque Index Follow up was used as the dependent variable in a multiple regression analysis and all the other variables served as independent variables.

Knowledge, habits and plaque index improved significantly over the six-month period. The knowledge means for the dental students' patients was 13 at Pre-test and 16 at Follow up, and the corresponding means for the hygiene students' patients were 13 and 15. There was no significant difference between the two groups at any time. The habits section showed means of 3.2 and 4.6 at pre-test and 6.7 and 7.1 at follow up test. The difference between means of the two groups was significant at the pre-test administration with the dental students having the lower score. This indicates that the dental students started with a poorer group but, as can be seen by the final results, they had caught up since there was no significant difference in scores by the post and follow up administrations. Thus it might be surmised that the dental students were more effective teachers since their group improved more. However, a negating effect to this hypothesis is that the patients may have had a higher internal motivation as a result of their slightly more serious gingival pathology. Results of the plaque index scores showed the dental group going from 81 to 27 to 30% while the hygiene group went from 71 to 44 to 34%. Thus, at the follow up appointment there was so significant difference in

the two groups. The scores do reinforce the findings of the habits section of the questionnaire in that the dental students' group had a poorer score to start with but ended up the same by the Follow up appointment. Again there appeared to be greater teaching effectiveness by the dental students from Pre- to Post-appointment, demonstrated by the rapid decrease in Plaque Index scores. However, this is negated by the results at Follow up where the dental group actually shows a degree of back-sliding.

The socio-economic factors obtained from section three of the patient questionnaire were used in a multiple regression analyses along with knowledge, habits and plaque index scores. The plaque index follow up was used as the dependent variable, and the data were run for each of the two groups separately and again as a total. The multiple regression ran one step for the dental students' patients and ran three steps in the other two cases, with the total analysis showing that 83% of the variance in Plaque Index score was dependent on knowledge pre-test score, habits follow up test score, and plaque index post-test score. The Blishen Index did appear in the third step of the hygienist group, indicating that socio-economic factors might be responsible for some of the variation. However, when the two groups were combined the influence of the Blishen Index dropped below the 0.05 level of significance.

When the total scores for the two groups were examined there appeared to be no significant difference between the dental students and the hygiene students in their attitudes toward the teaching of prevention, with means of 39.7 for the dental students and 37.5 for the hygiene students. However, when each individual set of adjectives was analysed separately some quite interesting results appeared. Not only did the hygienists score more positively on all questions, but this difference was significant in five questions dealing with value judgements about the importance of teaching prevention. Also, the consistently smaller standard deviation in the scores of the hygiene group shows a greater consistency in response within the group.

DISCUSSION

Some observations can be made from this study as to where, in the five stages of adoption outlined by Rogers (73), the innovation of correct oral hygiene practices now stands. As described earlier, stages one and two, awareness and information, can be effectively accomplished by public campaigns using the mass media. In the past five years there has been considerable time and money put into such campaigns on the North American continent. From the results of this study it would seem that the public campaign has met with some success. This success is reflected in the results from the knowledge section of the patient questionnaire in that the scores at pre-test were

reasonably high, thus indicating that the patients were already aware of facts about and reasons for good oral hygiene before the study began. At post-test, after they had received oral hygiene instruction twice, the knowledge scores showed only a one point increase for both groups. By the time of the six-month follow-up there was a further small increase to 16 for the dental group and to 15 for the hygiene group. However, the low initial scores on the habits section showed a marked improvement by the end of the study, indicating that individual instruction was necessary for the actual adoption of good oral hygiene practices. This is not surprising since the actual practice of oral hygiene involves psychomotor skills, and the learning of skills requires demonstration by the instructor, supervised practice by the individual, and repetition, feedback, and review after a period of self-practice.

Further examination of the results from the patient questionnaire and the plaque index shows that there was an increase in knowledge and habits scores and a reduction in plaque index scores over time for both groups. These results agree with Ferris et al (37), who stated that attitude change required multiple exposures to the topic. These results also agree with Verner and Dickinson (84), who state that attitude changes are best accomplished through discussion on a one-to-one basis or in small groups. This is clear

from the initial pre-test scores where the patients had a relatively high knowledge score but a low habits score, indicating that from mass media campaigns they had gained knowledge about prevention but had not been motivated to try preventive practices. The plaque index scores at pre-test also confirm this. Kriesburg (54) found that with children attitude change followed habits change, but in this case it would appear that habits change followed attitude change. This is probably true of the adult patient where there is no parental figure to enforce the habit change prior to the attitude change. Again the results would agree with Stople (82), who found that knowledge could be greatly increased through the use of educational materials but that habits were affected very little. He concluded that attitudes had to be changed before habits could be changed.

The Blishen Index was used to determine socio-economic status in this study. From the work of Kriesburg and Treiman (53) one would expect that socio-economic status would have considerable effect on the adoption of preventive practices. However, this study did not indicate such, as shown by the multiple regression analysis. This analysis showed that 83 % of the final change in plaque index score was due to pre-knowledge, habits follow-up and post-plaque index. Like Lambert, (38) this study found no relationship between social class and the adoption of innovations. However, Graham (45)

found that social classes will accept innovations to the extent that the innovational features and cultural characteristics of the classes are compatible. Again, this study failed to substantiate this finding. Possibly the sample size for this study was too small to demonstrate any change related to social class, or perhaps there was not a wide enough range of social classes in the study, as the group tended to be mainly middle class.

The total results of the patient questionnaire considered with the results of the plaque index indicate that the preventive education program, as taught by both the hygiene students and the dental students, is effective. Patients are being activated to practise good oral hygiene techniques and seem to continue to do so, at least over a six-month period. The results also show that there is no significant difference between the hygiene students and the dental students as to their teaching effectiveness. However, the final plaque index scores suggest that the dental group was starting to show a degree of back-sliding, while the hygiene group continued to improve. Both groups could be observed at a later date to ascertain if this trend continues.

Results from the student questionnaire indicated no overall difference between the two groups. Evidently they both considered the teaching of prevention an important and worthwhile task; yet

when each individual question was examined it was found that the hygienists consistently scored more positively, and that this difference was significant on the questions related to value judgements. This agrees with the original premise that, because the hygienists' whole training is oriented toward the teaching of prevention and because the dental students' training is mainly oriented toward restoration of teeth, the hygienists would show a more positive attitude. In the study of dental students, by Zacki (90) they found that by the senior year, the class was divided into two groups consisting of those who believed in the importance of prevention and practised good oral hygiene themselves, and those who were not convinced of its importance and did not practise it themselves. Although there is no statistical evidence in this study to confirm these findings, the less positive responses on the attitude questionnaire and the tendency for back-sliding of the dental group on the plaque index follow-up would lend credibility to this hypothesis.

CONCLUSIONS

The scores of the two groups for knowledge, habits, and plaque index did not differ from each other significantly, thus indicating that the dental hygiene students were as effective as the dental students in teaching prevention. This hypothesis has importance in regard to manpower shortages in the dental field. Hygienists can

be trained in less than half the time necessary to train dentists, therefore the training is less expensive. They can be ready for employment sooner and they can work at a lower hourly rate. Also, the dentist's time can be better utilized and he can be freed for diagnostic and restorative procedures.

The second hypothesis of this paper was the dental hygiene students are more aware of their roles as educators than are dental students. The student questionnaire results certainly verify this, since the hygienist consistently scored more positively on all questions and since the difference was significant on five questions dealing with value judgements about teaching. That the hygienists' patients scored slightly higher on their Habits Follow up and that their plaque index scores continued to drop lend further evidence that the hygienists are more motivated to teaching than are the dental students.

From the multiple regression data it was found that the three factors having a significant effect in determining the final plaque index were habits follow up, plaque index post, and knowledge pre-test score. However, the hypothesis stating that socio-economic factors had an influence on the adoption of good preventive practices was negated by the results from the multiple regression data.

Finally, it can be stated that the program of teaching prevention in the dental school is effective since patients showed significant improvement in knowledge, habits, and plaque index ratings over the six month period. Since the dental students' group was tending to back-slide somewhat on the follow up plaque index rating, it would be useful to check these same patients one year after their final appointment to see if this trend continues.

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APPENDIX I

PATIENT QUESTIONNAIRE

Chart no. _____

This questionnaire has been designed to survey the effectiveness of several teaching methods used by the students in this school. We are asking you to participate in this study by filling out the attached questionnaire.

Do not put your name on the form. Please be honest in answering the questions. Do not try to put down the answer you think we want you to give. Remember, it is not a test, we are looking for group averages and not the individual's scores.

Thank you for your cooperation.

Dr. Linda E. Sharpe

SECTION I

Please complete this section by circling either T or F for each question.

- | | | |
|---|---|---|
| 1. Flouridation of water supplies has been proven beneficial in reducing tooth decay. | T | F |
| 2. When water supplies are not flouridated children should receive flouride drops to help strengthen their teeth. | T | F |
| 3. Painting the teeth with flouride is not beneficial in reducing tooth decay after the age of twelve. | T | F |
| 4. Dental plaque must be removed from the teeth after each meal. | T | F |
| 5. Dental plaque always appears as a hard calcified deposit on the teeth. | T | F |
| 6. Dental floss is used to remove dental plaque from the teeth. | T | F |
| 7. Normally unwaxed dental floss is better for cleaning the teeth than waxed dental floss. | T | F |
| 8. A hard bristle nylon toothbrush is more effective for cleaning the teeth than is a soft multitufted nylon bristle brush. | T | F |
| 9. Disclosing tablets should be used everytime you brush your teeth to check on the efficiency of toothbrushing. | T | F |

10. It is normal for your gums to bleed sometimes when you are brushing them.

T F

11. Bad breath is often a sign of periodontal disease.

T F

12. Gingivitis is inflammation of the gums which can lead to severe periodontal disease if not controlled.

T F

13. After the age of forty it is more common to have teeth extracted because of periodontal disease than due to decay.

T F

14. The majority of young people in Canada today will be wearing dentures by the time they reach late middle age.

T F

15. Smoking may affect the condition of your gums.

T F

16. An electric toothbrush is twice as effective as an ordinary toothbrush.

T F

17. Commercial mouthwashes are beneficial in maintaining good oral hygiene.

T F

18. Thoroughly rinsing your mouth is an adequate substitute for brushing your teeth when you are in a hurry.

T F

19. Fresh fruits and vegetables are suitable between meal snacks because they contain fructose rather than glucose.

T F

20. Periodontal disease can be a sign of a dietary deficiency.

T F

21. There was an extensive campaign designed to ATTACK PLAQUE conducted on the radio and in the papers earlier this year.

T F

22. The above campaign was sponsored by one of the leading toothpaste companies.

T F

SECTION II

In this section please circle the number of the answer you consider to describe most accurately your own dental hygiene habits. Please circle only one answer for each question.

1. How many minutes per day do you spend brushing your teeth?

1. about one minute
2. 1 to 3 minutes
3. 3 to 4 minutes
4. 5 minutes or more

2. Which type of toothbrush do you use?

1. hard bristle nylon
2. soft multitufted bristle
3. natural bristle

3. Do you use a flouride toothpaste such as Crest or Colgate with MFP?

1. Yes
2. No

4. What action do you use when brushing your teeth?

1. up and down stroke
2. short back and forth vibrating stroke
3. sweeping back and forth stroke
4. rotary motion

5. Do you use dental floss?

1. Yes
2. No

6. If you use dental floss, how frequently do you use it?

1. daily on problem teeth
2. daily between all teeth
3. several times a week on all teeth
4. not applicable (do not use dental floss)

7. If you use dental floss, which way do you use it?

1. Push the floss through the contact, wrap it against the side of the tooth, and slide it back and forth to clean the tooth.
2. Push floss down between the teeth and pull it back out the same way to clean the area the brush cannot reach.
3. Push floss through the contact and draw it out to the side to remove food particles stuck between the teeth.
4. Not applicable (Do not use dental floss.)

8. Do you periodically use disclosing tablets at home to check on your brushing efficiency?

1. Yes
2. No

9. When brushing down into the gingival crevice what action do you use?

1. up and down stroke
2. short back and forth vibrating stroke
3. sweeping back and forth stroke
4. rotary motion

10. Every time you brush do you move systematically from area to area to ensure cleaning of all your teeth?

1. Yes
2. No

SECTION III

In this section please fill in the blanks.

1. Sex M _____ F _____
2. How old are you? _____ Years
3. How many years of schooling have you completed? _____ Years
4. a) What is your occupation? _____
b) If you are a student please state degree program on
which you are enrolled.

5. What is your marital status? Married _____
Single _____
Other _____

APPENDIX II
STUDENT QUESTIONNAIRE

PATIENT CHART 783

The purpose of the following scale is to determine the meaning that you attach to the educational role that you may perform as a dental hygienist or a dentist. Think about your notion of the importance of patient education in your profession, then complete the ten items shown below. There are seven choices for each item. Consider the item carefully, then place an X in the middle of the space that best indicates the strength of your feeling towards your educational role.

1. important								unimportant
2. useless								useful
3. interesting								boring
4. small								large
5. valuable								worthless
6. unpleasant								pleasant
7. relaxed								tense
8. passive								active
9. successful								unsuccessful
10. complex								simple

ORAL HYGIENE INDEX

FIRST VISIT _____ SECOND VISIT _____ FINAL VISIT _____