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Claremore Indian Hospital Dental Service

D. Hazle

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EVALUATION OF A PERIODONTAL DISEASE PREVENTION
PROGRAM FOR AMERICAN INDIAN PATIENTS WITH DIABETES

Submitted by:
Claremore Indian Hospital
Dental Service

Author:
Darrell Hazle, D.M.D.

Contributing Investigators:
Jan Shurts, R.D.H.
James Hix III, D.D.S., M.S.D.
Angela Perez, R.D.H.
Byron Jasper, D.D.S

Claremore Indian Hospital Approving Official:

Thomas B. Talamini
Thomas Talamini
Service Unit Director

Date: March 20, 1989

ABSTRACT

EVALUATION OF A PERIODONTAL DISEASE PREVENTION PROGRAM FOR AMERICAN INDIAN PATIENTS WITH DIABETES. D. Hazle, J. Shurts, A. Perez, J. Hix, and B. Jasper, Claremore Indian Hospital, Claremore, Oklahoma.

A periodontal disease prevention program was offered to patients with diabetes who were being seen at the Claremore Indian Hospital. The study period was for three years from 1985 to 1988. This group was targeted because the prevalence of diabetes in this American Indian population is about 9% compared to 5% for the national average. Periodontal disease in American Indians with diabetes is known to be more severe than that of other Indian population groups.

Patients referred to the dental clinic were screened using the Community Periodontal Index of Treatment Needs (CPITN). Those accepted for the program were provided a dental prophylaxis, root planing, and a preventive education class by a hygienist. Data was collected to allow evaluation of the effectiveness of a health belief questionnaire in predicting the outcome of the periodontal disease prevention program for individual patients, and to evaluate the effectiveness of the program in reducing the prevalence of CPITN ≥ 3 (increased pocketing) and the extent of periodontal disease conditions. Patients were seen at 0, 3, and 15 months. The age, sex, blood quantum, diabetic duration, height, weight, HbA1, and the CPITN were recorded for 171 patients at 0 months, and for 61 patients at 15 months.

Of the 61 diabetics returning at 15 months, the prevalence of CPITN ≥ 3 was reduced 23% from 98% to 75% ($p < .001$). This reduction was less than the 69% decrease from 91% to 22% experienced by 36 nondiabetics ($p < .001$), but approached that of the general population having a mean age 13 years younger. The mean age of the diabetic group was 49, 52% attended the education class, and their mean glycosylated hemoglobin HbA1 changed slightly from 11.2 to 11.3. The health belief questionnaire scores did not vary significantly with the outcome.

The extent of periodontal disease conditions one year after being seen by the hygienist were also reduced. The extent of CPITN scores 2, 3, and 4 was reduced 39% and the 3's and 4's were reduced 53%. This level for patients with diabetes was near that of the general population with a mean age of 22 years younger.

Targeting patients with diabetes for periodontal disease prevention programs appears to be effective in reducing the extent of their periodontal disease conditions and prevalence of increased pocketing.

EVALUATION OF A PERIODONTAL DISEASE PREVENTION PROGRAM FOR AMERICAN INDIAN PATIENTS WITH DIABETES

I. PROBLEM:

Targeting patient populations with the most need for dental services as well as those who will benefit most from preventive programs has become more popular in the 1980's. American Indian patients with diabetes meet the first requirement for targeting by having more severe periodontal disease than nondiabetics.^{1,2,3,4} However, it is not well documented to what degree patients with diabetes can prevent or reduce the severity of periodontal disease following dental prophylaxis and preventive education. The problems of vascular changes, abnormal collagen metabolism, altered oral flora, and abnormal defense mechanisms, and genetic predisposition associated with diabetes^{5,6,7} may not be overcome by prophylaxis and oral hygiene education. However, adults who have well-controlled diabetes are generally thought to have no more gingivitis or destructive periodontitis than nondiabetics.³ From clinical observation in his work with the Pima Indians, Dr. Mark Shlossman believes diabetics do demonstrate healthy periodontal tissue with good oral hygiene, even if blood sugar levels remain high.⁸

Because the most important part of periodontal care in a population is self-administered oral hygiene,⁹ spending limited resources for those who show the most improvement following preventive treatment would be the most cost effective use of resources. At present, no proven effective method exists to select patients who will demonstrate the best outcome from oral health education and preventive periodontal treatment.

Patients are routinely confronted with various health promotion programs, but only a small percent respond favorably to educational efforts to modify behavior. A screening tool is desirable for identification of potentially compliant patients who could be targeted for preventive education resources. A questionnaire, based on the Health Belief Model, administered before treatment, might be useful in selecting which patients to provide services if resources were not available to provide services to everyone. The Health Belief Model is thought to be 40% effective in identifying patients who are likely to follow a disease prevention regimen.¹⁰

In the Claremore Service Unit Dental Program of the Indian Health Service, resources are limited, and only about 15% of the dental services required by the American Indian population of 65,000 are met each year. Estimates based on the 1984 IHS Oral Health Survey¹¹ indicate an unmet need in excess of \$20 million for dental services exists for the 65,000 population. Although 45% of all dental services provided with the \$1.5 million budget are for patients over 20 years old, these services represent primarily lower levels of care for dental emergency treatment.

The prevalence of diabetes in the Claremore Service Unit has more recently thought to be about 9%,¹² or almost twice that of the national average of 5%¹³. However, in a 1974 survey by Sievers, prevalence rates for Creeks/Seminoles was 19% for patients over age 30, and 20% for Cherokees.¹⁴ Creeks and Cherokees are the predominate tribes in the Claremore Service Unit. This difference in prevalence rates may be accounted for by considering the different American Indian blood quantum composition of the populations surveyed. Before 1977, the Cherokee and Creek Tribes required 1/4 degree or more Indian blood quantum to receive care by the Indian Health Service. Today, about 60% of patients seeking routine dental care have less than 1/4 degree blood quantum.

The prevalence of periodontal disease among the Claremore Service Unit American Indian population is thought to be higher than that of the non-Indian population. In a pathfinder survey in 1987, the prevalence of those patients ages 35-44 having a Community Periodontal Index of Treatment Needs (CPITN)¹⁵ score of 3 or more was 73% (APPENDIX 1). The prevalence of periodontal disease in American Indian populations has been found to be higher than in non-Indian populations.^{16,17}

Considering the greater need of patients with diabetes for periodontal treatment among the American Indian population in the Claremore Service Unit, targeting of this group for preventive periodontal services was logical. Considering the scarcity of resources, selection of patients who would improve the most was also logical. These characteristics of a prevention program for targeting populations and selecting the best patients for disease prevention were also suggested by Dr. D.E. Barmes at the 1985 IHS Area Dental Officers Meeting.

Therefore, a program was developed based on referral of diagnosed diabetic patients to the Dental Service for preventive education and dental prophylaxis. Data was collected over a three-year period which would allow evaluation of both the effectiveness of the prevention program in reducing the extent of periodontal disease conditions, and the effectiveness of a health belief questionnaire in predicting the outcome of the preventive program.

II. OBJECTIVES:

To test the hypothesis that a questionnaire based on the Health Belief Model can be used to predict the outcome of a prevention program twelve months after dental prophylaxis and periodontal disease prevention education.

To determine if American Indian patients with diabetes would show a decrease in prevalence of CPITN ≥ 3 , and extent of conditions of periodontal disease as measured by the CPITN one year after dental prophylaxis and periodontal disease prevention education.

III. ACTIVITIES:

The Diabetic Staff at the Claremore Indian Hospital was encouraged to develop a referral program directing all dentulous diabetic patients to the Dental Service for screening and dental prophylaxis. Patients self

selecting themselves for participation in the periodontal disease prevention program were seen by the dental staff and appointed with the hygienist. At the first appointment with the hygienist, known as the 0-month visit, the following procedures were completed, and data collected.

1. Periodontal disease CPITN score using index teeth
2. Dental Health Belief Questionnaire
3. Diabetic Health Belief Questionnaire
4. Ascertain that the patient had at least 12 teeth
5. Select patients with CPITN average of .5 to 3.5
6. Place excluded patients on dental care waiting list
7. Demographics - Age, Sex, Blood Quantum
8. Begin dental prophylaxis and root planing
9. Personal oral hygiene instruction
10. Glycosylated hemoglobin (HbA_{1c}) baseline
11. Weight (baseline)
12. Duration of diabetes noted
13. Dental Exam
14. Appointment for dental education class

Indexing was used in the CPITN scoring to increase the probability of measuring changes around the same tooth on the second measurement 15 months later. Selected teeth in each sextant were used instead of using the worst score of all teeth in the sextant (Appendix 2). Where there were missing teeth, priorities were established for the next tooth to be used. This scoring is thought to slightly underestimate the actual treatment needs. If a tooth used for the initial CPITN score was extracted before the 15-month scoring, no readings were used for that sextant.

Patients who had very low treatment needs were excluded because their potential for improvement was minimal. Those with too great a need for corrective surgical treatment were eliminated because they had progressed beyond the benefits of a prevention program. The total of all sextant CPITN scores for each patient were averaged, and those below 0.5 and above 3.5 were excluded.

Two hygienists participated in the study, with one being assigned to the diabetic group and one to the nondiabetic group for the duration of the study. After training and experience in performing CPITN exams using index teeth, informal comparisons of the hygienists' exams on five patients were made in an attempt to standardize the two examiners. Discussions and adjustments followed the examinations until empirical differences were minimal.

The Dental and Diabetic Health Belief Questionnaires (Appendix 3) were developed with the assistance of Eric Bothwell, DDS, PhD, IHS Dental Services Branch, using the Health Belief Model described by Dr. M.H. Becker¹⁰. Questions were similar to those described by Dr. Becker¹⁸ after Givens et al. in the February, 1986 issue of The IHS Provider.

The four questions were thought to be directly related to the patients' perceived susceptibility, severity, benefits, and barriers concerning gum disease and its prevention.

Dr. Becker¹⁸ describes the "inadequate adherence to prescribed treatment plans" as "the most serious obstacle to achieving successful therapeutic outcomes, and noncompliance by diabetics is no exception." The Health Belief Model is seen as "a psychological framework for understanding patient compliance which is based upon the value an individual places on the identified goal and the likelihood that compliance will achieve that goal." The IHS Provider article by Dr. Becker described using the Health Belief Model to "explain noncompliance, to make an 'educational diagnosis,' and for designing compliance-enhancing interventions." The objective in using the Health Belief Model in this study was to stretch its use one step further—to determine if it could be used in predicting outcome of a preventive dental program which depends on self-administered oral hygiene for success.

The periodontal disease prevention education class (Appendix 4) was developed to give a consistent amount of information to patients in the most cost effective format. Patients were scheduled in groups two times each month. The ADA film, "Options: Dental Health in the Later Years," was shown and followed by discussion led by a hygienist. The discussions centered around risk factors and warning signs of periodontal disease as well as prevention and treatment of periodontal disease.

Recording measurements of weight and height allowed the calculation of Percent Body Mass Index (PBMI) and analysis of this variable as a factor in control of diabetes and changes in periodontal disease as measured by the CPITN scores.

The glycosylated hemoglobin (HbA_{1c}) measurement (also called HbA_{1c}) reflects the integrated glucose levels over the preceeding two months. The HbA_{1c} is the product of an irreversible reaction between plasma glucose and hemoglobin that is proportional to ambient glucose levels.¹⁹ The glucose molecules attach to the hemoglobin molecules for the life of the red blood cell at the time of its formation. Normal readings range from 4% to 7% and above normal from 7% to 21%.

A group of 171 patients with diabetes received initial assessment for these variables. A group of 138 nondiabetics also received the same initial assessment and treatment except for the HbA_{1c}, height and weight measurements. The nondiabetic group was composed of patients who had previously signed up on the Claremore Indian Hospital routine dental care waiting list. They had been told that they would receive dental cleaning and fillings when they were called off the waiting list. After their initial assessment and prophylaxis, they were contracted to private dentists for restorative treatment. The diabetic patients had no restorative dentistry provided, but were placed on the routine care waiting list.

After the initial measurements and dental prophylaxis by a hygienist, patients in both groups were sent 3-month recall appointments to have their oral hygiene progress reviewed. Areas of inadequate oral hygiene and new calculus formation were identified, and local factors were removed for those who responded. Personal oral hygiene instructions were reinforced.

Fifteen months after the initial assessment, patients were recalled. There were 61 diabetics and 36 nondiabetics who returned for reassessment of the CPITN, weight, and HbA_{1c}. For some patients, the 15-month recall may actually exceed 15 months, but was always at least 12 months following the 3-month recall. This variation was caused by some patients requiring more time to complete initial prophylaxis. The hygienists were instructed to make CPITN measurements before looking at previous CPITN scores in the patients record at the 15-month recall.

All data was entered on a Wang PC using a Lotus spreadsheet, and transferred to the School of Public Health, Department of Epidemiology and Biostatistics at the University of Oklahoma for statistical analysis. A combination of paired t-distributions, chi-square distributions, and analysis of variance was used in the analysis of data.

IV. RESOURCES:

The IHS Oklahoma City Area contributed a research grant for \$16,000 for statistical analysis and for the cost of a hygienist for the diabetic group during the first two years of the program. The cost of consultative services from the University of Oklahoma School of Public Health to review the initial program, and do preliminary and final analysis was \$800. The hygienist for the diabetic group performed data collection and computer entry. Other expenses were considered part of ongoing operations of the Claremore Dental Service and were absorbed by the operating budget of the Oklahoma City Area IHS Dental Program and the Claremore Service Unit Dental Program.

V. RESULTS:

The diabetic group demographics are shown in the Figure 1 below. Almost twice as many women as men participated. The mean weight and mean HbA_{1c} was about the same at the 0 month and 15 month measurement. The Percent Body Mass Index (PBMI) indicated 75.3% of the initial group of 158 and 85.3% of the 15 month group of 57 had PBMI's > 120 which means they were either overweight or obese. The HbA_{1c} values of 11.2% and 11.3% were well above the normal range of 4% to 7%.

The Indian blood quantum of the 61 diabetics who returned for the 15 month reassessment was similar to that of the 171 diabetics receiving initial assessment as shown in Figure 2. However, the 57.3% of patients in the initial group of diabetics with $\geq 3/4$ Indian blood quantum represents a disproportionately higher percent of that group compared to only 26.6% who were $\geq 3/4$ in the initial nondiabetic group (Figures 2 and 3).

SELF SELECTED DIABETIC
POPULATION CHARACTERISTICS
(N=171)

MEAN AGE	49.2	
SEX	F	63%
	M	37%

	0 MONTHS	15 MONTHS
WEIGHT	192.7 (N=176)	
	196.7 (N=54)	198.9 (N=54)
HEIGHT	66.1 (N=177)	
HBA1C	10.8 (N=148)	
	11.2 (N=54)	11.3 (N=53)

Figure 1.

BLOOD QUANTUM COMPOSITION OF
STUDY GROUPS

		DIABETIC (N=171)	NON-DIABETIC (N=195)	DIABETIC (N=59)
BLOOD QUANTUM	FULL	34.8%	12.3%	35.6%
	3/4	22.5%	14.3%	27.1%
	1/4-3/4	9.1%	13.3%	6.8%
	<1/4	33.7%	60.0%	30.5%
	$\geq 3/4$	57.3%	26.6%	62.7%

Figure 2

BLOOD QUANTUM OF THE DIABETIC GROUP VS NON-DIABETIC GROUP

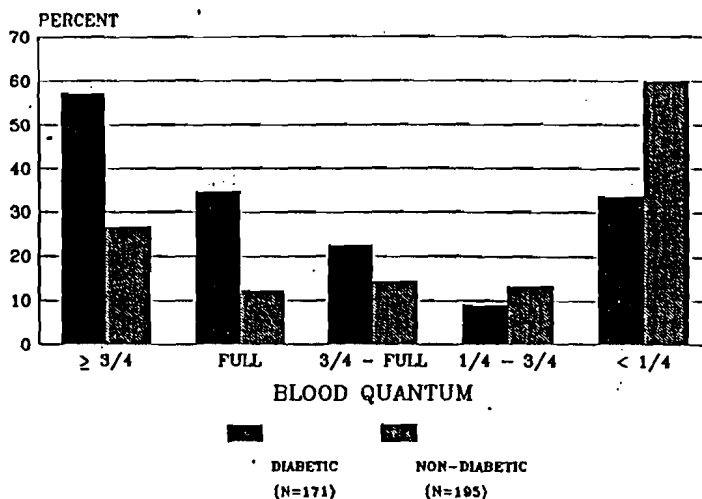


Figure 3

No difference in prevalence of CPITN ≥ 3 existed within the initial diabetic group of 154 between the high degree and low degree of blood quantum groups as shown by Figure 4. Diabetics with blood quantum $\geq 3/4$ did not have clinically or statistically significant difference ($p=0.435$) in prevalence of pocketing as measured by the percent of patients having CPITN scores of ≥ 3 when compared to diabetics with $3/4$ blood quantum.

On the other hand, there appears to be a greater difference in prevalence of pocketing between higher and lower blood quantum groups of the nondiabetic group. However, there are no p values to indicate whether the 97.3% prevalence of pocketing for the group with $\geq 3/4$ blood quantum compared to the 88.4% for the $< 3/4$ blood quantum group is statistically significant.

BLOOD QUANTUM GROUPS AND THE PREVALENCE OF CPITN ≥ 3 OF DIABETICS AND NONDIABETICS

BLOOD QUANTUM	DIABETICS (N=154)	NONDIABETICS (N=178)
$\geq 3/4$	92.6% (N=88) *	97.3% (N=37) #
$< 3/4$	89.2% (N=66)	88.4% (N=95)

* P=0.435

MEAN AGE 41.4
MEAN DIABETIC AGE 51.7

Figure 4.

A greater percent of diabetic patients attended the dental education class than nondiabetics as shown in Figure 5. Of the initial diabetic group (n=158) 51.9% attended the dental class compared to 25.6% of the nondiabetics (n=195). Almost 15% more diabetics in the initial group (n=158) attended the diabetic education class than attended the dental class. There were 5%-10% more patients attending the dental and diabetic education classes in the group that returned for the 15-month reassessment.

PERCENT ATTENDING EDUCATION CLASSES		
	DENTAL CLASS	DIABETIC CLASS
* DIABETICS	51.9% (N=158)	65.7% (N=143)
	62.7% (N=59)	71.2% (N=59)
* NON-DIABETICS	25.6% (N=195)	61.1% (N=36)

*SELF SELECTED BY SEEKING DENTAL CARE

Figure 5.

The mean initial Dental Health Belief Questionnaire score was 19.6, and for the Diabetic Questionnaire it was 18.2 out of a possible maximum score of 24. The Dental Health Belief scores of the initial 0-month group and the group returning at 15 months was nearly identical, 19.6 vs. 19.7, as shown in Figure 6. Figures 7 and 8 show the analysis of variance in the Dental Health Belief score and the change in the average maximum CPITN scores between 0 and 15 months. There appears to be a direct relationship between the higher test scores and greater decrease in maximum CPITN. However, the $p=0.3403$ indicates this relation occurs by chance a high percent of the time.

QUESTIONNAIRE SCORES		
	DENTAL	DIABETIC
MEAN HEALTH BELIEF	19.6 (N=177)	18.2 (N=169)
TEST SCORES*	19.7 (N=59)	17.7 (N=54)

* MAXIMUM SCORE = 24
RANGE WAS 5 TO 24

Figure 6.

The difference in maximum CPITN from 0 to 15 months as indicated by the average maximum CPITN scores was 0.59 with $p=.0001$ for the t-distribution of the 61 who returned for reassessment (Figure 9). Their mean age was 51.7, while the mean age of the nondiabetic group was 38.6. It is difficult to make comparisons without adjusting for age, but the nondiabetic group decreased their average maximum CPITN by 0.91 ($p=.0001$).

Regardless of the magnitude of difference between diabetic and nondiabetics, the diabetic average maximum CPITN decreased to a level near that of the general population with a mean age 13 years younger than the diabetic group (Figure 10), and only 35.5% with $\geq 3/4$ blood quantum ($n=45$).

	<u>SEVERITY</u> (AVG MAX CPITN)					
	INITIAL GROUP			RETURNING GROUP		
	MEAN AGE	0 MO	15 MO	MEAN AGE	0 MO	15 MO
DIABETIC	49.2	3.19 (N=171)	2.74 (N=61)*	51.7	3.33 (N=61)	2.74 (N=61)
NON-DIABETIC ROUTINE CARE	37.9	3.19 (N=138)	2.14 (N=36)	38.6	3.05 (N=36)	2.14 (N=36)
POPULATION PATHFINDER	36.6	2.67 (N=45)				

* PAIRED T-TEST: THE 0.59 REDUCTION IN THE AVG MAX CPITN 0 TO 15 MONTHS WAS SIGNIFICANT, $p=.0001$

Figure 9.

CHANGE IN SEVERITY (AVG. MAX. CPITN) BETWEEN 0 MONTHS AND 15 MONTHS

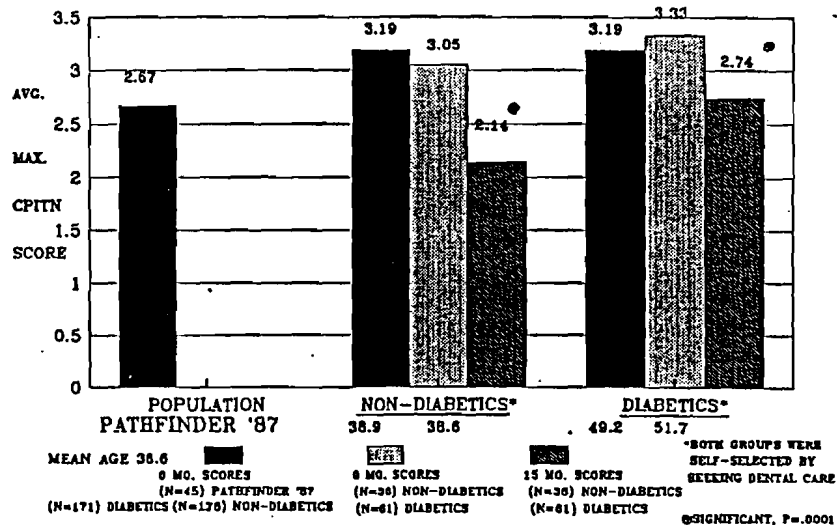


Figure 10.

Figures 11 and 12 show the prevalence of patients with CPITN ≥ 3 . Again, the age differences between diabetics and nondiabetics make comparisons between the two groups difficult. The prevalence of CPITN ≥ 3 of the nondiabetic group with a mean age of 37.9 who were called off the routine care waiting list was 90% which is considerably higher than that found for the general population in the pathfinder survey of 73% with a mean age 36.6. The prevalence of increased pocketing for the diabetic group with a mean age of more than ten years greater at 49.2 was 91%. The decrease in prevalence of CPITN ≥ 3 to 22% after 15 month for the nondiabetic group was much greater than the diabetic group. The diabetic group did decrease to 75.4% which was near the 73% of the general population almost 13 years younger. The p values for the chi-square analysis of the 0-15 month change in prevalence of CPITN ≥ 3 for both groups is $p < .001$.

	PREVALENCE (CPITN ≥ 3)					
	INITIAL GROUP			RETURNING GROUP		
	MEAN AGE	0 MO	15 MO	MEAN AGE	0 MO	15 MO
DIABETIC	49.2	91% (N=171)	75.4% (N=61)*	51.7	98% (N=61)	75.4% (N=61)*
NON-DIABETIC ROUTINE CARE	37.9	90% (N=138)	22.2% (N=36)*	38.6	91% (N=36)	22.2% (N=36)*
POPULATION PATHFINDER	36.6	73% (N=45)				

*SIGNIFICANT, P<.001

Figure 11.

CHANGES IN PREVALENCE (CPITN ≥ 3)
BETWEEN 0 MONTHS AND 15 MONTHS

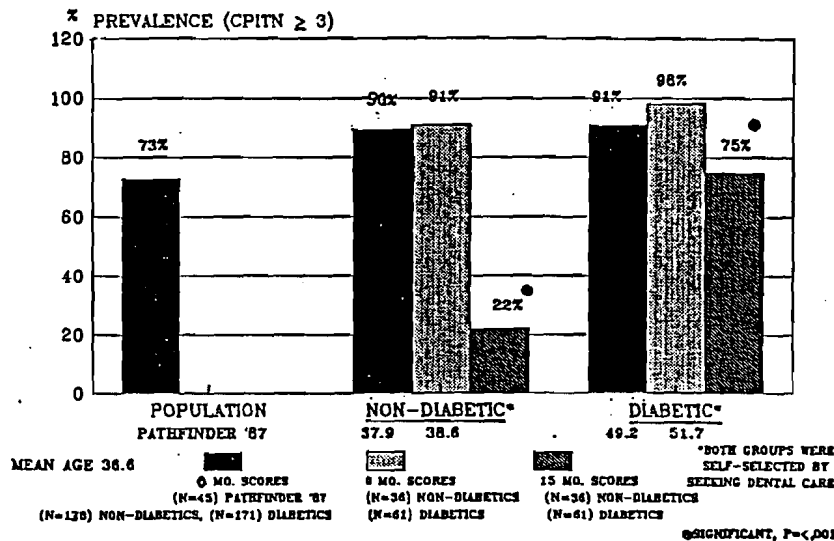


Figure 12.

The 0 month CPITN scores for the nondiabetics appear inflated and the 15 month scores are lower than expected. The low 15 month scores could have been influenced by contact with contract dental staff while having their restorative dentistry completed. It is also possible that the blinding procedure for the 15 month measurement was not completely followed, but this could not be confirmed.

Data which may be used to analyze the reduction in treatment needs required 12 months following the initiation of this periodontal disease prevention program is listed in Figures 13 and 14. By definition, the CPITN scores indicate the services required to treat the condition found in the sextant. After 15 months the group returning had a 29% reduction in total sextants with CPITN scores of 2, 3, and 4 from 82% to 53%.

CHANGE IN % OF SEXTANTS PER CPITN SCORE

CPITN SCORES	INITIAL GROUP (N=171)		RETURNING GROUP (N=61)	
	0 MO.		0 MO	15 MO
0	4%		2%	13%
1	10%		11%	28%
2	21%	} 79%	17%	22%
3	47%		53%	28%
4	11%		12%	3%
X	7%		5%	6%

CONCLUSION: A 29% REDUCTION IN THE TOTAL OF CPITN 2, 3, AND 4 SCORES REMAINS ONE YEAR AFTER PROPHYLAXIS AND PREVENTIVE ORAL HEALTH EDUCATION

Figure 13.

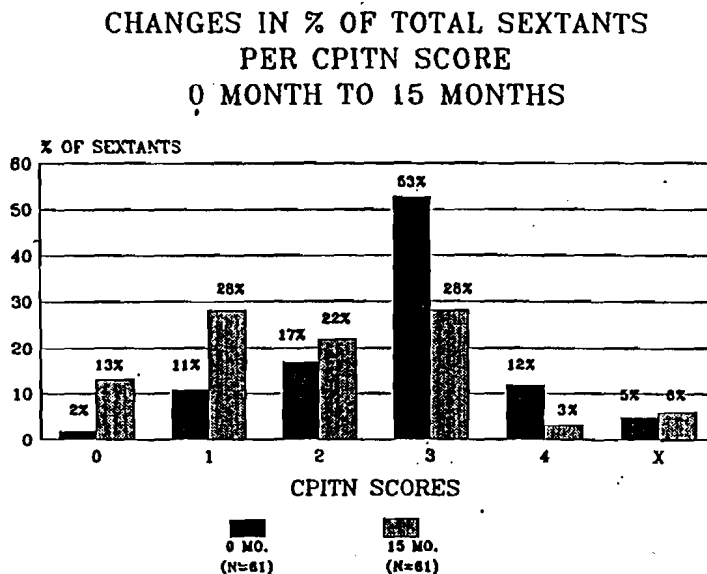


Figure 14.

A method of analyzing the "extent of conditions" is recommended by the World Health Organization.¹ The mean number of sextants requiring various combinations of treatment is calculated, i.e., those with CPITN scores of 2,3, and 4, or those with scores of 3's and 4's, and etc. The mean number of sextants per person indicates how much of the dentition on average is affected by each condition requiring treatment.

When these figures were calculated for the mean number of 2's 3's, and 4's for the diabetic group (n=59) at 0 month the result was 4.92 and for 15 months it was 3.13. This is a 39% reduction in the mean number of sextants per person with CPITN scores of 2, 3, and 4 one year after the patient was last seen. The reduction in mean number of sextants per persons with CPITN scores of 3 and 4 was 53%. It decreased from 3.86 to 1.83 (Figure 15).

EXTENT OF CONDITIONS MEAN NUMBER OF SEXTANTS/PERSON WITH SELECTED CPITN SCORES

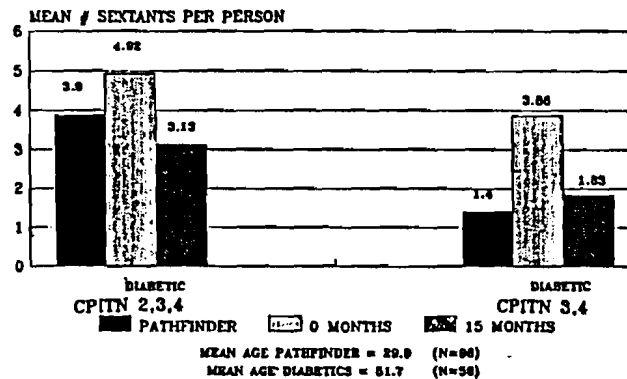


Figure 15.

VI. EVALUATION:

Initially there was difficulty in generating enough diabetic patient referrals from the Diabetic Staff. Because diabetic patients tend to have multiple problems and require multiple referrals to other services for consultation and preventive education, the Diabetic Staff had difficulty integrating yet another service into their list of referrals. The addition of "Dental" to the patient's route slip was of benefit.

The dropout rate was high. Almost 40% failed to return for the 3-month recall. After 15 months, 64% failed to return for the reassessment. An estimated 10% were eliminated from the prevention program by the established criteria for minimum number of teeth present and desirable CPITN range.

Although variance of the higher Dental Health Belief Questionnaire scores with the greater decrease in average maximum CPITN at first appears useful, the $p=.3403$ indicates it is not reliable enough to use in selecting or rejecting patients for preventive programs. Possibly, comparing the variance of health belief scores with the extent of conditions instead of the change in maximum CPITN would have resulted in a more favorable p value, but this is doubtful.

The Dental Service now recommends promoting self selection by those people who are interested in preventing their gum disease. The new approach promotes screening, and response to a cue like bleeding gums by those who are "ready" to do something about their gum disease. It discourages people from making appointments solely to "have my teeth cleaned."

This approach is in contrast to the plaque control programs of the late 1960's and 1970's when most everyone was thought capable of being transformed into model dental patients practicing plaque control if they were just given enough education and training. Now, it is thought that exposing as much of the target population as possible to cues, and promoting availability of the prevention program, may result in increased health seeking behavior by a small percent of the population. A small percent of 30,000 patients between ages of 20-45 can be a large number of patients.

This new program which relies on self selection recognizes the influence of a complex set of educational and social factors,¹⁶ and individual variations in attitudes of patients at different times in their lives which influence personal behavior.^{20,21,22,23,24,25} It is reasonable to believe that some patients who do not self select themselves for participation in a prevention program the first time it is offered may respond positively when the program is made available at a later date.

The responsibility of dental public health professionals in this type of program is to broadly disseminate information and cues to the community, and promote increased availability of prevention dental services for those who demand them. Hopefully, the workload created each year will be compatible with the resources available to the dental program, even if some higher level or less effective services must be discontinued in favor of preventive periodontal services.

The HbA_{1c} did not change for the diabetic group returning for reassessment, which gives some indication that there was no change in behavior to prevent the harmful effects of diabetes. The HbA_{1c} should decrease with exercise and weight loss to approach ideal body mass, but the mean weight also remained about the same after 15 months.

A similar argument may be made for determining how to use the 15-month CPITN scores of X in locations where the index tooth used at 0 month CPITN scores was extracted. Some have suggested that X's should be counted as a CPITN score of 5. However, without knowledge of what caused the loss, the data would not be reliable. It also creates another increment which is not a constant interval. Being consistent with the above argument for 1's not counting more than 2's, in the analysis of data maybe 15 month X scores should be given the same score as the 0 month measurement. At least no harm would result; whereas, discarding X scores potentially results in deceptive decreases for the maximum CPITN and ≥ 3 values. In this study there was only one patient each in the diabetic and nondiabetic group whose outcome was adversely affected by the absence of index teeth at the 15 month evaluation. Because of the difficulty in performing calculations with ordinal scores, it is recommended the mean number of sextants per person be used to indicate the extent of conditions.

In Figure 15 the extent of conditions for the diabetics were reduced at the 15 month assessment to similar levels found in the general population on the pathfinder survey. The mean number of sextants with CPITN scores of 2,3, and 4 was reduced 39% and 3's and 4's were reduced 53%. The extent of conditions do not average CPITN scores, and are preferable to the average maximum score to indicate change from 0 month to 15 months.

Based on the results shown in Figure 13, and costs experienced during this study, a hypothetical situation with 1000 American Indian patients with diabetes receiving dental education and dental prophylaxis and root planing would result in treatment needs reduction amounting to \$236,550 at a cost of \$37,500.

REDUCTION IN TREATMENT NEEDS AND COSTS

PER 1000 PATIENTS, 5700 SEXTANTS X 29% = 1653 SEXTANTS
 1653 SEXTANTS @ \$50/SEXTANT AVG COST FOR TREATMENT = \$82,650

IF CPITN 4 SERVICES ARE REDUCED 9% @ \$300/SEXTANT, THEN
 5700 SEXTANTS X 9% = 513 SEXTANTS X \$300 = \$153,900

NEEDS REDUCTION \$236,550

IF 1000 PTS REQUIRE 2 ONE-HOUR HYGIENIST VISITS EACH, AND 2000
 VISITS @ 8 VISITS/DAY REQUIRES 250 DAYS @ \$150/DAY = \$37,500

Figure 16.

COST \$37,500

VII. CONCLUSIONS:

The American Indian diabetic group of 61 had a 23% decrease in prevalence of CPITN ≥ 3 from 98% to 75% one year after being seen by the hygienist. Although the improvement was not as much as noted for the nondiabetic group, the prevalence of CPITN ≥ 3 approached a level experienced by the general American Indian population of the Claremore Service Unit which had a mean age 13 years younger and lower Indian blood quanta.

The mean number of sextants for the American Indians with diabetes having conditions of CPITN 2, 3, and 4, was reduced 39% and conditions with 3's and 4's were reduced 53% one year after being seen by the hygienist. The extent of conditions of the diabetic group was similar to that of the general American Indian population of the Claremore Service Unit which had a mean age almost 22 years younger and lower Indian blood quanta.

The Health Belief Questionnaire was not effective in predicting the outcome of a periodontal disease prevention program for American Indian patients with diabetes.

More study is recommended for corroborating the data for the nondiabetic American Indian population participating in periodontal disease prevention programs.

Targeting American Indian patients with diabetes for preventive periodontal services is effective in reducing the extent of their periodontal conditions and the prevalence of pocketing over 3.5 mm even when glucose levels remain higher than normal.

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W.H.O. STANDARD FORM FOR C.P.I.T.N. DATA SUMMARIES

COUNTRY: USA-IHS

AREA: CIH
ER-Waiting Area

YEAR: JAN.
'87

REFERENCE: File: Pathfind-Wks.

Byron G. Jasper, DDS
Claremore Indian Hospital

CPTN - PERIODONTAL DISEASE STATUS AND TREATMENT NEEDS

AGE	Total Subjects	Edentulousness N (%)	Total Dentate	TABLE I					TABLE II					TABLE III			
				percentage of persons who have as highest score					(a) mean number of sextants with					oral hygiene	prophy-	complex	
				0	1	2	3	4	0	1+2+3+4	2+3+4	3+4	4	X	instruc-	laxis	therapy
				no perio- dental disease	bleeding only	calculus	shallow pockets	deep pockets	no perio- dental disease	or higher score	or higher score	shallow pockets or higher score	deep pockets	excluded, less than 2 teeth	TN 1	TN 2	TN 3
											%	% (MNS)	%				
19-44	95	1	94	0	4.3	35.1	52.1	8.5	.6	5.2	3.9	1.4	.1	.1	100%	95.7%	8.5%
35-44	30		30	0	0	26.7	56.6	16.7	.6	1.3	2.5	1.2	.1	.1	(b) Alternate Version (Sextants are considered separately - not cumulatively)		

*Should be excluded from further analysis

TABLE IV: DISTRIBUTION OF DENTATE PERSONS BY THE NUMBER OF SEXTANTS HAVING EACH SCORE (0, 1, 2, 3, 4, or X)

No. of Sextants	Sextant Scores					
	0	1	2	3	4	X
0	64	38	7	37	86	90
1	9	22	20	25	5	2
2	13	18	16	16	2	0
3	5	7	24	9	0	2
4	3	5	18	3	1	0
5	0	3	9	4	0	0
6	0	1	0	0	0	NA

Note: The sum of each vertical line is N or 100%.
Six missing sextants are not applicable (N.A.) because

BASIC SAMPLING METHOD

INDEX AGE GROUPS
(for international comparisons)

15-19
35-44
65-74

Index Teeth Used

Use 7-10 sampling sites
to obtain a total sample of
200-250 per age group.

PERIODONTAL SCREENING

CPTIN

<u>SCORE</u>	<u>CRITERIA</u>	<u>TREATMENT NEEDS</u>
0	no disease	No treatment needed
1	bleeding on probing	OHI
2	supra or subgingival calculus	OHI and scaling
3	3.5 - 5.5 mm pocket	OHI and scaling, root planing
4	>5.5 mm pocket	Complex treatment and further periodontal evaluation

C.P.I.T.N.

VOLUME 32—NO. 3 J. AINAMO—WHO INDEX OF TREATMENT NEEDS*

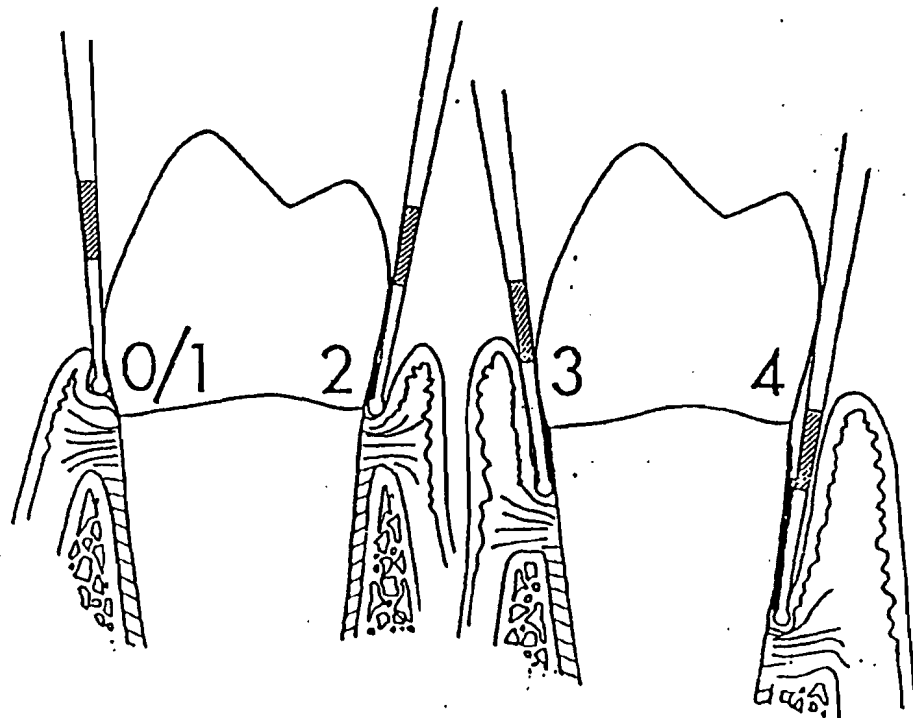


Fig. 3.

WE MODIFIED THE CPITN
BY SELECTING CERTAIN TEETH

ORDER OF PRIORITY

1st Molars
2nd Molars
3rd Molars
2nd Premolars

- Use Maxillary right central, left central, right lateral, left lateral, right cuspid, left cuspid
- Use Mandibular left central, right central, left lateral, right lateral, left cuspid, right cuspid
- Use the highest reading on the tooth selected.
- If a tooth used for an initial score was extracted, no readings are used for that sextant.

DENTAL CARE QUESTIONNAIRE

Please circle the number closest to Agree or Disagree which honestly represents the way you feel about gum disease (Peridontal Disease or Pyorrhea).

(Your answers to these questions will not affect your quality of treatment.)

1. There is a good chance I will lose some teeth from gum disease in my lifetime.

Strongly Disagree 1 2 3 4 5 6 Strongly Agree

2. It would not be so bad if I lost teeth from gum disease.

Strongly Disagree 1 2 3 4 5 6 Strongly Agree

3. I can keep from losing teeth from disease by taking care of my teeth and gums.

Strongly Disagree 1 2 3 4 5 6 Strongly Agree

4. It is difficult to find time during the day to clean my teeth thoroughly and prevent gum disease.

Strongly Disagree 1 2 3 4 5 6 Strongly Agree

CHART # _____
 AGE _____
 SEX _____
 CPITN _____
 H B _____
 CLASS ATTENDANCE _____

DIABETES CARE QUESTIONNAIRE

Please circle the number closest to Agree or Disagree which honestly represents the way you feel about your diabetes care. (Your answers to these questions will not affect the quality of care you receive)

1. Since I have diabetes there is a good chance that I will lose my feet or become blind in my lifetime.

Strongly disagree 1 2 3 4 5 6 Strongly agree

2. It would not be so bad for me to lose my feet or become blind.

Strongly disagree 1 2 3 4 5 6 Strongly agree

3. If I eat right and exercise regularly I will probably not lose my feet or become blind.

Strongly disagree 1 2 3 4 5 6 Strongly agree

4. It is difficult to find time during the day to include the exercise and food preparation needed to keep my blood sugar controlled.

Strongly disagree 1 2 3 4 5 6 Strongly agree

Chart #: _____

Age : _____

Sex : _____

HT : _____

WT : _____

HBA1C : _____

Day Care Attendance: _____

PERIODONTAL EDUCATION CLASS

The following is information to be discussed and presented in the Periodontal Education Class:

Show the ADA-Periodontal Film - "Options: Dental Health in the Later Years"

The Claremore Indian Hospital Surveys indicate:

1. 100% of the people over 18 years old using IHS facilities show early signs of gum disease around several teeth. 60% of the surveyed population over 28 years old had bone loss.
2. 73% age 35-44 show more advanced signs of gum disease.
3. Tooth loss in the Native American population is substantial after age 35. The ravages of uncontrolled periodontal disease and caries problems takes a heavy toll on tooth mortality. Gum disease is the major cause of tooth loss in adults.

Patients who have any of the following risk factors may be more likely to have gum disease and/or have more severe gum disease.

- a. Diabetes
- b. Parents or Grandparents with diabetes
- c. Smoking or tobacco use
- d. Clenching or grinding teeth
- e. Medications which dry the mouth such as antihistamines, blood pressure medicines
- f. Steroids and oral contraceptives
- g. Stress and depression
- h. Crooked teeth
- i. Between meal smoking or surgary food.
- j. Aging

Discuss the Eight Warning Signs of Gum Disease:

1. Gums that bleed or when you brush your teeth or use toothpicks.
2. Gums that are red, swollen, or tender.
3. Gums that have pulled away from your teeth.
4. Pus between your teeth and gums when the gums are pressed.
5. Permanent teeth that are loose or separating.
6. Any change in the way your teeth fit together when you bite.
7. Any change in the way your partial dentures fit.
8. Bad breath.

Discuss the following question: What does gum disease do to you?

1. List on a blackboard symptoms and warning signs of gum disease. Ask for class participation in developing this list of symptoms/warning signs.
2. Make diagram of periodontium and structures involved. (use the ADA-Flip Chart).

3. List symptoms that may occur during phases of gum disease.
4. Define Bacteria (environment and growth patterns).
5. For Diabetics - infections can be severe. They can throw off blood sugar control. The progression of periodontal disease is also a consideration.

Discuss the Prevention and Treatment of Periodontal Disease.

1. There is presently no immunization or community water treatment to prevent gum disease like fluoride prevents tooth decay. Patients must rely on their own understanding and efforts to prevent gum disease.
2. Prevention is an investment of your time. Your time investment can pay for your good dental health and improve diabetic control.
3. Discussion in general terms periodontal surgery information and other treatment needed because of periodontal involvement (appearance, biting and eating)

A dental assistant/RDH will demonstrate brushing and flossing.



It appears, as Dr. Mark Shlossman had observed with the Pima Indians in Arizona, that even when the blood sugar of diabetic patients remained high, their periodontal condition could improve with good oral hygiene. But one has to question whether oral hygiene was the reason for improvement in the diabetic group studied. Considering that diabetes is a more life threatening disease, and there was no improvement in the HbA_{1c}, one would be reluctant to attribute much improvement in CPITN status to improved oral hygiene. Since no debris index data was collected, one can only speculate about the oral hygiene factor. If the improvement in the CPITN scores was from the clinical therapy and not from improved oral hygiene, perhaps the improvement of those who failed to return for the 15-month check was similar to those who returned.

Considering the high average maximum CPITN score of the nondiabetics of 3.19, the pathfinder score of 2.67, and the diabetic score of 3.19, the score for the nondiabetic group appears to be inflated. Further study is recommended before conclusions about the magnitude of difference between these groups are formed. Comparing the change in extent of conditions between the two groups would more accurately reflect differences.

Use of the average maximum CPITN as a determinate of severity of periodontal disease has limitations. The numerical values of the CPITN are ordinal data, and do not progress in constant intervals. Because the numbers represent rank order of the extent of treatment required, the values obtained by averaging the maximum CPITN may be of questionable use. Intervals do exist among the CPITN scores of 2, 3, and 4. All three relate to progressive degrees of pocketing, with the 2 score representing pockets less than 3.5 mm, a 3 score representing 3.5 mm to 5.5 mm, and a 4 representing over 5.5 mm. However, a CPITN score of 1 has no less pocketing than a score of 2, and the intervals between 2,3, and 4 are not constant.

In the 0-month group of 61, there were no maximum scores of 1, and only one score of 2. However, in the 15 month group of the 61 there were seven 1's and seven 2's which were maximum scores. Because there is no difference in pocketing between the 1 and 2 CPITN scores, perhaps all 1's should be averaged as 2's if the average maximum score is to represent progression of pocketing. When a new average maximum CPITN was calculated after substituting 2's for 1's, the 15 month score for the diabetic group changed from 2.74 to 2.81 and the nondiabetic increased from 2.14 to 2.22. This still represents a substantial overall improvement in the average maximum CPITN for the nondiabetics of 0.83, and 0.52 for the diabetics 12 months after they were last seen by a dental professional.