ORIGINAL RESEARCH PAPER

Dental Science

KEY WORDS: 1. Periodontal indices, 2. Plaque index, 3. gingival index, 4. Glycated hemoglobin (HbA1c),

CORRELATION BETWEEN PERIODONTAL INDICES [PLAQUE INDEX (PI), GINGIVAL INDEX (GI)] AND GLYCATED HEMOGLOBIN (HBA1C), IN TYPE 2 DIABETES MELLITUS.

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ABSTRACT

Objectives: The objective was to find out Correlation between the clinical (periodontal indices) and metabolic changes (glycated hemoglobin) following non-surgical periodontal treatment (pre and post), in diabetic (Type 2) patients.
Material and methods: Forty type 2 diabetic patients with generalized chronic periodontitis were selected. Subjects were randomly assigned into two groups.
Data collection: Periodontal indices [Plaque index (PI), gingival index (GI)], were recorded at baseline, 1st and 3rd months. glycated hemoglobin (HbA1c), was analyzed at baseline, 1st and 3rd months following the non surgical periodontal therapy. The treatment group received scaling and root planning whereas the control group received no periodontal treatment.
Results: The results showed significant Correlation between periodontal indices and, levels of HbA_{1c} in Type 2 diabetes mellitus patients.
Summary and conclusions: Non surgical periodontal therapy is associated with improved glycemic control in Type 2 diabetes mellitus patients.

INTRODUCTION

Diabetes Mellitus, the most widespread disease of mankind, is a syndrome characterized by chronic hyperglycemia and disturbance of carbohydrate, fat and protein metabolism associated with absolute or relative deficiencies in insulin secretion and/or insulin action[1].

Prevalence of diabetes in adults worldwide was estimated to be 4.0% in 1995 and predicted to rise to 5.4% in the year 2025[2]. It is higher in developed than in developing countries. The number of adults with diabetes in the world will rise from 135 million in 1995 to 300 million in the year 2025[2]. There will be 42% increase, from 51 to 72 million, in the developed countries and a 170% increase from 84 to 228 million, in the developing countries[3]. Periodontal disease is an infection that affects the periodontium, the tissues that support the teeth. It is bacterial infection caused by gram negative anaerobes, which populate the sub gingival plaque. These putative pathogens Include Aggregatibacter actinomycetecomitans, Porhyromonas ginvivalis, Prevotella intermedia, Bacteroides forsythus and Spirochetes. Gram negative organisms specifically of the Bacteriodes species may affect the endocrine metabolic status of the diabetic patient.[4]

Research has been conducted into the relationship between diabetes and periodontal disease since the 1960s.[5] Prevalence of periodontal disease among individuals with inadequately controlled type-2 diabetes mellitus is generally higher than that of people free of systemic disorder.[4] Scientific evidence on the effects of periodontal disease and diabetes has emerged lately. Various studies have correlated response to periodontal treatment in diabetic patients and its influence on their metabolic control[5].

AIM & OBJECTIVES

The objective was to find out Correlation between the clinical (periodontal indices) and metabolic changes (glycated hemoglobin) following non-surgical periodontal treatment (pre and post), in diabetic (Type 2) patients.

METHODOLOGY

A prospective, interventional, comparative, clinical study was carried out on 40 type 2 diabetic patients with generalized chronic periodontitis. The patients were selected for study according to inclusion and exclusion criteria (table 1). Patients were in follow up for 3 months.

Table 1: Inclusion and Exclusion Criteria

INCLUSION CRITERIA	EXCLUSION CRITERIA
1. Age group: 35-70 years 2. Presence of moderately controlled type 2 diabetes mellitus with HbA1c 6-8% 3. Clinical diagnosis of generalized chronic periodontitis with probing Pocket depth. 4. No major diabetic complications like retinopathy, nephropathy, cardiopathy and cerebrovascular changes. 5. No periodontal treatment six months prior to the study	1. Presence of any systemic disease that could influence the course of periodontal disease like leukaemia, febrile conditions, chronic respiratory diseases etc. 2. Intake of antibiotics or anti-inflammatory drugs in the last four months. 3. Current smokers or ex-smokers for four to six months. 4. Patients on anticoagulation therapy and Pregnancy 5. Radiographs showing any periapical pathology.

Study consisted of 2 groups:

After randomization by computer software **Group I** - (Study group) consisted of 20 patients with type II Diabetes Mellitus who were subjected for scaling and root planning. **Group II** - (Control group) - consisted of 20 patients with type II Diabetes Mellitus who were not be subjected for scaling and root planning. **Procedure:** All subjects were asked to report to the clinic after fasting over night (8-12 hours) and the recordings of the dental status were made. The following dental variables were measured; Plaque index (Sillness and Loe), Gingival bleeding index (Loe and Sillness).

Treatment Regimen

Conventional periodontal treatment, scaling and root planning under local anesthesia (if necessary) will be carried out.

After scaling and root planning, following periodontal parameters were recorded at baseline:

Plaque Index (PI), Loe H., (1967)[6] A mouth mirror and a dental probe were used after air drying of the teeth to assess

plaque on four gingival areas of the tooth that is- distal -facial, mesial- facial, facial and ligual surfaces of each tooth. Assessed according to the Criteria (Table 2,3)

Table 2: Plaque Index (PI) Criteria

0	No plaque
1	A film of plaque adhering to the free Gingival margin and adjacent area of the tooth.
2	The plaque may be recognized only by running a probe across the tooth surface.
3	Moderate accumulation of soft deposits with in the gingival pocket, on the gingival margin and / or adjacent tooth surface, which can be seen with the naked eye.
4	Abundance of soft matter with in the gingival pocket and/ or on the tooth and gingival margin.

$$\text{Plaque score/ person} = \frac{\text{Total score}}{\text{Number of surfaces examined}}$$

Table 3: Plaque Index (PI) Score

Score	Conditions
0	Excellent
O.1–0.9	Good
1.0–1.9	Fair
2.0–3.0	Poor

Gingival Index (GI), Loe and Silness, (1963)[6] The tissue surrounding each tooth is divided into four gingival scoring units: distal facial papilla, facial margin, mesial facial papilla and the entire lingual gingival margin. Periodontal probe and mouth mirror was used to assess the gingival tissue. Each of the four gingival units is assessed according to the criteria (Table 4,5):

Table 4: Gingival Index (GI) criteria

0	Normal Gingiva
1	Mild inflammation, slight changes in color, slight edema no bleeding on probing.
2	Moderate inflammation, redness, edema and glazing, bleeding on probing.
3	Severe inflammation marked redness and edema, ulcerations, tendency to spontaneous bleeding.

$$\text{Gingival score/ person} = \frac{\text{Total score}}{\text{Number of surfaces examined}}$$

Table 5: Gingival Index (GI) Scores

Gingival Scores	Condition
0.1 – 1.0	Mild gingivitis
1.1 – 2,0	Moderate gingivitis
2.1 – 3.0	Severe gingivitis

Glycated Hemoglobin (HbA1c test) [7] Glycosylated (or glycated) hemoglobin (Hemoglobin A1c, HbA1c,) In the normal 120-day life span of the red blood cell, glucose molecules react with hemoglobin, forming glycated hemoglobin used primarily to identify the average plasma glucose concentration over prolonged periods of time. It is formed in, none enzymatic pathway by hemoglobin's normal exposure to high plasma levels of glucose. According to American Diabetic Association (ADA) 20107: Below 6.5%, Non diabetic and Above or equal 6.5% Diabetic (Table 6).

Table 6: Criteria for the Diagnosis of Diabetes

Criteria for the Diagnosis of Diabetes		
Measurements	**Diagnostic Values for Diabetes**	**Characteristics**
Glycosylated hemoglobin (HbA1c)	≥ 6.5%	The test should be performed in a laboratory using the standarized method. It reflects average blood glucose levels over a 2- to 3-month period of time

Criteria for the Diagnosis of Diabetes mellitus (ADA2010)[7]

Recall / follow up and Statistical Analysis

The periodontal parameters were recorded again at, 3 month interval. Patient were re-evaluated for clinical parameters like Plaque Index, Gingival Index and Biochemical investigation namely Glycated hemoglobin. The results are given as mean and standard deviation values. To compare the two groups, t paired and t unpaired test was used.

RESULTS

Total of forty subjects belonging to an age group of 35-70 years were included in the study. Subjects included were 20 men and 20 women and Mean age were Study group 50.46 years and Control group 40.73 years. (Table 7, Graph 1)

Periodontal indices

Plaque index: The mean plaque score at baseline was 1.7985 in the study group and 1.8185 in the control group. At the baseline the mean plaque index score was not statistically significant between the groups (p=0.645 ns). It was observed that the mean plaque index score was statistically significant at the 3rd month when compared between the groups (p=0.001 VHS) (Table 8 Graph I) **Gingival index scores:** The gingival index score, Intergroup comparisons showed statistically significant difference at the 3rd month (p=0.002 vhs) (Table 8). The mean gingival index score in the study group was 1.6930 and 1.6910 in the control group. There was no statistically significant difference in the gingival index score between the study and the control group at baseline (p=0.935 ns) (Table 8 Graph I).

Metabolic parameter

Glycated Hemoglobin (HbA1c): The baseline mean HbA1c value for the study group was 6.9450 ±.96599 and for the control group was 6.7750 ± .75803. At baselines were no statistically significant differences between the two groups. Both the groups showed moderate metabolic control. At 3rd month mean HbA1c value for the study group was 6.6944 ±0.84260 and for the control group was 7.5500 ± 0.58264. At 3rd month were statistically highly significant differences between the two groups. Study groups showed better metabolic control. (Table 8 Graph I).

CONCLUSION

Conclusion can be derived from the present study that periodontal care should be undertaken along with standard measures for the diabetic. In Type 2 diabetes mellitus patients periodontal indices and glycated hemoglobin strongly correlated and Non surgical periodontal therapy is associated with improved glycemic control of patients.

Table 7: Demographics of study

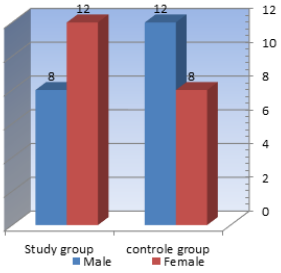
Group (T2DM and CGP)	Mean age	male	female	Total no
Study group	50.46	8	12	20
Control group	40.73	12	8	20
T2DM = type 2 diabetes mellitus CGP = chronic generalized periodontitis				

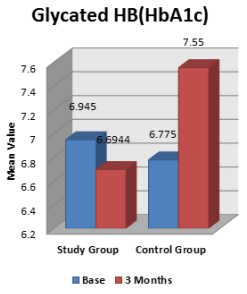
Table 8: Comparison of plaque index, gingival index and Hba1c between study and control group at baseline and 3rd month

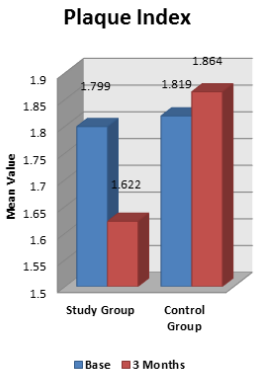
Parameters			N	MEAN	Std. deviation	P
Plaque index	**Baseline**	**Study**	20	1.7985	0.53386	P=0.645 ns
		Control	20	1.8185	0.37489	

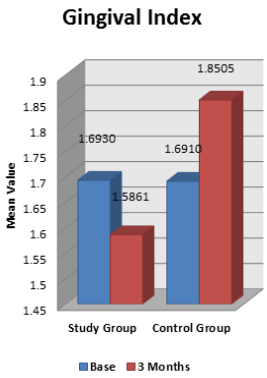
	3 months	**Study**	20	1.6217	0.19355	P=0.001
		Control	20	1.8635	0.22399	vhs.
Gingival index	**Baseline**	**Study**	20	1.6930	0.28075	p=0.93
		Control	20	1.6910	0.26392	5 ns
	3 months	**Study**	20	1.5861	0.15549	P=0.002
		Control	20	1.8505	0.32034	hs
Hba1c	**Baseline**	**Study**	20	6.9450	0.96599	0.575 ns
		Control	20	6.7750	0.75803	
	3 months	**Study**	20	6.6944	0.84260	0.002
		Control	20	7.5500	0.58264	vhs
NS = Not significant, HS = high significant, VHS =Very high significant						

Graph 1
Demography of study









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