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Effect of Non-Surgical Periodontal Therapy (NSPT) in Type 2 Diabetes Mellitus patients (T2DM) with chronic periodontitis.

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Abstract

Background: Periodontitis is often associated with diabetes and might be considered one of the complications of Diabetes mellitus (DM), both in Type 1 (T1DM) and Type 2 (T2DM). This clinical study was designed to evaluate the effects of scaling and root planning in chronic periodontitis condition of existing Type 2 Diabetes patients based on blood parameters like Fasting blood sugar (FBS), Post prandial blood sugar(PPBS), HbA1c, C-Peptide and Fasting insulin levels.

Materials and Methods: The trial was designed as a randomized controlled clinical trial with a sample size of total of 100 both male and female between age group 45 to 65 with chronic periodontitis having Type 2 Diabetes for more than 5 years. Test group taken as patients treated with NSPT and Control group were patients not treated for chronic periodontitis. Blood parameters like Fasting Blood sugar (FBS), Post Prandial blood sugar (PPBS), HbA1c, C-Peptide, Fasting Insulin were recorded at baseline, 12 weeks after non-surgical periodontal therapy (NSPT) after taking consent from the patient.

Results: In both test and control groups there was significant difference ($p<0.0001$) in Fasting Blood sugar (FBS), Post Prandial blood sugar (PPBS), HbA1c, C-Peptide, Fasting Insulin from baseline to the post treatment (NSPT) till 12-week period.

Conclusion: From the present study we can conclude that there is significant association between Diabetes

states and periodontitis. Treatment of periodontitis in existing Type 2 Diabetes can control the Diabetic condition and vice versa.

Keywords: Diabetes, Periodontitis, Insulin resistance, Fasting plasma glucose

Introduction

Periodontitis is a bacterial infection associated with Gram negative anaerobes. Diabetes mellitus (DM) is a clinically and genetically heterogeneous group of metabolic disorders manifested by abnormally high levels of glucose in the blood due to a deficiency of insulin secretion or resistance to insulin action[1]. A greater periodontitis prevalence and severity has been observed in people with diabetes relative to the general population[2].

Diabetes mellitus is a complicated metabolic disorder characterized by hypofunction or lack of function of the beta cells of the islets of Langerhans in the pancreas, leading to high blood glucose levels and excretion of sugar in the urine[3]**.** Diabetes is the commonest among metabolic disorders and its incidence is on the increase all over the world[4]**.** It affects 2 to 10% of the human population[5].

Many investigators have proposed a bipartisan relationship between diabetes mellitus (DM) and periodontal disease[6]**.** Persistent gram-negative periodontal infection leads to decline in insulin sensitivity in patients with diabetes through up-regulation of proinflammatory cytokines, and uncontrolled hyperglycaemia per se increases the severity of periodontal disease by an accumulation of advanced glycation end products and subsequent destruction of periodontal supporting tissue[6]. Therefore, the strong interplay of pathogenic mechanisms between the two diseases makes their association more vicious.

Nonsurgical periodontal therapy (NSPT) is the initial step in the management of periodontal diseases. The target of NSPT is to modulate or abolish the microbes and other causative factors implicated in gingival and periodontal diseases[7]**.**The effect of NSPT on glycaemic control in patients of diabetes with CP has been studied extensively in erstwhile reviews and meta-analyses[8,9,10]. However, there is a dearth of data regarding the impact of scaling and root planing (SRP) alone without the supportive use of any systemic or topical antibiotics, on glycaemic control and periodontal parameters in patients with type 2 DM (T2DM) in ailing from concurrent CP.

Materials and Methods

Patients with existing diabetes for more than 5 years with chronic periodontitis were treated after taking blood sample for Fasting blood sugar, Post prandial blood sugar, Fasting insulin, HbA1c and C-peptide. Test group taken as patients treated with NSPT and Control group were patients not treated for chronic periodontitis. Scaling and Root planning was done for Test group. After 12 weeks the blood samples were collected again and evaluated. The study included patients with pocket depth of less than or equal to 5mm (≤5) and 5 years of diabetes history. The teeth selected were 15,16 and 17 for measuring periodontal pocket depth. Patients with previous periodontal treatment and patients suffering from any systemic diseases, undergoing any periodontal therapy, taking antibiotic or having taken antibiotics in past 3 months, smokers, pregnant women lactating mothers were excluded from the study.

Statistical Analysis

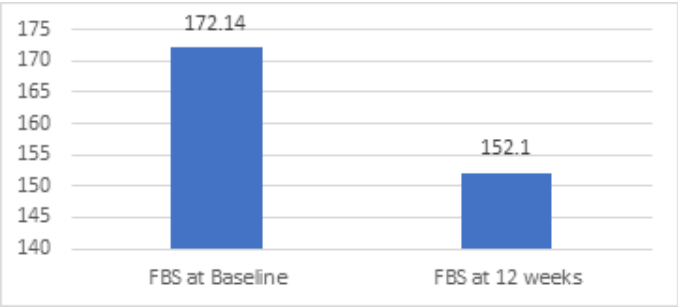
The data was statistically analysed using Statistical Package for Social Sciences (SPSS) version 22. Descriptives, Frequencies and T test was carried out for comparison between groups and variables.

Results

Table 1-a: Intragroup comparison of FBS at baseline and 12 weeks

	Timeline	Mean	Standard Deviation	P value
Control Group	FBS at Base Line	170.21	27.96	0.21
	FBS at 12 Weeks	166.45	23.11	
Test group	FBS at Base Line	171.76	34.23	0.001***

On intragroup comparison of FBS values a highly statistically significant difference (p<0.0001*) was noted from baseline to 12 weeks. A significant reduction in FBS was noted from baseline to 12 weeks post Scaling and Root Planing (SRP).

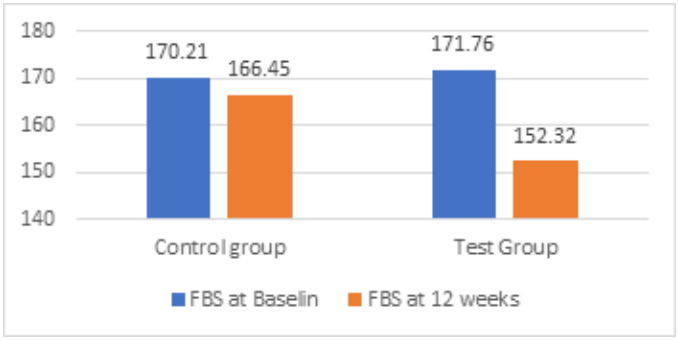


Graph 1: Intragroup comparison of FBS at baseline and 12 weeks

Table1-b: Intergroup comparison of FBS at baseline and 12 weeks.

Timeline	Mean	Standard Deviation	P value
FBS at Base Line	172.14	36.07	0.0001*
FBS at 12 Weeks	152.10	33.56	

On comparison of FBS values between Control Group and Test group a highly statistically significant difference (p<0.001***) was noted in the test group from baseline to 12 weeks. However, there was no significant difference (p<0.21) among the control group from baseline to 12 weeks

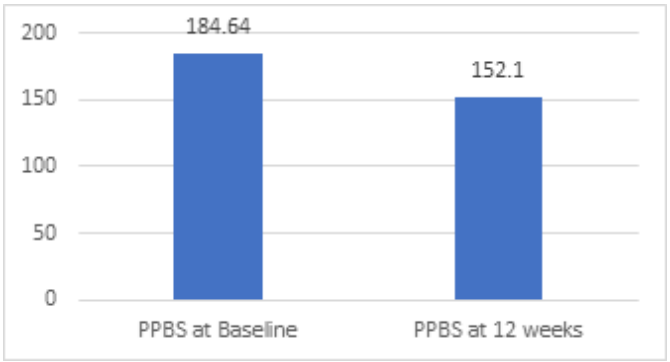


Graph 2: Intergroup comparison of FBS at baseline and 12 weeks

Table 2-a: Intragroup comparison of PPBS at baseline and 12 weeks

Timeline	Mean	Standard Deviation	P value
PPBS at Base Line	184.64	28.82	0.0001*
PPBS at 12 Weeks	160.30	34.79	

On intragroup comparison of PPBS values a highly statistically significant difference (p<0.0001*) was noted from baseline to 12 weeks. A significant reduction in PPBS was noted from baseline to 12 weeks post Scaling and Root Planing (SRP).



Graph 3: Intragroup comparison of PPBS at baseline and 12 weeks

Table 2-b: Intergroup comparison of PPBS at baseline and 12 weeks.

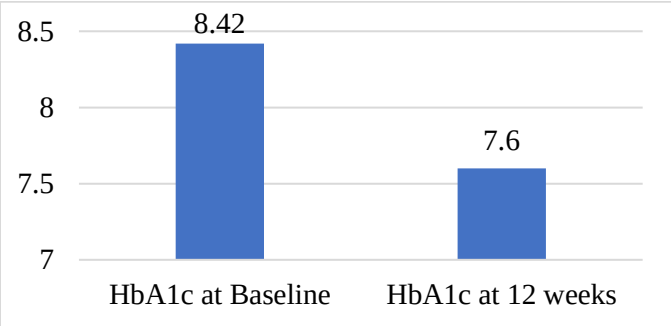
	Timeline	Mean	Standard Deviation	P value
Control group	PPBS at Base Line	182.21	18.21	0.09
	PPBS at 12 Weeks	177.67	17.98	
Test group	PPBS at Base Line	183.82	21.76	0.001**
	PPBS at 12 Weeks	160.89	24.65	

On comparison of PPBS values between Control Group and Test group a highly statistically significant difference (p<0.001**) was noted in the test group from baseline to 12 weeks. However, there was no significant difference (p<0.09) among the control group from baseline to 12 weeks. (Table 4)

Table 3-a: Intragroup comparison of HbA1C at baseline and 12 weeks.

Timeline	Mean	Standard Deviation	P value
Hba1c at Base Line	8.42	0.76	0.001**
Hba1c at 12 Weeks	7.60	0.94	

On intragroup comparison of HbA1c values a highly statistically significant difference (p<0.001**) was noted from baseline to 12 weeks. A significant reduction in HbA1c was noted from baseline to 12 weeks post Scaling and Root Planing (SRP).



Graph 4: Intragroup comparison of HbA1c at baseline and 12 weeks.

Table 3-b: Intergroup comparison of HbA1c at baseline and 12 weeks.

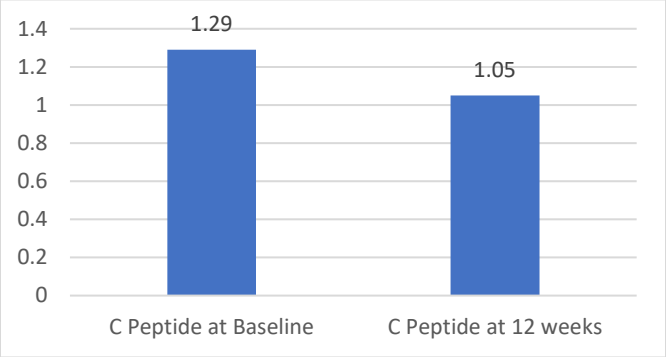
	Timeline	Mean	Standard Deviation	P value
Control Group	Hba1c at BASE LINE	8.33	0.59	0.11
	Hba1c at 12 WEEKS	8.02	0.65	
Test group	Hba1c at BASE LINE	8.39	0.77	0.001**
	Hba1c at 12 WEEKS	7.65	0.83	

On comparison of HbA1c values between Control Group and Test group a highly statistically significant difference (p<0.001**) was noted in the test group from baseline to 12 weeks. However, there was no significant difference (p<0.11) among the control group from baseline to 12 weeks.

Table 4-a: Intragroup comparison of C-peptide at baseline and 12 weeks.

Timeline	Mean	Standard Deviation	P value
C peptide at BASE LINE	1.29	0.50	**0.001****
C peptide at 12 WEEKS	1.05	0.43	

On intragroup comparison of C peptide values a highly statistically significant difference (p<0.001**) was noted from baseline to 12 weeks. A significant reduction in C peptide was noted from baseline to 12 weeks post Scaling and Root Planing (SRP)



Graph 5: Intragroup comparison of C peptide at baseline and 12 weeks.

Table 4-b: Intergroup comparison of C-peptide at baseline and 12 weeks.

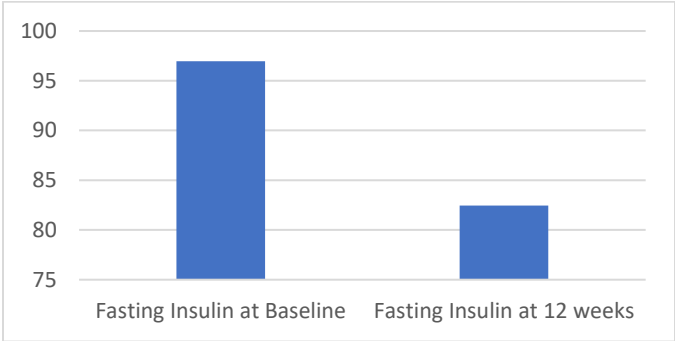
	Timeline	Mean	Standard Deviation	P value
Control Group	C-PEPTIDE AT BASE LINE (ng/mL)	1.23	0.36	0.32
	C-PEPTIDE AFTER 12 WEEKS (ng/mL)	1.17	0.28	
Test group	C-PEPTIDE AT BASE LINE (ng/mL)	1.27	0.42	0.005**
	C-PEPTIDE AFTER 12 WEEKS (ng/mL)	1.06	0.39	

On comparison of C peptide values between Control Group and Test group a highly statistically significant difference ($p<0.005$**) was noted in the test group from baseline to 12 weeks. However, there was no significant difference ($p<0.32$) among the control group from baseline to 12 weeks.

Table 5-a: Intragroup comparison of Fasting Insulin at baseline and 12 weeks.

Timeline	Mean	Standard Deviation	P value
Fasting Insulin at BASE LINE	96.96	43.80	0.0001**
Fasting Insulin at 12 WEEKS	82.45	33.91	

On intragroup comparison of Fasting Insulin values a highly statistically significant difference ($p<0.0001$**) was noted from baseline to 12 weeks. A significant reduction in Fasting insulin was noted from baseline to 12 weeks post Scaling and Root Planing (SRP).



Graph 6: Intragroup comparison of Fasting Insulin at baseline and 12 weeks.

Table 5-b: Intergroup comparison of Fasting Insulin at baseline and 12 weeks.

	Timeline	Mean	Standard Deviation	P value
Control Group	Fasting Insulin AT BASE LINE	95.9	32.12	0.08
	Fasting Insulin AFTER 12 WEEKS	92.8	34.21	
Test group	Fasting Insulin AT BASE LINE	96.6	38.54	0.001**
	Fasting Insulin AFTER 12 WEEKS	83.2	36.27	

On comparison of Fasting Insulin values between Control Group and Test group a highly statistically significant difference ($p<0.001$**) was noted in the test

group from baseline to 12 weeks. However, there was no significant difference ($p<0.08$) among the control group from baseline to 12 weeks.

Discussion

The aim of the present study is to evaluate FBS, PPBS, HbA1c, C peptide, Fasting insulin levels in chronic periodontitis with Type II diabetes mellitus patients with and without SRP.

The results of this study that there is statistically significant reduction in blood parameters in chronic periodontitis with type II diabetes mellitus after scaling and root planing (SRP).

A review article, examining the relationship between diabetes and chronic periodontitis, concluded that the relationship is bidirectional, and more understanding is required regarding the impact of periodontal diseases on diabetes[11]. Given the high proportion (45.9%) of those with diabetes who are affected by this condition, long-term effect of periodontitis on diabetes needs further research.

In the present study a significant reduction in FBS and PPBS was noted from baseline to 12 weeks post Scaling and Root Planing (SRP) and no significant reduction was seen in the control group suggesting that scaling and root planing plays a significant role in reduction of fasting blood sugar and post prandial blood sugar.

A significant reduction in C peptide and fasting insulin was noted from baseline to 12 weeks post Scaling and Root Planing (SRP) and no significant reduction was seen in the control group suggesting the scaling and root planing plays a significant role in reduction of C-peptide and fasting insulin.

Whether SRP can improve diabetes mellitus remains controversial. HbA1c is one of the most important markers in T2DM patients and is used to evaluate the severity of diabetes as well as the glucose control condition. Any reduction in the HbA1c level is likely to reduce the risk of complications. Each 1% reduction in the HbA1c level would bring a relative risk reduction of 21% for any diabetes related endpoint, 21% for diabetes-related deaths, 14% for myocardial infarction, and 37% for microvascular complications[12].

Simpson et al performed a meta review and reported that the mean percentage difference in HbA1c after scaling/root planing and oral hygiene (antibiotic therapy) versus no treatment/usual treatment after 3 to 4 months was 0.40%, a value higher than that obtained in the present study[13].

Sun WL et al (2011) Periodontal intervention can improve glycaemic control, lipid profile and IR, reduce serum inflammatory cytokine levels and increase serum adiponectin levels[14].

In contrast to the present study slam SK et al (2015) demonstrated that there is an independent association between periodontitis and fasting glucose levels[15].

This clinical trial provided evidence that elimination of periodontal infection and reduction of periodontal inflammation significantly reduced the HbA1c level, thus improving diabetic metabolic control.

A more direct influence regarding the effects of periodontal infection on glycaemic control in diabetes comes from the treatment studies. There is evidence to support that periodontal infection has an adverse effect on glycaemic control as assessed with the periodontal treatment[16,17].

Other studies by Navarro-Sanchez et al., Ricardo et al., Rodrigues et al., Patricia et al., Stewart et al., and Grossi et al. also reported a significant reduction in HbA1c level[18-22].

The periodontal tissues are highly vascular. During inflammation, this vascularity is further increased, the inflammatory cytokines such as TNF-α, IL-1, IL-6, and

inflammatory mediators have been found to have important effects on glucose and lipid metabolism[23-25].

We can see the reduction in the blood parameters like FBS, PPBS, HBA1C, C peptide and fasting insulin in the individuals after non-surgical therapy as there is reduction in the severity of the periodontal parameters which reduces the inflammation in the site.

Conclusion

The study demonstrates that non-surgical therapy in chronic periodontitis patients with type II diabetes mellitus significantly reduces the blood parameters and improvement in the glycemic control confirming that there is an interrelationship between DM and periodontal disease. Therefore, periodontal treatment should be included in diabetes preventive measures.

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