

A study on the change in HbA1c levels before and after non-surgical periodontal therapy in type-2 diabetes mellitus in generalized periodontitis

Akshay Munjal¹, Yashika Jain¹, Sowmya Kote², Vineesh Krishnan³, Rafi Fahim⁴, Samruddhi Swapnil Metha⁵, Deepak Passi⁶

¹Department of Periodontology, World College of Medical Sciences and Research Hospital, Jhajjar, Haryana, ²Public Health Dentistry, KGF College of Dental Sciences, Bangalore, Karnataka, ³Conservative Dentistry and Endodontics, Sree Mookambika Institute of Dental Sciences, Kulasekharam, Kanyakumari, Tamil Nadu, ⁴Prosthodontics, Teerthankar Mahaveer Dental College and Research Center, Moradabad, Uttar Pradesh, ⁵Oral Medicine and Radiology, Bharati Vidyapeeth Deemed University Dental College and Hospital, Sangli, Maharashtra, ⁶Subdivisional Hospital, Bundu, Ranchi, Jharkhand, India

ABSTRACT

Aim: The aim of this study was to evaluate and investigate changes in HbA1c levels before and after non-surgical periodontal therapy in type-2 diabetes mellitus patients with generalized periodontitis. **Materials and Methods:** A statistically significant number of type-2 diabetes mellitus subjects diagnosed with chronic generalized periodontitis were included in the study. The selected subjects were randomly allocated to 2 groups. Group 1: Control group: Subjects who received only scaling and root planning. Group 2: Test group: Subjects received antibiotic coverage with non-surgical periodontal therapy (scaling and root planning). Clinical parameters included plaque index, gingival index, PRO MIG pocket depth, and clinical attachment level. In addition, the metabolic parameters were recorded at the same time intervals, which included fasting blood sugar, random blood sugar, and HbA1c levels. **Statistical Analysis:** ANOVA test was applied to the parameters. **Results:** HbA1c more significantly reduced by test group compared to the other group. **Conclusion:** there is definitely a positive effect of nonsurgical on HbA1c levels in type 2 diabetes mellitus. This point levels significantly reduced after conventional non-surgical periodontal therapy. **Conclusion:** There is definitely a positive effect of non-surgical periodontal therapy on HbA1c levels in type 2 diabetes patients with chronic periodontitis.

Keywords: Chronic generalized periodontitis, diabetes, HbA1c

Introduction

Periodontitis is a chronic inflammatory disease of multifactorial etiology. The primary ideological factor remains pathogenic microorganisms whereby the destruction of periodontal apparatus results from the interplay between host immune microbial interactions. Moreover, microbiologic cause periodontitis is often influenced by systemic factors.

Thus, many systemic disorders have an impact on periodontal health. Diabetes mellitus an autoimmune disorder is considered as a risk factor of periodontitis, which is often regarded as six complications of diabetes.

Diabetes mellitus is often preceded by low-grade inflammatory response. This indicates that diabetes and periodontitis may be associated through the dysregulated inflammatory immune response.

Address for correspondence: Dr. Yashika Jain, Department of Periodontology, World College of Medical Sciences and Research Hospital, Jhajjar, Haryana, India. E-mail: docyashikajain@gmail.com

Access this article online

Quick Response Code:



Website:
www.jfmpc.com

DOI:
10.4103/jfmpc.jfmpc_105_19

This is an open access journal, and articles are distributed under the terms of the Creative Commons Attribution-NonCommercial-ShareAlike 4.0 License, which allows others to remix, tweak, and build upon the work non-commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

For reprints contact: reprints@medknow.com

How to cite this article: Munjal A, Jain Y, Kote S, Krishnan V, Fahim R, Metha SS, *et al.* A study on the change in HbA1c levels before and after non-surgical periodontal therapy in type-2 diabetes mellitus in generalized periodontitis. J Family Med Prim Care 2019;8:1326-9.

Diabetes mellitus patients usually present with advanced periodontal destruction, having deficit or impaired glucose tolerance depending on the type of diabetes.

Aim and Objective

The aim of this study was to evaluate and investigate changes in HbA1c levels before and after non-surgical periodontal therapy in type-2 diabetes mellitus patients with generalized periodontitis.

Materials and Methods

A statistically significant number of type-2 diabetes mellitus subjects diagnosed with chronic generalized periodontitis were included in the study. The selected subjects were randomly allocated to 2 groups:

Group 1: Control group: Subjects who received only scaling and root planning.

Group 2: Test group: Subjects received antibiotic coverage with non-surgical periodontal therapy (scaling and root planning).

Antibiotic coverage: Rapiclav 625 (Amoxicillin 500 mg + potassium clavulanate 125 mg)

Inclusion criteria

The following were the inclusion criteria:

1. Patient's age between 30 and 70 years.
2. Presence of type 2 diabetes, criteria for the diagnosis of diabetes mellitus are symptoms of diabetes plus HbA1c $\geq 6.0\%$, random blood glucose concentration of 200 mg/dl, and fasting plasma glucose ≥ 126 mg/dl (Harrison's 15th ed, Principles of Internal Medicine).
3. Clinical diagnosis of moderate generalized chronic periodontitis defined by loss of clinical attachment of 4 to 6 mm in all quadrants. Radio-graphically assessed bone loss of 30–50%.
4. Presence of ≥ 10 teeth per dental arch, excluding third molars.
5. No previous periodontal treatment taken.
6. Signing informed consent, and commitment to post-treatment follow-up visits.
7. No modification in medication for 2 months, before or during the study.

Exclusion criteria

1. Presence of systemic disease that could influence the course of periodontal disease or hemoglobin levels in the blood
2. Intake of anti-inflammatory antibiotics for 4 weeks before the study
3. Current smokers or ex-smokers of < 5 years
4. Pregnancy or intention to be pregnant during the 6 months of study.

Clinical parameters included plaque index, gingival index, PRO-MIG pocket depth, and clinical attachment level at baseline,

1 month and 3 months. In addition, the metabolic parameters were recorded at the same time intervals, which included fasting blood sugar, random blood sugar, and HbA1c levels.

Statistical analysis

ANOVA test was applied to the parameters.

Results

HbA1c more significantly reduced by test group compared to the other group [Figure 1]. Conclusion: there is definitely a positive effect of nonsurgical on HbA1c levels in type 2 diabetes mellitus. This point levels significantly reduced after conventional non-surgical periodontal therapy.

Discussion

Diabetes is characterized by an increased susceptibility to infection, poor wound healing, and increased morbidity and mortality. Oral cavity provides a continuous source of infectious agents, and its condition often reflects the progression of systemic pathologies. Diabetes is also recognized as an important risk factor for more severe and progressive periodontitis infection or lesions resulting in the destruction of tissues and supporting bone that form the attachment around the tooth.

Type 1 or Insulin-Dependent Diabetes Mellitus (IDDM)

- Previously referred to as juvenile onset diabetes, develops when the body's immune system destroys pancreatic beta cells
- The only cells in the body that make the hormone insulin that regulates blood glucose
- Type 1 diabetes usually occurs in children and young adults, although its onset can occur at any age.

Type 2 or Non-Insulin-Dependent Diabetes Mellitus (NIDDM)

- Previously referred to as adult-onset diabetes, may account for approximately 90% to 95% of all diagnosed cases of diabetes
- It usually begins as insulin resistance, a disorder in which the cells do not use insulin properly
- As the need for insulin rises, the pancreas gradually loses its ability to produce insulin.

Periodontal disease and diabetes

Chronic hyperglycemia has been closely associated with an inflammatory response that has been linked to complications observed in diabetes. The presence of periodontal disease represents a unique opportunity for oral pathogens and their products to gain access to the systemic circulation.

In vivo studies,^[1-5] patients with periodontitis and diabetes were found to have significantly higher levels of local inflammatory mediators compared to systemically healthy individuals with periodontal disease. Cytokine production as a consequence of

an infectious challenge could potentially contribute to insulin resistance in a number of ways:

1. Modification of the insulin receptor
2. Alteration of adipocyte function with increased production of free fatty acids
3. Diminution of endothelial nitric oxide production.

In vitro studies^[6] of monocytes from people with diabetes have shown a hyper-responsive phenotype with over expression of pro-inflammatory mediators such as

- interleukin- 1 (IL-1);
- tumor necrosis factor- (TNF-); and
- prostaglandin E2- (PGE₂).

The process may also alter pancreatic – cell function, either acting directly or through stimulation of free fatty acid production. Cytokine-induced mechanisms have been suggested to participate in the cell damage or “burnout” seen in animal obesity models of type 2 diabetes that may be mediated through a c-Jun NH2-terminal kinase–induced insulin resistance model. Increased resistance to skeletal muscle glucose uptake is part of the physiological adjustment to the catabolic milieu seen in inflammation. As cytokines or inflammatory mediators decrease insulin sensitivity, insulin resistance may be part of a causal pathway linking inflammatory mediators to incident diabetes. Adipocytes produce large quantities of cytokines, such as TNF- and IL-1, in the presence of inflammation.

In the present study, reduction in HbA1c level, in diabetic group [Table 1], was from baseline to 1 month was 12%, from one to 3 month was 6.5%, and from baseline to 3 month was 18.5%.

These results were suggestive of non-surgical periodontal therapy that lead to the reduction in HbA1c levels, especially

in patients with an elevated degree of diabetes mellitus severity and periodontal disease. Thus, it is possible that treatment of chronic periodontitis improves glycemic status of diabetics. Reduction in HbA1c levels in the present study confirms results of prior studies as described as follows: In the study of Débora C. Rodrigues,^[7] both the groups showed reductions in HbA1c levels. The change in HbA1c levels was 6.5% in G2 (one stage full-mouth scaling and root planning plus amoxicillin/clavulanic acid, 875 mg) and 11% in G1 (one stage full-mouth scaling and root planning alone), with a statistically significant difference between groups. Stewart *et al.*^[8] in a retrospective study, evaluated patients who received scaling and root planning without antibiotics; after 10 months, glycosylated hemoglobin examinations were performed and revealed an average reduction of 17% from baseline HbA1c levels. Similar results with positive correlation was seen by Hasan S^[9] where he concluded Glycosylated hemoglobin and periodontitis are positively correlated implying that diabetic control may improve periodontal status as well.

Conclusion

Hence, there is a bidirectional relationship between diabetes mellitus and periodontitis, with the former producing a greater severity of periodontal disease and the latter compromising blood glucose control in diabetic patients. The treatment of periodontitis in diabetic patients would lead to a reduction in the soluble mediators responsible for periodontal tissue destruction and would lessen the insulin resistance of the tissues. The findings of this study showed that effective periodontal treatment resulted in lower glycemic levels, which can be measured with the help of HbA1c assay – a reliable long-term marker of glycemic control, and in the reduction of clinical parameters of periodontal infection, confirming the existing inter-relationship between diabetes mellitus type-2 and periodontitis. Therefore, periodontal treatment should be included in diabetes preventive measures.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

References

1. Aldridge JP, Lester V, Watts TLP, Collins A, Viberti G, Wilson RF. Single-blind studies of the effects of improved periodontal health on metabolic control in type 1 diabetes mellitus. *J Clin Periodontol* 1995;22:271-5.
2. Smith GT, Greenbaum CJ, Johnson BD, Persson GR. Short-term responses to periodontal therapy in insulin-dependent diabetic patients. *J Periodontol* 1996;67:764-802.
3. Westfelt E, Rylander H, Blohme G, Jonasson P, Lindhe J. The effects of periodontal therapy in diabetics. Results after 5 years. *J Clin Periodontol* 1996;23:92-100.
4. Seppala B, Seppala M, Ainamo J. A longitudinal study on insulin-dependent diabetes mellitus and periodontal disease. *J Clin Periodontol* 1993;20:161-5.

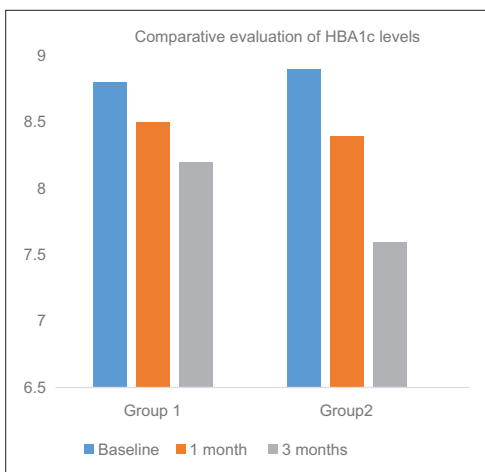


Figure 1: Comparative evaluation of HBA1c levels

Table 1: Comparative evaluation of HBA1c levels

HbA1c level	Baseline	1 month	3 months	P
Group 1: Control group	8.8±1.64	8.5±1.24	8.2±1.4	>0.05
Group 2: Test group	8.9±1.56	8.4±1.36	7.6±1.2	<0.05*

P>0.05 Non-significant, <0.05 statistically significant

5. Seppala B, Ainamo J. A site-by-site follow-up study on the effect of controlled versus poorly controlled insulin-dependent diabetes mellitus. *J Clin Periodontol* 1994;21:161-5.
6. Christgau M, Palitzsch KD, Schmalz G, Kreiner U, Frenzel S. Healing response to non-surgical periodontal therapy in patients with diabetes mellitus: Clinical, microbiological and immunologic results. *J Clin Periodontol* 1998;25:112-4.
7. Stewart JE, Wager KA, Friedlander AH, Zadeh HH. The effect of periodontal treatment on glycemic control in patients with type 2 diabetes mellitus. *J Clin Periodontol* 2001;28:306-10.
8. Stewart JE, Wager KA, Friedlander AH, Zadeh HH. The effect of periodontal treatment on glycemic control in patients with type 2 diabetes mellitus. *J Clin Periodontol* 2001;28:306-10.
9. Hassan S, Sadia H, Ujala F. Correlation of glycemic control with severity and extent of periodontal status. *Pak J Physiol* 2018;14: 28-30.