

Effect of Diabetes Mellitus on Periodontal Health: A Pilot Study at Dental Teaching Hospital in Multan

Mujeeb Ahmad¹, Taimur ul Hassan², Sunnia Zafar³, Aneeqa Shafiq⁴, Nizam Ghaffari⁵, Humayun Akram⁶

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ABSTRACT

Objective: Various studies have proven a relationship between prolonged uncontrolled glycemc levels due to diabetes and periodontal destruction. Dental care providers must be aware of this condition to educate the patients. Despite multiple global publications, regional data from Pakistan, particularly from Multan remains limited. This study aims to reinforce and establish the correlation and educate the population as well as dental practitioners.

Materials and Methods: This descriptive study was conducted from July 2023 to October 2023. 54 samples were collected having age range 30-60 years of both genders. Periodontal health was assessed by checking Probing Pocket Depths, Gingival Index and Plaque Index. Fasting Blood Sugar levels were checked to assess blood glucose levels.

Results: The results concluded that subjects with fasting blood sugar levels more than 200mg/dl and having diabetes for more than 5 years had more severity of periodontal destruction as compared to those with good glycemc controls.

Conclusion: Increased blood sugar levels for a prolonged period can cause periodontal destruction. Diabetic dental patients must be educated about the adverse effects of diabetes on tooth supporting structures.

Keywords: Diabetes Mellitus, Gingival Index, Glycemc Index, Oral hygiene, Periodontitis

^{1,5,6}Demonstrator, ²Assistant Professor, Bakhtawar Amin Medical & Dental College, Multan, Pakistan.

³Dental Surgeon, Multan, Pakistan.

⁴Demonstrator, CMH Multan Institute of Medical Sciences Multan, CIMS Dental College, Multan, Pakistan.

Corresponding author: Mujeeb Ahmad, House # 368-A, Wapda Town Phase 1, Northern Bypass Road, Multan, Pakistan.

Email: mujeeb.shah69@gmail.com

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INTRODUCTION

The prevalence of diabetes for all age-groups worldwide was estimated to be 2.8% in 2000 and 4.4% in 2030. The total number of people with diabetes is projected to rise from 171 million in 2000 to 366 million in 2030.¹ According to a study in Pakistan, the prevalence of diabetes in Pakistan was revealed to be 14.62%.² Diabetes is a major cause of blindness, kidney failure, heart attacks, stroke and lower limb amputation.³ Diabetes Mellitus (DM) is a metabolic diseases characterized by elevated levels of blood glucose. There are three main types of DM: Type 1 DM results from the body's failure to produce enough insulin. Type 2 DM begins with insulin resistance, a condition in which cells fail to respond to insulin properly. Gestational diabetes, is the third main form and occurs when pregnant women without a previous history of diabetes develop a high blood glucose level.⁴ Type 2 diabetes mellitus the most common type of diabetes and is characterized by hyperglycemia, hyperlipidemia and associated complications.⁵ It is defined as a clinical syndrome characterized by hyperglycemia. Uncontrolled diabetes for a prolonged period of time can lead to a variety of systemic complications including retinopathy, nephropathy, neuropathy, cerebrovascular diseases, cardiovascular diseases and peripheral vascular diseases.⁶⁻⁷

The association between diabetes and periodontal diseases is well-established.⁸ With uncontrolled diabetes, there is an increase in blood sugar level. This glycemic increase effects in the following ways; Polymorphonuclear Leukocytes (PMNs) chemotaxis and adherence is affected resulting in defective phagocytosis. Hence body's defense mechanism is hindered, Collagen metabolism is affected and Advanced Glycation end products are released which alter the function of extracellular matrix. All these factors combined together lead to periodontal diseases.⁹

Diabetes mellitus has a high incidence in our society. Most of the cases are diagnosed at later stages. People are unaware of the devastating effects of diabetes on dental health. The uncontrolled sugar level affects the periodontal health adversely. Increased glycemic levels combined with poor oral hygiene habits leads to severe periodontal destruction eventually leading to tooth mobility.¹⁰ The deleterious effects of diabetes mellitus on tooth supporting structures can be minimized if the patient keeps strict monitoring of their glycemic levels

and keeps them within the normal range. This study is designed to establish the connection between periodontal health and diabetes. Although this connection is well established globally, there is notable lack of clinical data from South Asia particularly from Pakistan. Most of the existing researches originate from Western countries where dietary habits and access to healthcare facilities differ from that of Pakistan. Within Pakistan, there is a shortage of region-specific studies that examine the relationship between glycemic control and periodontal health. This gap is especially evident in southern Punjab, including the city of Multan, where diabetes prevalence is rising. This study aims to address this deficiency by assessing periodontal status in diabetic patients using clinical parameters such as probing depth, plaque index, and gingival index, in correlation with fasting blood sugar levels. Research that highlights this link in a local population can help improve early diagnosis, patient education, and integration of periodontal assessment into routine diabetic care.

MATERIALS AND METHODS

A Descriptive study was designed including a questionnaire consisting of 11 questions to assess subjects for inclusion into the study. After the selection of subjects, intra oral examination was done to check periodontal health. Finally, blood sugar levels were checked by ordering Fasting Blood Sugar (FBS) tests. All subjects were included in the study with informed consent. Study was conducted in OPD of Bakhtawar Amin Dental Hospital, Multan from July, 2023 to October, 2023 with ethical approval from Institutional Research Board (IRB). Samples were collected using convenient sampling technique. The sample size was calculated using OpenEpi, sample size calculator designed specifically for population surveys. The required calculated sample size was 54 with a confidence level of 95% and a 5% margin of error.

Data collection procedure started with filtering of subjects fit for this study. A pre-validated detailed questionnaire was used which contained demographic data of subjects and 11 questions to assess whether the subject meets our inclusion criteria. Inclusion criteria was as follows; both male and female patients with DM type 2 having ages between 30 to 60 years, diagnosed cases of diabetes mellitus for more than a year, taking oral hypoglycemic and no prior history of periodontal treatment and antibiotic

intake during the past 6 months. Exclusion criteria included patients with any other associated chronic disease in addition to DM, any systemic complication of Diabetes Mellitus, Immuno-compromised patients and patients taking steroids orally.

If an individual fell in our criteria, an informed consent was taken for their involvement in the study. An intra oral examination was conducted to diagnose periodontal diseases status. This was done by using CPITN probes to check the gingival probing pocket depths (PPD). Probing was done on 6 points on each tooth (mesio-buccal, buccal, disto-buccal, mesio-lingual, lingual and disto-lingual). Maximum depth was recorded in the table and then a mean probing depth was taken by calculating the average depth of all teeth. Gingival status was assessed by Gingival Index (GI), Loe & Silness (1963). Dental plaque was assessed by Plaque Index (PI), Silness & Loe (1967). After conducting clinical examinations, patients were screened for blood sugar levels. Fasting Blood Sugar tests were advised.

Statistical analysis was carried out using IBM SPSS ver. 25.0 to find the association between PPD, GI and PI with FBS, gender and duration of disease. Pearson correlation between PPD, GI, PI and duration of disease with FBS was done which was found to be statistically significant at $p \leq 0.05$ (95% confidence interval).

RESULTS

The aim of this study was to find a co-relation between increased glycemic levels and periodontal destruction. 54 patients (38 males and 16 females) with mean age of 38.6 years concluded our study sample. The PPD ranged from 3.23 mm to 8.19 mm with a mean of 5.56 mm while GI score ranged from 1.84 to 2.98 with the mean of 2.36 and PI score ranged from 0.98 to 2.96 with the mean of 1.86.

Table 1 shows that patient with elevated Fasting Blood Sugar value (>200 mg/dl) had greater mean PPD, GI score, PI score as compared to the patients having FBS value (<200 mg/dl) and this was found to be statistically significant ($p=0.0001$). When males and females are compared for PPD, GI and PI, males were found to have higher PPD as compared to females, while there was a slight rise in GI scores and PI scores in males as compared to female patients. This rise in PPD, GI and PI in males

as compared to female was statistically non-significant ($p=0.5283$, 0.5219 , 0.7986 respectively). Subjects who were diagnosed with diabetes for more than 5 years showed higher mean PPD, GI and PI, and this rise was found to be statistically significant ($p=0.0231$, 0.0509 , 0.0635 respectively).

Table 1: Association Between Different Selected Potential Factors and Periodontitis

| | Mean Probing Pocket Depth | Mean Gingival Index Score | Mean Plaque Index Score |
|--|---------------------------|---------------------------|-------------------------|
| Glycemic Level | | | |
| Fasting Blood Sugar more than 200mg/dl | 5.54 | 2.83 | 2.41 |
| Fasting Blood Sugar less than 200 mg/dl | 3.99 | 1.89 | 1.03 |
| p-value | 0.0001 | 0.0001 | 0.0001 |
| Gender | | | |
| Male | 5.53 | 2.47 | 1.71 |
| Female | 5.09 | 2.19 | 1.45 |
| p-value | 0.5283 | 0.5219 | 0.7986 |
| Duration | | | |
| More than 5 years | 5.83 | 2.52 | 2.53 |
| Less than 5 years | 4.63 | 2.23 | 2.09 |
| p-value | 0.0231 | 0.0509 | 0.0635 |

DISCUSSION

It is frequently observed that periodontal disease progression is modified by a variety of factors. Other than obvious factor of oral hygiene that leads to plaque and calculus formation which later transforms into periodontal disease, systemic diseases also play a vital role in the destruction of periodontal tissues. Diabetes Mellitus is one of such systemic diseases that exert its deleterious effects on the tooth supporting structures.

The results of our research are a proof that long term poor glycemic control can cause periodontal destruction. The finding that Diabetes Mellitus patients have increased prevalence of periodontal disease is consistent with other studies.¹¹

Recent studies have suggested a bidirectional relationship between Diabetes Mellitus and Periodontitis. While diabetes is a strong risk factor for the development

of periodontal disease, Periodontitis as a chronic inflammatory disease also has a negative impact on control of diabetes.¹²

Subjects who had long standing uncontrolled Diabetes Mellitus with lower values of Plaque Index and Gingival Index suggesting good oral hygiene maintenance, they also started to show signs of periodontal destruction. This suggests that even after removing the obvious risk factor of periodontitis which is poor oral hygiene, diabetic patients are prone to periodontal destruction if their glycemic levels are not well controlled.¹³ According to some researchers, increased severity of periodontal disease in diabetics is not related to increased local irritants. According to them angiopathy, abnormal collagen metabolism, abnormal polymorphonuclear cell (PMN) function, and altered sulcular microbial flora are core cause of severity of periodontitis in diabetic patients. These factors mitigate the defensive capacity of tissues and may disrupt the tissue response to local irritants.¹⁴ In the present study, effect of blood glucose level is directly related to the plaque which is similar to the results shown by Janet H et al.¹⁵ Previous pathological study showed diabetic patients had a larger content of lipid-rich plaque compared with non-diabetic patients.¹⁶

Hence it is of utmost importance to educate and spread awareness among diabetic patients about the catastrophic effects of uncontrolled blood sugar on tooth supporting structures. Diabetic patients frequently show up at dental offices and hospitals with dental problems. Proper screening for diabetes mellitus should be done prior to any dental procedure.¹⁷ Diabetic patients should follow a proper diet plan and monitor their sugar levels strictly at regular intervals and keep them within the normal ranges.¹⁸⁻²⁰

CONCLUSION

Diabetic patients are occasionally encountered at dental clinics and hospitals. Advanced dental care requires good doctor and patient relationship. All dental practitioners and health care providers should be well aware about the correlation between diabetes and periodontitis. They should be aware of the screening methods for diabetic patients. Glycemic levels of diabetic patients should be monitored at every appointment. Patients should be educated about the negative impact of uncontrolled blood sugar levels on tooth supporting structures. Proper patient education can

yield fruitful results.

DISCLAIMER

None to declare.

CONFLICT OF INTEREST

There is no conflict of interest among the authors.

ETHICAL STATEMENT

An ethical clearance letter was obtained from the Institutional Research Board of Bakhtawar Amin Medical & Dental College, Multan. (Ref No 90/23 dated 26/01/2023)

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AUTHORS CONTRIBUTION

Conception and design of study: M. Ahmed, T. U, Hassan
 Acquisition of data: H. Akram, N. Ghaffari
 Analysis and/or interpretation of data: M. Ahmed, A. Shafiq
 Drafting the manuscript: M. Ahmed
 Revising the manuscript critically for important intellectual content: T. U. Hassan, A. Akram
 Approval of the version of the manuscript to be published: M. ahmed, T. U. Hassan, S. Zafar, A. Shafiq, N. Ghaffari, H. Akram

REFERENCES

1. Wild S, Roglic G, Green A, Sicree R, King H. Global prevalence of diabetes: estimates for the year 2000 and projections for 2030. *Diabetes Care*. 2004 May;27(5):1047–53.
2. Akhtar S, Nasir JA, Abbas T, Sarwar A, Raza M, Ijaz T, et al. Diabetes in Pakistan: A systematic review and meta-analysis. *Pak J Med Sci*. 2019 Jul-Aug;35(4):1173–8.
3. Soyoye DO, Abiodun OO, Ikem RT, Kolawole BA, Olujimi JA. Diabetes and peripheral artery disease: A review. *World J Diabetes*. 2021 Jun 6;12(6):827–37.
4. Kumar R, Saha P, Kumar Y, Sharma A, Kaur P. A review on diabetes mellitus: type 1 & type 2. *World J Pharm Pharm Sci*. 2020;9(10):838–50.

5. Moeintaghavi A, Arab HR, Bozorgnia Y, Khajeh-Hosseini N. Non-surgical periodontal therapy affects metabolic control in diabetics: a randomized controlled clinical trial. *Aust Dent J*. 2012 Mar;57(1):31–7.
6. Cheung N, Wong TY. Diabetic retinopathy and systemic vascular complications. *Prog Retin Eye Res*. 2008 Mar;27(2):161–76.
7. Papatheodorou K, Banach M, Edmonds M, Papanas N, Papazoglou D. Complications of diabetes. *J Diabetes Res*. 2015;2015:189525.
8. Campus G, Salem A, Uzzau S, Baldoni E, Tonolo G. Diabetes and periodontal disease: A case-control study. *J Periodontol*. 2005 Mar;76(3):418–25.
9. Bascones-Martínez A, González-Febles J, Sanz-Esporrín J. Diabetes and periodontal disease. *Am J Dent*. 2014 Apr;27(2):63–6.
10. Ojehanon PI, Azodo CC, Erhabor P, Ehizele AO. Periodontal characteristics of diabetic patients with tooth mobility. *J Soc Health Diabetes*. 2017 Dec;5(2):94–9.
11. Tandon V, Arora V, Tirth A, Jain M, Sharma R. Effects of diabetes mellitus on periodontal diseases in the adult population of Moradabad. *J Dent*. 2015;29(1):5–8.
12. Barutta F, Bellini S, Durazzo M, Gruden G. Novel insight into the mechanisms of the bidirectional relationship between diabetes and periodontitis. *Biomedicines*. 2022 Jan;10(1):178.
13. Kocher T, König J, Borgnakke WS, Pink C, Meisel P. Periodontal complications of hyperglycemia/diabetes mellitus: epidemiologic complexity and clinical challenge. *Periodontol* 2000. 2018 Oct;78(1):59–97.
14. Sandholm L, Swanljung O, Rytömaa I, Mäki J, Ylöstalo P. Periodontal status of Finnish adolescents with insulin-dependent diabetes mellitus. *J Clin Periodontol*. 1989 Nov;16(10):617–20.
15. Southerland JH, Taylor GW, Offenbacher S. Diabetes and periodontal infection: making the connection. *Clin Diabetes*. 2005 Oct;23(4):171–8.
16. Moreno PR, Murcia AM, Palacios IF, Leon MN, Bernardi VH, Fuster V, et al. Coronary composition and macrophage infiltration in atherectomy specimens from patients with diabetes mellitus. *Circulation*. 2000 Oct 31;102(18):2180–4.
17. Naumova VN, Makedonova YA, Mikhilchenko DV, Sviridov AA, Selezneva NV. The outcomes of the dental patients' screening for diabetes mellitus. *J Int Dent Med Res*. 2020 Sep;13(3):1071–80.
18. Sami W, Ansari T, Butt NS, Hamid MRA. Effect of diet on type 2 diabetes mellitus: A review. *Int J Health Sci (Qassim)*. 2017 Apr;11(2):65–71.
19. Delahanty LM, Halford BN. The role of diet behaviors in achieving improved glycemic control in intensively treated patients in the Diabetes Control and Complications Trial. *Diabetes Care*. 1993 Nov;16(11):1453–8.
20. Walker KZ, O'Dea K, Gomez M, Dietrich M, Kraemer M, Kriketos A. Diet and exercise in the prevention of diabetes. *J Hum Nutr Diet*. 2010 Aug;23(4):344–52.