

## ORIGINAL ARTICLE

## CORRELATION OF GLYCEMIC CONTROL WITH SEVERITY AND EXTENT OF PERIODONTAL STATUS

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**Background:** Diabetes is one of the main causes of periodontitis. People who do not maintain good oral hygiene or good metabolic control of their diabetes are more prone to get periodontitis especially those people who are of old age and people who have had diabetes for many years. The objectives of this study were to evaluate and correlate the extent and severity of glycaemic control with periodontal disease. **Method:** Sixty patients visiting the dental OPD of Isra dental college and Isra University (Diabetic OPD) from February to July 2016 were recruited. Diabetic patients who had no evidence of systemic disease other than diabetes and who had advanced periodontitis (30% or more of the teeth examined having >4 mm probing depth) were included. Glycaemic control was measured using glycated haemoglobin whereas periodontal status was measured using plaque and gingival indices according to the standard protocols. A well-designed proforma was used to record demographic characteristics, oral hygiene maintaining methods, medical history, drug history and current status of periodontium on the basis of indices i.e., gingival index and plaque index. All the readings were taken at day one and after three months. **Results:** Of the 60 subjects; 36 (60%) were male and 24 (40%) were female with a mean age of 48.30±8.718 years. There was a significant and positive correlation between glycated haemoglobin and gingival index at day one and after three months ( $r=0.62$ ,  $p=0.001$  and  $r=0.58$  and  $p=0.001$  respectively). However, plaque index was correlated with glycated haemoglobin only after three months ( $r=0.15$ ,  $p=0.02$ ). **Conclusion:** Glycated haemoglobin and periodontitis are positively correlated implying that diabetic control may improve periodontal status as well.

**Keywords:** Glycated haemoglobin, Glycaemic control, diabetes mellitus, periodontal health

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## INTRODUCTION

Diabetes mellitus is a group of metabolic disorders manifested by abnormally high levels of glucose in the blood. The hyperglycaemia is the result of deficiency of insulin secretion or insulin resistance or a combination of both. Insulin is required for transport of glucose from the blood stream into the cells, where glucose is used for energy. Deficiency of insulin secretion or insulin resistance results in inability to transport glucose into the cells. Hyperglycaemia is consequently triggered by the presence of glucose in the blood.<sup>1</sup>

Pakistan, Hong Kong and Singapore are among the countries with the highest prevalence of diabetes mellitus in the adult population.<sup>2</sup> Worldwide adult diabetes mellitus prevalence was 4.0% in 1995 and is expected to increase up to 5.4% by the year 2025. In Pakistan the prevalence of diabetes mellitus was 5.2 million in 2000, and the number is estimated to increase to 13.9 million by the year 2030.<sup>2</sup>

Diabetes mellitus is one of the main causes of periodontitis which is now considered the sixth complication of diabetic micro vasculopathy. Severity of periodontitis varies significantly with the glycaemic control.<sup>3-5</sup> Poorly controlled diabetes and the accumulation of advanced glycation end products (AGEs) in the gingival tissue of the diabetics are

thought to be the primary cause for oral and other complications of diabetes.<sup>4</sup>

Pathogenesis of periodontal disease is complex because it is the combination of the initiation and maintenance of the chronic inflammatory process by a diverse microbial flora, leading to the destruction of tissue. Periodontal disease is a very prevalent condition. In the United States, over half the population aged 18 years or more have periodontal disease in its early stages, increasing to up to 75% after the age of 35 years; its mild to moderate forms are present in 30–50%, and the severe generalized form in 5 to 15% of the general adult population. Periodontal disease has a higher prevalence in poor and developing countries and a significant worldwide variation in all the other countries.<sup>5</sup>

Many studies have been conducted on the association of diabetes mellitus and periodontal status but with varying results.<sup>6</sup> Current study was planned to determine the correlation between glycated haemoglobin and periodontal status. A greater consideration of the relationship of periodontal disease and diabetes mellitus will offer additional suitable management of the patients.

## METHODOLOGY

In this cross sectional comparative study, patients visiting the dental OPD of Isra dental college and Isra

University (Diabetic OPD) from February to July 2016 were recruited. A proper institutional approval was obtained before starting the study. Sixty patients above the age of 30 years from both the genders were included through convenience sampling after getting written informed consent. Sample size was calculated using WHO sample size calculator by keeping alpha as 0.05 and beta as 0.2. Patients were included if they had no evidence of systemic disease other than diabetes, patients having moderate to advanced periodontitis (30% or more of the teeth examined having >4 mm probing depth). Diabetic patients were included on the basis that they had the disease for five years or more. No change in the medications or diet was made for the patients. Patients having less than 16 teeth, any form of oral ulcers, edentulous patients and patients who had undergone periodontal treatment in the last 6 months were excluded from this study along with patients having acute oral pain due to either pericoronitis or temporomandibular joint disorders.

Glycaemic control was measured using glycated haemoglobin (HbA1c) whereas periodontal status was measured using plaque and gingival indices according to the standard protocols.<sup>7</sup> A well-designed proforma was used to record demographic characteristics, oral hygiene maintaining methods, medical history, drug history and current status of periodontium on the basis of indices, i.e., gingival index and plaque index.

On day 1, after initial readings were taken; patients underwent scaling and after that oral hygiene instructions (appropriate brushing and flossing technique) were explained to be followed regularly at home. After 3 months patients were recalled for their follow up readings of HbA1C, Plaque and gingival index.

Data was analyzed using SPSS-22, and  $p \leq 0.05$  was considered significant.

## RESULTS

Mean age of patients was noted as  $48.30 \pm 8.718$  years. Of the 60 subjects; 36 (60%) were males and 24 (40%) were females. Table-1 shows mean values of the study variables at day one and three.

Correlation of glycated haemoglobin with plaque and gingival indices is shown in Table-2 along with level of significance.

**Table-1: Descriptive analysis of study variables**

Variable	Mean±SD
HbA1C reading at Day 1	7.113±1.735
HbA1C reading After 3 Months	7.172±1.713
Plaque Index day 1	2.007±0.481
Plaque Index after 3 Months	1.788±0.490
Gingival Index Day 1	1.711±0.588
Gingival Index After 3 Months	1.536±0.585

**Table-2: Correlation of HbA1C with plaque and gingival indices at day 1 and after 3 months**

Bivariate correlation	Timing	r	p
Plaque Index vs HbA1C	Day 1	0.15	0.25
	3 Months	0.31	0.02*
Gingival Index vs HbA1C	Day 1	0.62	0.001*
	3 Months	0.58	0.001*

\*Significant

## DISCUSSION

Results of the current study showed that glycated haemoglobin was strongly associated with periodontitis. This is presumably mediated through oral hygiene. This finding concurs with that of previous studies proposing that diabetes is a risk factor for periodontal disease.<sup>8</sup> In another study where pocket depth was considered as a marker of severity of periodontal disease, moderate disease was more common among the diabetics. Significant association between diabetes mellitus and periodontal disease was found by using the deep periodontal pockets as the clinical parameter for periodontal disease severity. Many individuals had high plaque index scores on the first visit in this study, despite the fact that the use of a toothbrush was more common, the proportion of people cleaning their teeth daily was similar in both males and females.

It is suggested that the probable reason for the accumulation of more plaque in diabetic patients could be poor self-efficacy, resulting in less effective cleaning. Increased level of glucose in gingival crevicular fluid (GCF) and saliva per se could be another possibility, leading to a higher accumulation of plaque and calculus.<sup>9</sup> More missing teeth among diabetic patient is a characteristic of a population with poor oral hygiene. In this regard this study found similarity. A comparative Saudi study has shown that in the diabetic patient group, 81% of patients had nine to twenty missing teeth.<sup>10</sup> Another study by Kawamura and co-workers showed that diabetic patients had six to seven missing teeth.<sup>11</sup> This in turn concurs with our study as majority of the patients had missing teeth with over 23% having eight missing teeth. Bartold *et al* concluded that the incidence of severe periodontal disease was affected by the improved oral hygiene. They also reported that continuous assessment of patients and sub gingival debridement led to the successful management of the disease.<sup>12</sup> It was also concluded in two Finnish studies that perception of dental self-efficacy played a decisive role and had a positive influence on compliance in relation to oral health behavior.<sup>13,14</sup> Similar results were found in another longitudinal study conducted to find out contribution of periodontal disease to the mortality associated with diabetes mellitus.<sup>15</sup>

Borrell suggested screening for unidentified diabetics in the population on the basis of their self-reported family history of diabetes, hypertension and periodontal status.<sup>16</sup> Hence, diabetes is a disorder of

importance to dentists and dental hygienists and to patients seen in the dental office as it has this bidirectional relationship with periodontitis.

## CONCLUSION

Glycated haemoglobin and periodontitis are positively correlated implying that diabetic control may improve periodontal status as well. Oral health should be promoted in people with diabetes as an integral component of their overall diabetes management. Closer collaboration between medical and dental clinical team is necessary for joint management of people with diabetes and periodontitis and contact with dentist is important after the diagnosis of diabetes mellitus.

## REFERENCES

1. Mealey BL, Rees TD, Rose LF, Grossi SG. Systemic factors impacting the periodontium. In: Rose LF, Mealey BL, Genco RJ, Cohen DW, (Eds). *Periodontics Medicine, Surgery, and Implants*. St. Louis: Elsevier Mosby; 2004. p.790–845.
2. 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;27(5):1047–53.
3. Mansour AA, Abd-Al-sada N. Periodontal disease among diabetics in Iraq. *Med Gen Med* 2005;7(3):2.
4. Orbak R, Simsek S, Orbak Z, Kavrut F, Colak M. The influence of type-1 diabetes mellitus on dentition and oral health in children and adolescents. *Yonsei Med J* 2008;49(3):357–65.
5. Negrato CA, Tarzia O, Jovanović L, Chinellato LE. Periodontal disease and diabetes mellitus. *J Appl Oral Sci* 2013;21(1):1–12.
6. Naruse K. Diabetes and periodontal disease: What should we learn next? *J Diabetes Investig* 2014;5(3):249–50.
7. Loe H. The Gingival Index, the Plaque Index and the Retention Index Systems. *J Periodontol* 1967;38:610–6.
8. Leong P, Tumanyan S, Blicher B, Yeung A, Joshipura K. Periodontal disease among adult, new-immigrant, Chinese Americans in Boston with and without diabetes –a brief communication. *J Public Health Dent* 2007;67(3):171–3.
9. Tenovuo J, Alanen P, Larjava H, Viikari J, Lehtonen OP. Oral health of patients with insulin-dependent diabetes mellitus. *Scand J Oral Sci* 1986;94(4):338–46.
10. Almas K, Al-Qahtani M, Al-Yami M, Khan N. The relationship between periodontal disease and blood glucose level among type II diabetic patients. *J Contemp Dent Pract* 2001;2(4):18–25.
11. Kawamura M, Fukuda S, Kawabata K, Iwamoto Y. Comparison of health behaviour and oral/medical conditions in non-insulin-dependent (type II) diabetics and non-diabetics. *Aust Dent J* 1998;43(5):315–20.
12. Bartold P, Seymour G, Cullinan M, Westerman B. Effect of increased community and professional awareness of plaque control on the management of inflammatory periodontal diseases. *Int Dent J* 1998;48(3 Suppl 1):282–9.
13. Syrjälä AM, Knecht MC, Knuutila ML. Dental self-efficacy as a determinant to oral health behaviour, oral hygiene and HbA1c level among diabetic patients. *J Clin Periodontol* 1999;26(9):616–21.
14. Knecht MC, Syrjälä AM, Laukkanen P, Knuutila ML. Self-efficacy as a common variable in oral health behavior and diabetes adherence. *Eur J Oral Sci* 1999;107(2):89–96.
15. Sandberg GE, Sundberg HE, Fjellstrom CA, Wikblad KF. Type 2 diabetes and oral health: a comparison between diabetic and non-diabetic subjects. *Diabetes Res Clin Pract* 2000;50(1):27–34.
16. Borrell L, Kunzel C, Lamster I, Lalla E. Diabetes in the dental office: using NHANES III to estimate the probability of undiagnosed disease. *J Periodontal Res* 2007;42:559–65.

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