

## Original Research

### Assessment of glycaemic control and insulin resistance in patients with chronic periodontitis

<sup>1</sup>Ruhi Mahajan, <sup>2</sup>Aashima Gupta, <sup>3</sup>Nitin Kudyar

<sup>1</sup>Assistant Professor, Deptt of Biochemistry, ASCOMS, Jammu, Jammu and Kashmir, India;

<sup>2</sup>Reader, Himachal Dental College, Sundernagar, Himachal Pradesh, India;

<sup>3</sup>Consultant, Dist. Hospital, Udhampur, Jammu and Kashmir, India

#### ABSTRACT:

**Background:** Periodontitis and diabetes mellitus have a “two-way street” relationship. Diabetes mellitus is underlined by elevated blood glucose levels consequential to impaired insulin secretion or insulin resistance or both. The present study assessed glycaemic control and insulin resistance in patients with chronic periodontitis. **Materials & Methods:** 74 patients of type II diabetes mellitus having severe periodontitis in the age group of 25–55 years of both genders were enrolled in the present study. Group I were type II DM patients and group II comprised of age matched control. All underwent fasting blood sugar (FBS), glycosylated hemoglobin (HbA1c), and insulin resistance by the Homeostatic Model Assessment of Insulin Resistance (HOMA-IR) determination. **Results:** Group I had 44 males and 30 females and group II had 36 males and 38 females. The mean BMI in group I was 25.4 Kg/m<sup>2</sup> and in group II was 26.1 Kg/m<sup>2</sup>. Fasting blood glucose was 96.3 mg/dl in group I and 82.4 mg/dl in group II. HbA1c in group I was 5.8% and in group II was 5.1%. The mean HOMA-IR was 2.15 in group I and 1.52 in group II. **Conclusion:** The mean values for fasting blood glucose, HbA1c, and HOMA-IR were significantly higher in the severe periodontitis group than in the control group with a healthy periodontium.

**Key words:** blood glucose, diabetes, insulin

Received: 25 March, 2022

Accepted: 28 April, 2022

**Corresponding author:** Nitin Kudyar, Consultant, Dist. Hospital, Udhampur, Jammu and Kashmir, India

**This article may be cited as:** Mahajan R, Gupta A, Kudyar N. Assessment of glycaemic control and insulin resistance in patients with chronic periodontitis. J Adv Med Dent Sci Res 2022;10(5):98-100.

#### INTRODUCTION

More than 50% of adult population worldwide have periodontitis, and alarmingly, approximately 11.2% of them have severe periodontitis. Periodontitis and diabetes mellitus have a “two-way street” relationship. Diabetes mellitus is underlined by elevated blood glucose levels consequential to impaired insulin secretion or insulin resistance or both. The global prevalence of diabetes varies from 4.6% in France to 8.3% in the United States and 8%–12% in the urban areas of India.<sup>1</sup>The Joint International Workshop of the European Federation of Periodontology and the American Academy of Periodontology (AAP) stated that patients with moderate-to-severe periodontitis are at an increased risk for diabetogenesis.<sup>2,3,4</sup> A recommendation of the recent joint statement by the Indian Society of Periodontology (ISP) and Research Society for the Study of Diabetes in India (RSSDI) stated that periodontitis can cause insulin resistance and alterations in glycemic status. An association

between impaired glucose tolerance and periodontitis has been previously reported. Studies have also revealed an association between impaired fasting glucose (IFG) and periodontitis.<sup>5,6</sup> The present study assessed glycaemic control and insulin resistance in patients with chronic periodontitis.

#### MATERIALS & METHODS

The present study comprised of 74 patients of type II diabetes mellitus having severe periodontitis in the age group of 25–55 years of both genders. All were informed regarding the study and their written consent was obtained. Ethical clearance was obtained before starting the study.

Demographic data such as name, age, gender etc. was recorded. A thorough clinical examination was carried out. Group I were type II DM patients and group II comprised of age matched control. All underwent fasting blood sugar (FBS), glycosylated hemoglobin (HbA1c), and insulin resistance by the Homeostatic Model Assessment of Insulin Resistance

(HOMA-IR) determination. Results of the study was compiled and compared in both groups. P value less than 0.05 was considered significant.

**RESULTS**

**Table I Distribution of patients**

Groups	Group I	Group II
Status	DM	Healthy
M:F	44:30	36:38

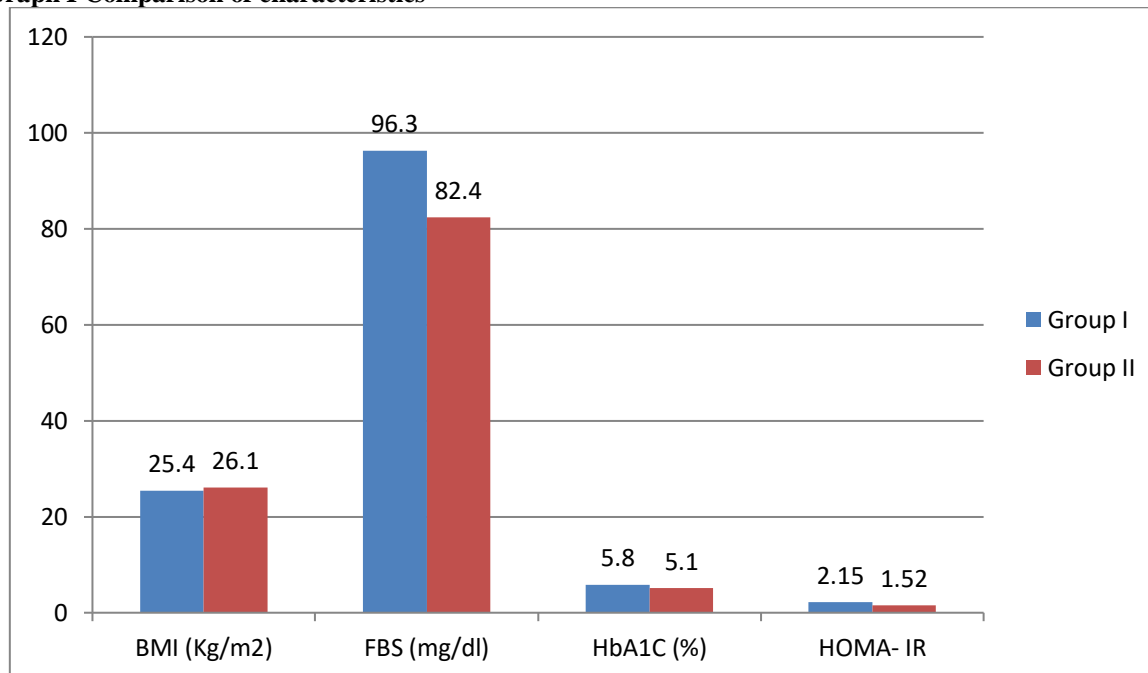
Table I shows that group I had 44 males and 30 females and group II had 36 males and 38 females.

**Table II Comparison of characteristics**

Parameters	Group I	Group II	P value
BMI (Kg/m <sup>2</sup> )	25.4	26.1	0.12
FBS (mg/dl)	96.3	82.4	0.05
HbA1C (%)	5.8	5.1	0.05
HOMA- IR	2.15	1.52	0.04

Table II, graph I shows that mean BMI in group I was 25.4 Kg/m<sup>2</sup> and in group II was 26.1 Kg/m<sup>2</sup>. Fasting blood glucose was 96.3 mg/dl in group I was 82.4 mg/dl in group II. HbA1C in group I was 5.8% and I group II was 5.1%. The mean HOMA- IR was 2.15 in group I and 1.52 in group II. The difference found to be significant (P< 0.05).

**Graph I Comparison of characteristics**



**DISCUSSION**

Periodontitis is a chronic multifactorial infectious disease of the supporting tissues of the teeth. It is estimated that between 10 and 15% of adults from 21 to 50 years of age and about 30% of subjects >50 years of age have severe periodontitis.<sup>7,8</sup> Clinically, patients suffer from gradual loss of tooth attachment in the alveolar bone leading to periodontal pockets, receding gums, loose teeth, and eventually tooth exfoliation, which may result in changes in diversity of food uptake, possibly affecting general health. Often gums are red and swollen, bleed easily, and patients with periodontitis suffer from bad breath.<sup>9</sup> There is a growing body of evidence supporting the fact that the periodontal infection with gram-negative

microorganisms adversely affects glycaemic control. Thus, it is now acknowledged that due to untreated or inadequately controlled moderate-to severe periodontitis, the systemic inflammatory burden may be increased.<sup>10</sup> The present study assessed glycaemic control and insulin resistance in patients with chronic periodontitis. We observed that group I had 44 males and 30 females and group II had 36 males and 38 females. Teeuw WJ et al<sup>11</sup> in their study found that a total of 371 patients were included in this analysis with periodontitis as predictor and the actual absolute change in A1C as the outcome. The duration of follow-up was 3–9 months. All studies described a research population of type 2 diabetic patients in

whom glycemic control improved after periodontal therapy compared with the control group (rangeA1C:1.17 up to 0.05%). The studies in a meta-analysis demonstrated a weighted mean difference of A1C before and after therapy of 0.40% (95% CI 0.77 to 0.04%, P 0.03) favoring periodontal intervention in type 2 diabetic patients. Nevertheless, this improvement in %A1C must be interpreted with care due to limited robustness as evidenced by heterogeneity among studies.

We found that mean BMI in group I was 25.4 Kg/m<sup>2</sup> and in group II was 26.1 Kg/m<sup>2</sup>. Fasting blood glucose was 96.3 mg/dl in group I was 82.4 mg/dl in group II. HbA1C in group I was 5.8% and I group II was 5.1%. The mean HOMA- IR was 2.15 in group I and 1.52 in group II. George et al<sup>12</sup> assessed and compared glycemia in severe periodontitis patients and in individuals with clinically healthy periodontium. From among individuals who were undiagnosed for diabetes mellitus, 37 patients with severe periodontitis and 37 individuals with healthy periodontium in the age group of 25–55 years were recruited for the study. The fasting blood sugar (FBS), glycosylated hemoglobin (HbA1c), and insulin resistance by the Homeostatic Model Assessment of Insulin Resistance (HOMA-IR) were assessed and compared between the two groups. The mean FBS, HOMA-IR, and HbA1c were significantly higher for patients with severe periodontitis than those individuals with healthy periodontium. After adjustments for age, gender, and body mass index, patients with severe periodontitis had a statistically significant association with impaired glucose metabolism (HbA1c  $\geq$  5.7) (adjusted odds ratio [OR] of 9.56; 95% confidence interval [CI]: 1.819–46.08; P < 0.01). Furthermore, patients with severe periodontitis had significantly greater odds to develop impaired fasting glucose (adjusted OR of 7.489, 95% CI: 1.408–39.839; P < 0.01).

The high prevalence of prediabetes, incident diabetes, and insulin resistance among severe periodontitis patients who were previously undiagnosed for diabetes can be attributed to a state of heightened systemic inflammation in severe periodontitis.<sup>13</sup> Chronic inflammation could be the plausible biological mechanism linking infections and insulin resistance. Evidence from animal models has shown that pro-inflammatory cytokines, such as tumor necrosis factor- $\alpha$  (TNF- $\alpha$ ), can induce a state of insulin resistance.<sup>14</sup> TNF- $\alpha$  may disrupt serine phosphorylation of insulin receptor substrate-1, and experimental evidence has repeatedly shown that systemic inflammation is a common determinant for both insulin resistance and T2 diabetes mellitus.

## CONCLUSION

Authors found that the mean values for fasting blood glucose, HbA1c, and HOMA-IR were significantly higher in the severe periodontitis group than in the control group with a healthy periodontium.

## REFERENCES

1. Genco RJ, Sanz M. Clinical and public health implications of periodontal and systemic diseases: An overview. *Periodontol* 2000 2020;83:7-13.
2. Kassebaum NJ, Bernabé E, Dahiya M, Bhandari B, Murray CJ, Marcenes W. Global burden of severe periodontitis in 1990-2010: A systematic review and meta-regression. *J Dent Res* 2014;93:1045-53.
3. Genco RJ, Graziani F, Hasturk H. Effects of periodontal disease on glycemic control, complications, and incidence of diabetes mellitus. *Periodontol* 2000 2020;83:59-65.
4. Genco RJ, Borgnakke WS. Risk factors for periodontal disease. *Periodontol* 2000 2013;62:59-94.
5. Bonaldi C, Vernay M, Roudier C, Salanave B, Oleko A, Malon A, et al. A first national prevalence estimate of diagnosed and undiagnosed diabetes in France in 18- to 74-year-old individuals: The French Nutrition and Health Survey 2006/2007. *Diabet Med* 2011;28:583-9.
6. Dhir S, Lalwani R, Sharma JK, Kolte A, Bansal S, Gupta A. "The Perio-Diabetes Symposium": Consensus Report of the Indian Society of Periodontology and Research Society for the Study of Diabetes in India – A joint event on Periodontitis and Diabetes. *J Indian SocPeriodontol* 2019;23:593-4.
7. Genco RJ, Borgnakke WS. Diabetes as a potential risk for periodontitis: Association studies. *Periodontol* 2000 2020;83:40-5.
8. Polak D, Sanui T, Nishimura F, Shapira L. Diabetes as a risk factor for periodontal disease-plausible mechanisms. *Periodontol* 2000 2020;83:46-58.
9. Løe H. Periodontal disease. The sixth complication of diabetes mellitus. *Diabetes Care* 1993;16:329-34.
10. American Diabetes Association. 3. Comprehensive medical Evaluation and assessment of comorbidities: Standards of medical care in diabetes-2018. *Diabetes Care* 2018;41 Suppl 1:S28-37.
11. Teeuw WJ, Gerdes VE, Loos BG. Effect of periodontal treatment on glycemic control of diabetic patients: a systematic review and meta-analysis. *Diabetes care*. 2010 Feb 1;33(2):421-7.
12. George AK, Narayan V, Kurian N, Joseph AE, Anil S. A pilot study on glycemia and insulin resistance in patients with severe periodontitis. *J Indian SocPeriodontol* 2021;25:393-8.
13. Han DH, Lim SY, Sun BC, Paek D, Kim HD. The association of metabolic syndrome with periodontal disease is confounded by age and smoking in a Korean population: The Shiwha-Banwol Environmental Health Study. *J ClinPeriodontol* 2010;37:609-16.
14. Tonetti MS, Jepsen S, Jin L, Otomo-Corgel J. Impact of the global burden of periodontal diseases on health, nutrition and wellbeing of mankind: A call for global action. *J ClinPeriodontol* 2017;44:456-62.