



## Research Brief

# Are cardiovascular risk parameters and glycemic levels associated with periodontitis in type 2 diabetes patients? A clinical study

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## ABSTRACT

This study investigated the associations between cardiovascular risk parameters, glycemic level and periodontitis in the diabetic adult population. BMI (body mass index), total cholesterol and triglyceride was used as cardiovascular risk measure and glycosylated hemoglobin (HbA1c) was recorded for glycemic levels. Study results provide evidence of significant association between periodontal disease, cardiovascular risk and glycemic levels.

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## 1. Introduction

Periodontitis is an inflammatory microbial disease, causing destruction of tooth supporting structures and ultimately loss of the tooth. Growing body of evidence supports the fact that periodontal infection adversely affects the glycemic control and in turn increases the systemic inflammatory burden.<sup>1,2</sup> Diabetes mellitus is a highly prevalent metabolic disorder. Poor glycemic levels damage the blood vessels leading to multiple associated complications. These include atherosclerosis, myocardial infarction, retinopathy, nephropathy, neuropathy, delayed wound healing and an increased risk of infection. Periodontitis has been considered as the sixth complication of diabetes mellitus.<sup>3</sup> Studies demonstrating the association between diabetes and periodontitis or cardiovascular disease and periodontitis are several but few studies have focused on association of the above three factors i.e. periodontal disease, cardiovascular risk and diabetes at the same time. Hence the primary objective of the study was to explore associations between diabetes and periodontitis. Secondary outcome was further aimed at exploring the effect of glycemic level and cardiovascular risk parameters on severity of periodontitis.

## 2. Methods

Three hundred and fifty subjects, both diabetic and nondiabetic in the average age group of 35–80 years, based on selection criteria of diabetes<sup>4</sup> and periodontitis<sup>5</sup> were screened and recruited. Periodontal assessment included a full mouth examination of probing depth (PD), clinical attachment level (CAL), gingival recession (GR) and bleeding on probing (BOP). Venous blood analysis was done for fasting glucose, glycosylated hemoglobin (HbA1c) and lipid profile (cholesterol and triglycerides). Other demographic variables recorded were age, sex, obesity, smoking, history and duration of diabetes and periodontitis.

## 3. Results

For comparisons, subjects were divided into three group according to tertiles of the mean probing depth ranging from 1.75 TO 2.25 mm (low), 2.26–2.75 mm (medium) and 2.76–4.95 mm (high). This categorization was done to facilitate the interpretation and the range of variation of the variables.<sup>6</sup> Prevalence and severity of periodontitis among demographic variables was compared with Chi-square test. Multi-variable regression analyses was done to find the association between diabetes and periodontitis after adjusting confounding factors. Table 1 shows the demographic variables is relation to severity of periodontitis. One year of smoking showed an increase of 1.35 times in the odds of having periodontitis (Table 1). Results also reveal that a one unit increase in HbA1c can increase 1.34 times the odds of having

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**Table 1**  
Demographic variables of study subjects by tertiles of mean severity of periodontal disease (PD).

Variable	TOTAL (n = 350)	None (No PD) n = 54	Low PD (n = 77)	Middle PD (n = 98)	High PD (n = 121)	95%CI	OR
Age (years ± mean SD)	50.25 ± 12.77	48.7 ± 12.90	47.80 ± 11.48	49.49 ± 13.47	53.78 ± 11.90	1.000–1.037	0.238
Male/female (n)	195/155	39/38	29/25	59/39	68/53	0.72–1.635	0.185
<sup>a</sup> Smoking (years; ± mean SD)	1.41 ± 2.48	0.62 ± 1.22	0.89 ± 1.48	1.71 ± 2.55	1.93 ± 3.26	1.101–1.676	1.358
<sup>a</sup> Family History of diabetes mellitus (N/UK/Y)	247/18/85	67/3/37	41/5/8	86/8/27	53/2/43	–	–
BMI (± mean SD)	30.53 ± 6.82	18.86 ± 5.63	26.89 ± 6.90	30.70 ± 7.12	33.54 ± 7.89	0.738–2.053	1.231
<sup>a</sup> Frequency of toothbrushing (N) ≥ 2 times/day	–	23	120	115	92	1.417–6.763	0.095
<sup>a</sup> Family history of Periodontitis (n/y)	211/139	27	22	50	34	–	–
<sup>a</sup> Duration of diabetes mellitus (years ± mean SD) <sup>a</sup>	–	–	9.76 ± 6.245	8.42 ± 5.772	7.91 ± 6.124	1.426–2.872	0.872

1) a = Data was received from patients themselves and reflects patients' knowledge of their medical, social and family history.

2) Prevalence and severity of periodontitis were compared by Chi-square test.

3) Multi variable logistic regression adjusted to demographic variables (with determination of Odds ratio, 95% confident intervals) was used to determine factors associated with severity of periodontitis.

OR = Odds ratio; – = not applicable.

**Table 2**  
Metabolic parameters (HbA1c, fasting glucose, cholesterol, triglycerides) and periodontal disease severity: HbA1C > 7.0%.

Variable	TOTAL n = 350	None (No PD) n = 77	Low PD (n = 54)	Middle PD n = 98	High PD n = 121	95%CI	p value	OR
HbA1c (%)	7.4 ± 2.04	6.31 ± 1.34	7.00 ± 1.64	7.09 ± 1.71	8.5 ± 2.56	1.019 – 1.619	0.001*	1.340
F- glucose (mmol/l)	150.12 ± 62.24	91.23 ± 21.21	125 ± 31.20	138 ± 34.67	180 ± 77.47	0.729 – 1.040	0.041*	1.0 63
Chol (mmol/l)	144.32 ± 26.83	121.34 ± 21.53	132 ± 19.31	147 ± 20.43	167 ± 25.76	0.998 – 1030	0.003*	1.014
Triglycerides (mmol/l)	131.66 ± 27.71	99.13 ± 19.51	109 ± 22.35	112 ± 20.78	142 ± 37.98	1.011 – 1.040	0.002*	1.025

1) Multi variable logistic regression adjusted to demographic variables (with determination of Odds ratio, 95% confident intervals, p value) was used to determine factors associated with severity of periodontitis.

2) OR = Odds ratio.

3) mean difference of significance was significant at = 0.05 (p < 0.05)\*.

periodontitis (Table 2). High blood cholesterol and triglyceride were also found to be associated with increased severity of periodontitis. No significant relationship was found between diabetes and periodontitis on multi-variable analysis.

#### 4. Discussion

This study demonstrates that subjects with poorly-controlled diabetes (HbA1c ≥ 7) had elevated serum triglyceride and poor periodontal clinical parameters. Similar results have been previous published studies.<sup>7,8</sup> The impact of lipid levels on severity of periodontal inflammation is in agreement to the published study.<sup>9</sup> The reason cited for the poor periodontal health in high cardiac risk levels and diabetics with poor glycemic control is underlying inflammatory response. Chronic periodontitis gives favorable environment to the periodontal bacteria and their byproducts that alleviate the systemic inflammation leading to stimulation of the proinflammatory cytokines (C-reactive proteins, TNF-α, MCP IL-1β, interleukin-6). This in turn may lead to insulin resistance and hyperglycemia.<sup>10,11</sup> A significant finding from the study also shows that subjects with good glycemic control (HbA1c < 7) had fair periodontal health. The key results indicate that presence of diabetes alone does not have an effect on periodontal health. However it is the poorly glycemic control and failing lipid metabolism that increases the severity of periodontitis. This interprets to a fact that a well controlled diabetic will not have any added higher risk of developing periodontitis when compared to a nondiabetic.

#### 5. Conclusion

Risk of developing periodontal disease and or worsening of periodontitis is significantly associated with cardiac risk parameters and poor HbA1c control.

#### Clinical relevance

Study has attempted to lend an insight to a preventive integrative approach for management of cardiometabolic disorders and periodontitis by specialists i.e cardiologist, endocrinologist and periodontist. Further the study emphasises on reinforcing the need for development and implementation of guidelines for screening periodontitis, pre-diabetes, diabetes and cardiovascular disease in dental and medical primary care settings.

#### Conflicts of interest

None.

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None.

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