

# Association of C-Reactive Protein Levels With Periodontitis and Type II Diabetes Mellitus

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## ABSTRACT

**Aim:** To examine the plasma C-reactive protein levels in Pakistani population in association with periodontitis and diabetes.

**Methods:** Eighty subjects were collected from Rabia Welfare Hospital and Dental Hospital, The University of Lahore from May 2010 to November 2010. They were divided in four groups; group I (normal healthy), group 2 (periodontitis), group 3 (diabetes) and group 4 (both periodontitis and diabetes). Each group comprised 20 patients. Patients who have at least 15 teeth and age between 30-60 years were included. The obtained values of the patient samples and control sera were multiplied by dilution factor of 100 to obtain CRP results in mg/l.

**Results:** Statistically significant difference of C-reactive protein levels is present between periodontitis, diabetes and periodontitis diabetes group as compared to control group ( $P < 0.05$ ).

**Conclusion:** The CRP levels are raised with periodontitis and diabetes, and if both are present in a person, these levels are further elevated.

**Keywords:** C-reactive protein, Periodontitis, Type II diabetes mellitus

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## INTRODUCTION

Periodontitis is considered as one of the most common and severe type of oral infections.<sup>1</sup> Periodontitis is a multifactorial disease which is complicated by inflammatory response of the host and is caused by diverse types of Gram negative anaerobes like *Fusobacterium nucleatum*, *Porphyromonas gingivalis*, *Bacteroides forsythus* and *Treponema denticola*.<sup>2</sup> In patients with poor oral hygiene, these bacteria grow and form colonies in the form of dental plaque, which infect the periodontium, as a result inflammation occurs, and body defensive immune cells gets activated.<sup>3,4</sup>

Type 2 diabetes mellitus (NIDDM) comprises an array of dysfunctions resulting from the combination of resistance to insulin action and inadequate insulin secretion. It is characterized by hyperglycemia and is associated with microvascular, macrovascular and neuropathic complications.<sup>6</sup> Diabetes mellitus and periodontitis have a strong relationship. Both are inflammatory diseases and the levels of pro-inflammatory cytokines are elevated, which interlink these two diseases by worsening their pathologic affect with more periodontal tissue destruction and poor glycemic control.<sup>5,6</sup>

C-reactive protein an acute-phase protein found in the blood, the levels of which rise in response to

inflammation is linked closely to diabetes and periodontal infection<sup>7</sup>. In various diseases that result in tissue injury or inflammation, the CRP levels may rise within hours after an acute event. It is though that elevated CRP levels assist in complement binding to foreign and damaged cells and enhance the humoral response to the disease<sup>8</sup>.

Salzberg et al<sup>9</sup> are working on elevated levels of C-reaction protein in periodontitis. The elevated inflammatory cytokines levels associated with destructive periodontal diseases cause an increase in CRP levels<sup>10</sup>. The function of immune cells including neutrophils, is decreased in diabetes but the monocyte/macrophage cell line may be hyper responding when faced with bacterial antigenic contact. This hyper response results in a greater production of pro-inflammatory cytokines as tumor necrosis factor alpha and IL-6, which result in elevation of CRP levels<sup>11</sup>. The measurement of elevated CRP levels in periodontitis and diabetes are helpful in clinical diagnosis, therapy and monitoring of inflammatory conditions. Both diseases are common in our country.

## SUBJECTS AND METHODS

Eighty subjects were collected from Rabia Welfare Hospital and Dental Hospital, The University of Lahore from May 2010 to November 2010. They were divided in four groups; group I (normal healthy), group 2 (periodontitis), group 3 (diabetes) and group 4 (both periodontitis and diabetes). Each group comprised 20 patients. Patients who have at least 15

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teeth and age between 30-60 years were included. Pregnant women, chronic cardiac diseases, rheumatoid arthritis, chronic renal failure, thyroid disease, smokers, any acute or chronic infections were excluded. The status of periodontal disease was measured by using Community Periodontal Index of Treatment Needs (CPIN). High sensitivity enzyme linked immunoassay test kit (Biomerica) was used for the quantitative determination of C-reactive protein concentrations in human serum. The mean absorbance values were calculated for each set of reference standards, controls and samples. C-reactive protein levels were measured from the standard curve by using the mean absorbance value for each sample. The obtained values of the patient samples and control sera were multiplied by dilution factor of 100 to obtain CRP results in mg/l. The statistical analysis was performed using a software program SPSS-17.

This study was included 80 subjects who were divided into four groups. 54% of all the subjects were males and 46% were females with an overall 65% between 30-45 years of age and 35% between 45-60 years of age with mean age  $48.80 \pm 6.96$  years. The sugar level in serum of diabetic patients and diabetic periodontitis patients was significantly higher as compared to healthy population. Periodontal status of patients belonging to periodontitis group and diabetic periodontitis groups was statistically significant. The levels of C-reactive proteins were significantly lower as compared to other groups (Table 1). Statistically significant difference ( $P < 0.05$ ) is present in plasma C-reactive proteins concentration in all study groups (Table 2). Statistically significant difference of C-reactive protein levels is present between periodontitis, diabetes and periodontitis diabetes group as compared to control group ( $P < 0.05$ ) but there is insignificant difference in C-reactive protein levels between periodontitis group and diabetes group ( $P > 0.05$ ) [Table 3].

## RESULTS

Table 1: Comparison of fasting serum sugar levels

Group	Fasting serum sugar levels (mg/dl)	Periodontal status	C-reactive protein
Control	101.65±10.72	0.45±0.51	2.25±1.00
Periodontitis	103.75±10.36	3.40±0.50	5.36±0.89
Diabetics	206.35±41.08	1.00±0.64	4.65±0.98
Diabetics + Periodontitis	216.90±42.54	3.65±0.48	8.27±1.96

Table 2: Significance of plasma C-reactive proteins concentrations among study groups (ANOVA)

Plasma C-reactive proteins concentrations	Sum of squares	Df	Mean square	F	Sig.
Between Groups	369.714	3	123.238	74.095	.000
Within Groups	126.406	76	1.663		
Total	496.120	79			

Table 3: Pair-wise comparison of plasma C-reactive proteins concentration among study groups (LSD)

Dependent variable	Group	Mean difference	Std. error	Sig.	
Plasma C-reactive proteins concentration	Control	Periodontitis	-3.10750*	.40783	.000
		Diabetics	-2.39750*	.40783	.000
		Diabetics+Periodontitis	-6.02750*	.40783	.000
	Periodontitis	Control	3.10750*	.40783	.000
		Diabetics	.71000*	.40783	.086
		Diabetics+Periodontitis	-2.92000*	.40783	.000
	Diabetics	Control	2.39750*	.40783	.000
		Periodontitis	-.71000*	.40783	.086
		Diabetics+Periodontitis	-3.63000*	.40783	.000
	Diabetics+Periodontitis	Control	6.02750*	.40783	.000
		Periodontitis	2.92000*	.40783	.000
		Diabetics	3.63000*	.40783	.000

## DISCUSSION

In Pakistan, there is a very high incidence of periodontitis and diabetes. In the present study, we observed the levels of C-reactive proteins in associations with periodontitis and type 2 diabetes. The results of the study demonstrated that C-reactive protein levels are raised in diabetics ( $4.65 \pm 1.00$ ) and

patients with periodontitis ( $5.36 \pm 0.8$ ) as compared to control group ( $2.25 \pm 1.00$ ). The CRP levels were found highest in patients with both periodontitis and diabetes in relation to other study groups ( $8.27 \pm 1.9$ ). Slade et al<sup>12</sup> also found a significant association between periodontal disease and elevation of CRP levels.

The CRP levels are also raised in diabetes mellitus. Iyer and Desai<sup>13</sup> stated that C-reactive protein and fibrinogen levels in type 2 diabetes mellitus subjects, the mean CRP values were 1.7 mg/L in diabetics and 1.16mg/L in controls. So a significant correlation was found with CRP and diabetes. Coban and Sari<sup>14</sup> reported the levels of serum high sensitivity C-reactive protein in all groups. All studies on periodontitis patients with diabetes clearly demonstrate that the inflammatory response in such patients is related to increase in CRP.

## CONCLUSION

The measurement of high sensitivity immunoassay should be done to assess high sensitivity CRP levels, as they are indicative of chronic, low grade inflammation. The measurement of periodontitis and diabetes should be done properly to avoid future complications.

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