

Original Research

Effect of Periodontal Therapy on Serum C-Reactive Protein & Interleukin-17 Levels in Chronic Periodontitis Patients with or without type 2 diabetes mellitus: A Clinico Biochemical Study

Santokh Singh¹, Vikram Bali², Gagandeep Gupta³, Rajneesh Parimoo⁴, Vedika Verma⁵, Varsha Verma¹

¹PG student, ²Professor & Head, ³Reader, ⁴Senior Lecturer, ⁵Lecturer, Department of Periodontology, Desh Bhagat Dental College & Hospital, Mandi Gobindgarh, Punjab

ABSTRACT:

Background: The relationship between diabetes mellitus & periodontitis has been extensively examined and it is clear from all the epidemiological studies that diabetes mellitus increases the risk for and severity of periodontal diseases showing a two way relationship between them. C-reactive protein (CRP) is a type I acute phase protein, which can increase up to 1000 fold after the onset of a stimulus. Thus the aim of this study was to estimate and compare the levels of Serum C-Reactive Protein & Interleukin-17 Levels in Chronic Periodontitis Patients with or without type 2 diabetes mellitus in systemically healthy participants with chronic periodontitis, participants with chronic periodontitis and type 2 diabetes mellitus. **Materials & methods:** A total of 50 subjects of both the sexes, in the age range of 18-65 years, were divided into following groups of 25 each on the basis of clinical and laboratory parameters as, Group 1: Chronic Periodontitis with Type 2 Diabetes Mellitus with RBS of ≥ 200 mg/dl and HbA1c of ≥ 7.5 : Group 2 systemically healthy participants who have chronic periodontitis, defined as PPD of ≥ 5 mm, CAL of ≥ 2 mm and radiographic evidence of bone loss, Levels of Serum C-Reactive Protein & Interleukin-17 Levels was estimated using a commercially available ELISA kit. **Results:** Levels of Serum C-Reactive Protein & Salivary Interleukin-17 was highest in chronic Periodontitis and T2DM group. Periodontal clinical parameters PI, GI, PPD, CAL were recorded higher in chronic periodontitis and T2DM group when compared to when healthy participants who have chronic periodontitis. A statistically significant correlation between parameters such as FPG, HbA1c, PI, GI, PPD, CAL and salivary biomarkers were seen. **Conclusion:** The results showed an decrease in the levels of C-Reactive Protein & Salivary Interleukin-17 & HbA1c after periodontal therapy

Key words: Periodontitis, CRP, Interleukin-17, Diabetes Mellitus

Received: 12 September, 2020

Accepted: 16 November, 2020

Corresponding author: Dr. Santokh Singh, PG student, Department of Periodontology, Desh Bhagat Dental College & Hospital, Mandi Gobindgarh, Punjab

This article may be cited as: Singh S, Bali V, Gupta G, Parimoo R, Verma V, Verma V. Effect of Periodontal Therapy on Serum C-Reactive Protein & Interleukin-17 Levels in Chronic Periodontitis Patients with or without type 2 diabetes mellitus: A Clinico Biochemical Study. Int J Res Health Allied Sci 2021; 7(1):17-20.

INTRODUCTION:

Periodontitis is a term used to describe an inflammatory process, initiated by the plaque biofilm, that lead to loss of periodontal attachment to the root surface and adjacent alveolar bone, and which ultimately results in tooth loss.¹

Periodontitis has been referred to as the sixth

complication of diabetes.² Epidemiological data confirm that diabetes is a major risk factor for periodontitis; susceptibility to periodontitis is increased by approximately threefold in people with diabetes.³ There has, recently, been much emphasis on the 'two-way' relationship between diabetes and

periodontitis. That is, not only is diabetes a risk factor for periodontitis, but periodontitis could also have a negative effect on glycaemic control.⁴ Patients suffering from severe periodontitis have increased local production of inflammatory cytokines (IL-7, TNF and IL-6) and moderate systemic inflammatory response (defined by raised concentration of CRP, fibrinogen and moderate leucocytosis).⁵ Infection or inflammation activates leukocytes, which further induce the synthesis and secretion of C-reactive protein (CRP). CRP is an acute-phase reactant protein which is synthesized by the liver in response to the inflammatory cytokines interleukin-6 (IL-6), IL-1, and tumor necrosis factor- α . An elevated serum concentration of CRP is an evidence of active tissue-damaging process and CRP is an indicator of current disease activity.⁶ Therefore CRP & Interleukin-17 is useful as a proinflammatory marker in patients of chronic periodontitis with or without diabetes mellitus. The purpose of this study shall be to analyze how periodontal therapy affects CRP levels & Interleukin-17 levels in chronic periodontitis patients with or Without type 2 diabetes.

MATERIALS & METHODS

The present study was conducted in the Department of Periodontics and Implantology at Desh Bhagat Dental College & Hospital, Mandi Gobindgarh on subjects to estimate and compare the levels of C-reactive protein & Interleukin-17 of the chronic periodontitis patients before and after scaling and root planing. A sample size of 50 patients of age group 30-60 years with good systemic health diagnosed with chronic periodontitis were selected from OPD. The patients were asked to sign a written consent after the procedure was explained to them.

Group 1: Chronic Periodontitis with Type 2 Diabetes Mellitus

Group 2: Systemically healthy participants who have Chronic Periodontitis

The inclusion criteria included patients who had good oral hygiene, chronic periodontitis on basis of gingival index (GI), plaque index (PI), probing depth (PD), Clinical attachment level (CAL), patients with minimum of 20 teeth and those with good systemic health and mental health status. The exclusion criteria included patients having systemic diseases like rheumatoid arthritis, cardiovascular diseases, gastrointestinal disorders, respiratory diseases, and patients with a history of smoking or any periodontal surgery in past 6 months, pregnant and lactating females.

RESULTS

Among 50 subjects (Males-22, Females-28) included in the study CRP and IL-17 were detected in all the samples. The concentration differed in all the groups. The mean concentration of CRP in Group 1 and 2 was 12.0 mg/I and 9.0 mg/I respectively at baseline and 10.5 mg/I & 8.9 mg/I after three months of periodontal therapy. The mean and standard deviation of Plaque Index (PI) in Group 1, Group 2 was 2.45+ 0.53 and 2.25+ 0.49 at baseline and 1.90 + 0.51 and 1.45+ 0.49 after three months of periodontal therapy respectively. The mean and standard deviation of Gingival Index (GI) in Group 1, Group 2 was 2.35+ 0.62, 2.19± 0.42 at baseline and 2.10+ 0.53, 1.80± 0.51 after three months of periodontal therapy respectively. The mean and standard deviation for Probing pocket depth (PPD) in Group 1, Group 2 was 5.95+ 0.81, 3.82+ 0.59 at baseline and 4.90 + 0.48 , 4.10+ 0.53 respectively. The mean and standard deviation for Clinical attachment level (CAL) in Group 1, Group 2 was 5.60+ 0.49, 4.40+ 0.55 at baseline and , 4.90+0.48, 4.10±0.53 after three months of periodontal therapy respectively.

This infers that the clinical parameters which included PI, GI, PPD and CAL were highest in group 1 The group 1 & 2 showed considerably reduced scores of clinical parameters after periodontal therapy. This shows that diabetes along with chronic periodontitis has a higher destructive effect on the periodontal health. The mean and standard deviation of HbA1c levels in Group 1, Group 2 was 6.90+ 0.25, 5.10+ 0.23 at baseline and 6.70+ 0.21, 5.0+ 0.23 after three months of periodontal therapy respectively. Hence, it can be inferred that the levels of HbA1c in chronic periodontitis and T2DM groups is significantly reduced after periodontal therapy because chronic periodontitis can interfere with the glycemic control in T2DM patients.

The mean and standard deviation for Clinical CRP in Group 1, Group 2 was 12.65+ 1.12, 9.88+ 0.95 at baseline and 10.56+1.10, 8.90±0.89 after three months of periodontal therapy respectively. Hence, it can be inferred that the levels of CRP in chronic periodontitis and T2DM groups is significantly reduced after periodontal therapy. The mean and standard deviation of IL-17 levels in Group 1, Group 2 were 64.37+25.1, 52.54+ 18. 79 at baseline and 59.37+24.1, 48.54+ 18. 69 after three months of periodontal therapy respectively. This infers that the salivary levels of IL-17 significantly reduced after periodontal therapy.

The mean and standard deviation for PI, GI, PPD, CAL HbA1c, CRP , IL-17 Group 1, Group 2 at baseline

| Parameter | Group | N | MEAN | SD | P VALUE |
|-----------|---------|----|------|------|---------|
| PI | Group 1 | 25 | 2.45 | 0.53 | <0.001 |
| | Group 2 | 25 | 2.25 | 0.49 | |
| GI | Group 1 | 25 | 2.35 | 0.62 | <0.001 |
| | Group 2 | 25 | 2.19 | 0.42 | |
| PPD | Group 1 | 25 | 5.95 | 0.81 | <0.001 |
| | Group 2 | 25 | 3.82 | 0.59 | |
| CAL | Group 1 | 25 | 5.60 | 0.49 | <0.001 |
| | Group 2 | 25 | 4.40 | 0.55 | |
| HbA1c | Group 1 | 25 | 6.9 | 0.25 | <0.001 |
| | Group 2 | 25 | 5.1 | 0.23 | |
| CRP | Group 1 | 25 | 12 | 1.21 | <0.001 |
| | Group 2 | 25 | 9 | 95 | |
| IL-17 | Group 1 | 25 | 64 | 25 | <0.001 |
| | Group 2 | 25 | 52 | 18 | |

* - Statistically Significant; SD – Standard deviation; N – Group sample size; GI – Gingival Index; PI – Plaque Index; PPD – Probing Pocket Depth; CAL- Clinical attachment loss; HbA1c – glycated haemoglobin; CRP – C Reactive Protein ; IL-17 – Interleukin 17.

The mean and standard deviation for PI, GI, PPD, CAL HbA1c, CRP , IL-17 Group 1, Group 2 after 3 months of periodontal therapy .

| Parameter | Group | N | MEAN | SD | P VALUE |
|-----------|---------|----|------|------|---------|
| PI | Group 1 | 25 | 1.90 | 0.51 | <0.001 |
| | Group 2 | 25 | 1.45 | 0.49 | |
| GI | Group 1 | 25 | 2.10 | 0.53 | <0.001 |
| | Group 2 | 25 | 1.80 | 0.51 | |
| PPD | Group 1 | 25 | 5.45 | 0.79 | <0.001 |
| | Group 2 | 25 | 3.20 | 0.61 | |
| CAL | Group 1 | 25 | 4.90 | 0.48 | <0.001 |
| | Group 2 | 25 | 4.10 | 0.53 | |
| HbA1c | Group 1 | 25 | 6.7 | 0.21 | <0.001 |
| | Group 2 | 25 | 5.0 | 0.23 | |
| CRP | Group 1 | 25 | 10.5 | 1.10 | <0.001 |
| | Group 2 | 25 | 8.9 | 89 | |
| IL-17 | Group 1 | 25 | 59 | 24 | <0.001 |
| | Group 2 | 25 | 48 | 18 | |

* - Statistically Significant; SD – Standard deviation; N – Group sample size; GI – Gingival Index; PI – Plaque Index; PPD – Probing Pocket Depth; CAL- Clinical attachment loss; HbA1c – glycated haemoglobin; CRP – C Reactive Protein ; IL-17 – Interleukin 17.

DISCUSSION

The present study was conducted to evaluate the effect of Periodontal Therapy on Serum C-Reactive Protein & Interleukin-17 Levels in Chronic Periodontitis Patients with or without type 2 diabetes mellitus. The present study was conducted in the Department of Periodontics and Implantology at Desh Bhagat Dental College & Hospital, Mandi Gobindgarh. C-reactive protein (CRP) is a very strong acute phase protein. In healthy, young subjects and resting situations the serum concentration is < 1.5 mg/l. In acute phase situations, however, the concentration can increase up to a thousand-fold.⁷ CRP is synthesized mainly in hepatocytes, but mRNA and CRP have been shown to be present in monocyte-

derived macrophages in atherosclerotic plaques, lymphocytes and alveolar macrophages.⁸ Its synthesis is regulated mainly by interleukin (IL)-6, IL-1 and tumor necrosis factor. Peak values of CRP usually disappear within a few days of the inflammatory stimulus. The CRP concentration is associated with cardiovascular disease and with other inflammatory diseases, such as rheumatoid arthritis. Also, several components of the insulin-resistance syndrome, such as obesity and increased blood pressure, are associated with altered CRP values and which has been confirmed by several other groups.⁹ Also, patients with insulin-dependent diabetes mellitus have increased CRP levels. The present study determines whether the presence of

periodontitis and periodontal treatment could influence the serum levels of C-reactive protein, HbA1c and IL-17 levels. The results of the present study highlight 3 points. Firstly, an increase in serum CRP, IL-17 & HbA1c levels concomitantly with the severity of the disease. Secondly, a properly performed periodontal therapy results in the improvement of the periodontal parameters irrespective of the state of the disease. Thirdly, a reduction in systemic inflammation as evidenced by the reduction in CRP, HbA1C & IL-17 levels with periodontal therapy.

Fredriksson *et al.*¹⁰ in a study, estimated a median CRP of 2 mg/l for periodontitis patients, 0 mg/l among controls. In another study, Loos *et al.*¹¹ observed the highest CRP values in patients with a generalized form of periodontitis (median 1.45 mg/l); for patients with a more localized form of periodontal disease, the median CRP value was 1.30 mg/l, while healthy controls presented with a median of 0.90 mg/l.

In the present study, the CRP, HbA1c & IL-17 levels in periodontitis patients reduced significantly after periodontal therapy. This is in agreement with other studies that reported a significant reduction in CRP, HbA1c & IL-17 level after treatment. Another aspect of the present study was the correlation between individual parameters and CRP, HbA1c & IL-17 level. Parameters such as plaque index, gingival index, probing pocket depth and clinical attachment level gain showed a positive correlation with changes in CRP, HbA1c & IL-17 after three month following treatment. Since these parameters showed a positive correlation, they can be used as predictors for changes in CRP, HbA1c & IL-17 level.

CONCLUSION

As the number of patients in this study was relatively small, these results have to be interpreted with caution. The present study envisaged to determine the relationship between periodontitis and periodontal treatment upon the serum levels of C-reactive protein HbA1c & IL-17 level. In the present study, the patients

without DM lower mean CRP & IL-17 levels as compared to the patients with chronic periodontitis with DM. In periodontitis patients, mean levels of CRP, IL-17 & HbA1c decreased after the periodontal therapy. It is concluded that periodontal therapy could be one of the important aspects in the prevention of adverse cardiovascular events and glycemic control.

REFERENCES

1. Genco R, Kornman K, Williams R, *et al.* Consensus report Periodontal diseases: Pathogenesis and microbial factors. *Ann Periodontol* 1996;1:926-32.
2. Ref Ide M., *et al* (2003): Effect of treatment of chronic periodontitis on levels of serum markers of acute-phase inflammatory and vascular responses. *J Clin Periodontol* ; 30: 334-40.
3. Preshaw PM, Alba AL, Herrera D, Jepsen S, Konstantinidis A, Makrilakis K, Taylor R. Periodontitis and diabetes: a two-way relationship. *Diabetologia*. 2012;55(1):21-31.
4. Ref Williams R.C. and Offenbacher S. (2000): Periodontal Medicine : the emergency of a new branch of periodontology. *Periodontology* 2000; 23: 9-12.
5. Ide M, Mc Partlin D, Coward Py, Crook M, Lumb P, Wilson RF. Effect of treatment of chronic periodontitis on levels of serum markers of acute phase inflammatory and vascular responses. *J.clin periodontol* 2003; 30: 334-340.
6. Pepys M.B. (1981): C-reactive protein fifty years on. *Lancet*; 21: 653-56.
7. De Maat MPM, Klufft C. Determinants of C-reactive protein concentration in blood. *Ital Heart J* 2001;2:189-95
8. Dong Q, Wright JR. Expression of C-reactive protein by alveolar macrophages. *J Immunol* 1996;156:4815-20.
9. Hak AE, Stehouwer CD, Bots ML. Associations of C-reactive protein with measures of obesity, insulin resistance, and subclinical atherosclerosis in healthy, middle-aged women. *Arterioscler Thromb Vasc Biol* 1999;19:1986-91.
10. Fredriksson MI, Figueredo CM, Gustaffson A, Bergstrom KG, Asman BE. Effect of periodontitis and smoking on blood leukocytes and acute phase proteins. *J Periodontol* 1999;70:1355-60
11. Loos BG, Craandijk J, Hoek FJ, Wertheim-van-Dillen PM, van der Velden U. Elevation of systemic markers related to cardiovascular diseases in the peripheral blood of periodontitis patients. *J Periodontol* 2000;71:1528-34