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ORIGINAL RESEARCH

Assessment of IL- 21 level in patients with periodontitis- A clinical study

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ABSTRACT

Background: Periodontitis is a multifactorial disease that involves bacterial biofilm and the generation of an inflammatory response. The present study was conducted to assess IL- 21 level in patients with periodontitis. **Materials & Methods:** The present study was conducted on 35 subjects of chronic periodontitis. 35 healthy subjects were taken as control. Patients were divided into 2 groups. Group I were patients and group II were controls. Plaque index, gingival index, probing depth and bleeding on probing were assessed for all the patients. The GCF samples from deepest probing depth were collected for IL-21 assessment. Levels of IL-21 in GCF and gingival tissues were quantified using a sandwich enzyme-linked immunosorbent assay (ELISA) according to the manufacturer's instructions. **Results:** The mean PD in group I was 3.42 mm and in group II was 1.19 mm, AL was 4.23 mm in group I and 1.89 in group II, sites with plaques was 81.2 mm in group I and 26.5 mm in group II, sites with BOP was 50.4 mm in group I and 2.4 mm in group II. The difference was significant ($P < 0.05$). The mean IL- 21 level in group I was 45.7 pg/mg in group I and 34.1 pg/mg in group II. The difference was significant ($P < 0.05$). **Conclusion:** There was increased level of IL- 21 in patients with periodontitis as compared to healthy subjects.

Key words: ELISA, Periodontitis, IL-21

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INTRODUCTION

Periodontitis is a multifactorial disease that involves bacterial biofilm and the generation of an inflammatory response. Although a chronic bacterial and endotoxin exposure is a prerequisite for gingival inflammation and periodontal tissue destruction to occur, its presence alone is responsible for a relatively small proportion (20%) of the variance in the clinical expression of periodontitis.¹

Cytokines are important in expression of the characteristics of the immune response to bacterial endotoxins. Interleukins comprise a large group of cytokines that are naturally occurring glycoproteins produced by the body.

They help in recruitment of neutrophils and macrophages to participate and amplify the inflammatory immune reaction.² IL-21 is principally composed by activated T cells which facilitate IL-21 to modulate the acquired and innate immunity. IL-21, a type-I cytokine structurally appears similar to IL-2, IL-4, and IL-15 proteins. IL-21 compete in the immunity against tumor cells and chronic viral infections and with the advancement of immune inflammatory diseases in various organs systems.³

It functions via the receptor IL-21R which is a type I cytokine receptor.⁴ Recently IL-21 has gained importance as it has been associated with the pathogenesis of inflammatory breakdown in various systemic diseases like

rheumatoid arthritis, colitis, and inflammatory bowel disease. On account of the fact that IL-21 plays a paramount role in inflammation, its over production leads to amplification of local inflammation, intensifying tissue damage and destruction.⁵ The present study was conducted to assess IL- 21 level in patients with periodontitis.

MATERIALS & METHODS

The present study was conducted in the department of Periodontics. It comprised of 35 subjects chronic periodontitis. 35 healthy subjects were taken as control. Chronic periodontitis was defined as having >5 teeth with periodontal sites with probing depths (PD) >5 mm, clinical attachment loss (AL) >3mm, and extensive bone loss determined radiographically. All were informed regarding

the study and written consent was obtained. Ethical clearance was obtained prior to the study.

General data such as name, age, gender etc. was recorded. Patients were divided into 2 groups. Group I were patients and group II were controls.

Plaque index, gingival index, probing depth and bleeding on probing were assessed for all the patients. The GCF samples from deepest probing depth were collected for IL-21 assessment. Levels of IL-21 in GCF and gingival tissues were quantified using a sandwich enzyme-linked immunosorbent assay (ELISA) according to the manufacturer's instructions. Results thus obtained were subjected to statistical analysis. P value less than 0.05 was considered significant ($P < 0.05$).

RESULTS

Table I Distribution of patients

Groups	Group I	Group II
Status	Chronic Periodontitis (Study)	Aggressive Periodontitis (Control)
Number	35	35

Table I shows that group I was study (chronic periodontitis) and group II was control (Aggressive Periodontitis) patients. Each group had 35 subjects.

Table II Comparison of parameters

Parameters (Mean)	Group I	Group II	P value
Probing depth (mm)	3.42	1.19	0.01
Attachment level (mm)	4.23	1.89	0.05
Sites with plaque (mm)	81.2	26.5	0.02
Sites with BOP (mm)	50.4	2.4	0.001

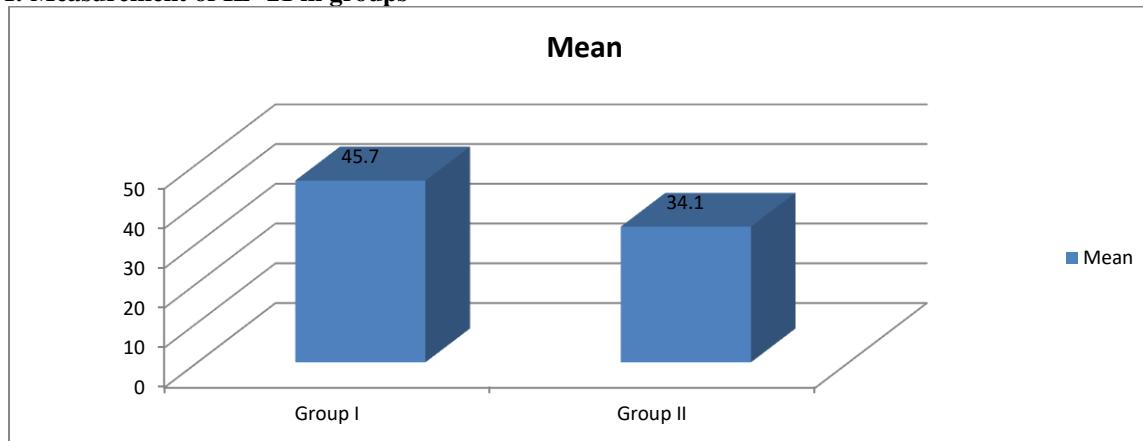
Table II shows that mean PD in group I was 3.42 mm and in group II was 1.19 mm, AL was 4.23 mm in group I and 1.89 in group II, sites with plaques was 81.2 mm in group I and 26.5 mm in group II, sites with BOP was 50.4 mm in group I and 2.4 mm in group II. The difference was significant ($P < 0.05$).

Table III Measurement of IL- 21 in groups

Parameters (Mean)	Group I	Group II	P value
IL- 21 (pg/mg)	45.7	34.1	0.05

Table III, graph I shows that mean IL- 21 level in group I was 45.7 pg/mg in group I and 34.1 pg/mg in group II. The difference was significant ($P < 0.05$).

Graph I: Measurement of IL- 21 in groups



DISCUSSION

Periodontitis is a chronic inflammatory condition which shows increased local and systemic levels of inflammatory mediators and markers of inflammation like IL-21, and a direct link has been established between periodontitis and rheumatoid arthritis. Periodontitis is a chronic inflammatory disease that affects the supporting structures of the teeth and is considered as one of the most common reasons for tooth loss. It is one of the most common pathologies of bone and an important modifying factor of several chronic inflammatory systemic diseases like cardiovascular disease and obesity.⁶

IL-21 is a proinflammatory cytokines expressed by activated Th1 and Th17 cells (proinflammatory lineage) functions via receptor IL-21R, a type I cytokine receptor. IL-21 expressed at site of inflammation in varying quantities is mainly secreted by activated CD4+ T cells and natural killer T cells (NKT).⁷ The activities of IL-21 have effects on both lymphoid and myeloid lineages. IL-21 is a helper cytokine that orchestrate a potent innate response. It has effect on leukocyte subsets, such as antigen presenting dendritic cells and phagocytic macrophages to a lesser extent compared to T cells, NK cells and B cells. IL-21 regulates IgE production and eosinophilic requirements. IL-21 activates the JAK/signal transducer and activator of transcription (STAT) pathway. Two other major pathways have been associated with IL-21 signalling: mitogen activated protein kinase (MAPK) and phosphoinositol-3 kinase (PI-3K), thus interlinked to cellular functions.⁸ The present study was conducted to assess IL- 21 level in patients with periodontitis.

In this study, group I was study (chronic periodontitis) and group II was control (Aggressive Periodontitis) patients. Each group had 35 subjects. The mean PD in group I was 3.42 mm and in group II was 1.19 mm, AL was 4.23 mm in group I and 1.89 in group II, sites with plaques was 81.2 mm in group I and 26.5 mm in group II, sites with BOP was 50.4 mm in group I and 2.4 mm in group II.

Dutzanet al⁹ in their study gingival crevicular fluid samples were collected from chronic gingivitis (n=12), chronic periodontitis (n=12) and controls (n=10). Clinical parameters like Plaque index, Gingival index, Gingival bleeding index, Probing depth and Relative attachment level were recorded at baseline and at the end of six weeks. Patients with chronic gingivitis and periodontitis received non-surgical periodontal treatment (Scaling and Root planing). IL-21 was quantified through an Enzyme-linked Immunosorbent Assay. The baseline levels of IL-21 in GCF was significant in chronic gingivitis ($p<0.05$) and highly significant in chronic periodontitis patients ($p<0.001$) when compared to controls. Non-surgical periodontal therapy was found to significantly reduce the levels of IL-21 in chronic Periodontitis compared to gingivitis.

We observed that mean IL- 21 level in group I was 45.7 pg/mg in group I and 34.1 pg/mg in group II. Napimoga et

al¹⁰ found that the population studied consisted of 34 patients (15 with chronic periodontitis and 19 healthy patients). Twenty samples (10 gingival crevicular fluid [GCF] and 10 gingival biopsies) were collected from each group before the patients with periodontitis received periodontal treatment. Total protein concentrations were measured in all samples; the presence of IL-21 was confirmed by immunohistochemistry and Western blot, and IL-21 levels were quantified through an enzyme-linked immunosorbent assay. GCF IL-21 was mainly detected in patients with chronic periodontitis ($P <0.05$). Levels of IL-21 in gingival tissues were significantly higher in patients with chronic periodontitis compared to healthy individuals ($P <0.05$). The Western blot and immunohistochemical staining confirmed the presence of IL-21 in periodontal tissues and GCF.

IL-21 plays a pivotal role in the pathogenesis of various inflammatory systemic diseases like inflammatory bowel disease, rheumatoid arthritis and colitis. Th1/Th2/Th17 paradigm has offered an explanation of periodontal pathogenesis on the principle of periodontal disease activity dictated by a complex interplay between the host immune system and the periodontal pathogens.¹¹ Thus IL-21 plays a paramount role in inflammation and its overproduction leads to complication of the inflammatory response intensifying tissue damage. Since rheumatoid arthritis and periodontitis has been associated with one another [28] increasing evidence has led to the hypothesis that dysregulation of IL-21 signalling pathway during microbial infection may be a determinant periodontal disease activity.¹²

CONCLUSION

There was increased level of IL- 21 in patients with periodontitis as compared to healthy subjects.

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