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# Rheumatoid Arthritis and Chronic Periodontitis – A Disease Link.

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**Abstract**

**Background**:

Rheumatoid Arthritis and Chronic Periodontitis are two chronic inflammatory disorders which share a similar pathophysiology. Previously many studies have proposed a relationship between both the diseases. Therefore, the aim of the study was to explore the co-relation between grading of Rheumatoid arthritis and severity of chronic periodontitis in south Indian population.

**Material And Methods**:

Sixty consecutive patients attending a rheumatology clinic were examined for their levels of periodontitis and rheumatoid arthritis. Patients without rheumatoid arthritis was selected on age and gender matched served as controls. Probing pocket depth, clinical attachment loss and plaque score were measured for Periodontitis. Measures of rheumatoid arthritis include DAS scores. Severity of rheumatoid disease activity score was correlated with the severity of Periodontitis and it was analyzed with the control group.

**Results**:

No difference in the plaque score between the rheumatoid arthritis and the control group was observed. More pocket depth and more number of missing teeth were found in the rheumatoid arthritis group. No significant difference was seen in the severity of rheumatoid arthritis disease group with the severity of chronic Periodontitis. But when only the severe chronic Periodontitis group was compared with the rheumatoid activity disease group there was a significant difference noted.

**Conclusion**:

The result of the study shows a positive co-relation between the rheumatoid arthritis and chronic Periodontitis. The severity of rheumatoid arthritis disease group increases with the severity of chronic Periodontitis.

**Keywords**: Boneloss, DAS score, Inflammation, Periodontitis, Rheumatoid arthritis.

## INTRODUCTION:

Periodontitis is a multifactorial chronic inflammatory disease, which has been associated with bone loss and destruction of periodontal ligament, which ultimately leads to tooth loss.[1] The subgingival microbiota in patients with periodontitis provide a significant and persistent gram negative bacterial challenge in the host and these microorganisms and their products such as lipoplysaccharides have ready access to the circulation through the ulcerated and discontinuous sulcular epithelium.[2,3] Various studies have put forward that periodontitis can remarkably increase the possibility of different systemic chronic inflammatory diseases such as rheumatoid arthritis.

Rheumatoid arthritis (RA), a chronic autoimmune disease, is also associated with connective tissue and bone destruction involving all the joints. Both the diseases share similar cellular and molecular pathobiology. It had also been found in various studies, that both these chronic disorders exhibit similar immunological response ,due to the increased release of pro-inflammatory cytokines (interleukin IL-1, interleukin IL-6 and tumor necrosis factor [TNF]- a).[4] In spite of the fact that, the etiology of these two persistent inflammatory diseases are different, the rheumatoid arthritis patients are more prone to encounter Periodontitis and the intensity of Periodontitis will be significantly raised in patients with rheumatoid arthritis. Poor oral hygiene status was also reported in rheumatoid arthritis patients due to limited joint movement and also due to the medications used in the treatment of rheumatoid arthritis.[5] Several studies have reported the correlation of severity of clinical parameters in Periodontitis and rheumatoid arthritis.[6] But in contrast with the previous studies, no co-relation with the clinical findings in patients with chronic periodontitis and rheumatoid arthritis was seen in a study conducted by Tania Lucia de Oliveira Silva et al.[7] The prevalence and severity of RA and periodontitis patients depend on genetic, dietary, cultural and ethnic differences.[8-13] Limited studies are available in the literature to show the severity of clinical parameters in periodontitis and RA in South Indian population. Therefore, the present study was carried out to investigate the correlation between grading of rheumatoid arthritis and severity of chronic periodontitis in South Indian population.

## MATERIALS AND METHODS:

The present case control study included 60 subjects with age, between 35-68 years. The subjects were screened for clinical periodontal parameters and rheumatologic findings and were categorized into two groups as 30 rheumatoid arthritis with chronic periodontitis subjects (group I) as cases and 30 systemically and periodontally healthy subjects ( group II) as controls.

The study participants (case group) were recruited from the Department of Rheumatology, Kilpauk Medical College, Chennai. Control group participants were selected from Thai Moogambigai Dental College, Chennai. The study was conducted from June 2016 to December 2016. The ethical committee clearance was approved by the, kilpauk Medical College, Chennai, and written informed consent was obtained from all subjects.

The participants were enrolled according to inclusion and exclusion criteria. The

inclusion criteria for group I consisted of rheumatoid arthritis subjects who fulfilled the American College for Rheumatology (ACR) criteria[14], and with chronic periodontitis. Chronic periodontitis was selected based on clinical attachment loss (CAL). Subjects with less than 20 teeth, systemic diseases like diabetes, heart diseases, blood diseases, history of chemotherapy or radiotherapy, as well as pregnant women, users of drugs influencing periodontal tissue (Phenytoin, Cyclosporine, Nifedipine, and oral contraceptives) or antibiotics during the last six months were excluded from the study. Severity of chronic periodontitis was classified depending on CAL as mild, moderate and severe periodontitis.

CAL between 2-3 mm was mild periodontitis, 3-5mm was moderate periodontitis and 5 mm or more was considered severe. The clinical parameters assessed were Plaque index (PI), Probing Pocket Depth (PPD) and CAL. The numbers of missing teeth were also calculated.

PI were recorded at four sites (mesiobuccal, midbuccal, distobuccal and mid palatal sites) around each tooth. Periodontal probing was measured from the gingival margin to the base of the pocket and is performed at six sites per tooth (mesiobuccal, mesiolingual,distobuccal,distolingual,midbuccal and midlingual). CAL was measured as the distance from cemento-enamel junction to the bottom of the periodontal pocket. The overall CAL scores of all sextants also were calculated.

DAS-28 score system was used to assess the rheumatoid disease activity in the RA subjects. The DAS score system involved four parameters: 28 tender joints (TJ28), 28 swollen joints (SJC28), ESR and patient general health (GH) based on a 100-mm visual analog scale. The 28 joints assessed included 10 metacarpophalangeal joints and 10 proximal interphalangeal joints of the hand, 2 wrists, 2 elbows, 2 shoulders and 2 knees. Patient GH based on a 100-mm visual analog scale was taken as: grade 0, corresponding to no disease activity and grade 100, corresponding to high disease activity.

Rheumatoid disease activity was defined as: low, moderate and high.

- Low disease activity was confirmed if DAS-28 score was≤ 3.2,
- Moderate if DAS-28 score was in between 3.2and 5.1
- High if DAS-28 score was ≥ 5.1.

**Statistical analysis:**

Demographic data, comparision of periodontal parameters were expressed as mean ± standard deviation and as percentages. Chi‑square and independent *t*‑tests were used for comparison of rheumatoid disease activity with periodontal disease.

## RESULTS:

A total of sixty subjects (20 males and 40 females) were recruited in this study. The age of the patients, socio economic status of the patients were tabulated in Table 1. Comparison of periodontal parameters in group I and group II were illustrated in Table 2. The mean value of plaque index in group I was 1.96±0.51 and in group II was 1.38±0.67. The mean probing depth in group I was 5.73±1.91 and in group II was 3.30±0.79. The mean clinical attachment level in group I was 7.56±1.90 and in group II was 5.06±1.48. There was a significant difference in the plaque index, periodontal probing depth and clinical attachment level with the P value of <0.001. Table 3 shows the comparison of rheumatoid disease activity with periodontal disease among cases (RA subjects). There was 14 patients in the low disease activity group in RA subjects of which 80% showed mild Periodontitis, 55.6% showed moderate Periodontitis and 31.2% showed severe Periodontitis. 9 patients had moderate disease activity score, of which 33.3% had moderate periodontitis and 37.5% had severe periodontitis. 7 patients had severe disease activity of RA of which 20% had mild periodontitis,11% moderate periodontitis and 31.2% had severe Periodontitis, but there was no statistical significance( P value 0.285.) Table 5 demonstrates the comparison of rheumatoid disease activity with only severe chronic periodontitis group : Of the 14 low rheumatoid disease activity , 5 subjects exhibited severe periodontitis. Of 9 patients with moderate rheumatoid disease activity, 6 of them showed severe periodontitis. Of 7 patients with severe rheumatoid disease activity, 5 of them showed severe periodontitis with the statistical significance of P <0.001.

**Table 1.** Demographic Data

| | | Group | | P value |
|---|---|---|---|---|
| | | Case (30) | Control (30) | |
| Age (years) | | 50.96 ± 8.45 | 53.8 ± 9.34 | 0.233 |
| Gender | Male | 6 (30.0%) | 14 (70.0%) | 0.027 |
| | Female | 24 (60.0%) | 16 (40.0%) | |
| SES | Low | 25 (50.0%) | 25 (50.0%) | 0.635 |
| | High | 5 (50.0%) | 5 (50.0%) | |

**Table 2**. Comparison of periodontal parameters

| Parameters | Group | N | Mean | SD | CI 95% | | P value |
|---|---|---|---|---|---|---|---|
| | | | | | Lower | Upper | |
| Missing teeth | Group I | 30 | 0.30 | 0.4 | 0.1260 | 0.4740 | 0.22 |
| | Group II | 30 | 0.16 | 0.3 | 0.0251 | 0.3082 | |
| Plaque Index | Group I | 30 | 1.9600 | 0.51502 | 1.7677 | 2.1523 | |
| | Group II | 30 | 1.3867 | 0.67299 | 1.1354 | 1.6380 | <0.001 |
| PD | Group I | 30 | 5.7333 | 1.91065 | 5.0199 | 6.4468 | |
| | Group II | 30 | 3.3000 | 0.79438 | 3.0034 | 3.5966 | <0.001 |
| CAL | Group I | 30 | 7.5667 | 1.90613 | 6.8549 | 8.2784 | |
| | Group II | 30 | 5.0667 | 1.48401 | 4.5125 | 5.6208 | <0.001 |

**Table 3.** Comparison of Rheumatoid Disease Activity with periodontal disease among cases (RA subjects)

| Rheumatoid disease activity | Periodontitis | | | P |
|---|---|---|---|---|
| | Mild Periodontitis | Moderate periodontitis | Severe periodontitis | |
| Low | 4 | 5 | 5 | 0.285 |
| | 80.0% | 55.6% | 31.2% | |
| Moderate | 0 | 3 | 6 | |
| | .0% | 33.3% | 37.5% | |
| Severe | 1 | 1 | 5 | |
| | 20.0% | 11.1% | 31.2% | |
| Total | 5 | 9 | 16 | |
| | 100.0% | 100.0% | 100.0% | |

**Table 4** Comparison of Rheumatoid disease activity with only severe chronic Periodontitis group

| Rheumatoid disease activity | Severe chronic Periodontitis | P=value | |
|---|---|---|---|
| Low n=14 | 5 | 0.000033 | Significance $p \leq 0.01$ |
| Moderate n=9 | 6 | 0.000105 | |
| Severe n=7 | 5 | 0.000917 | |

## DISCUSSION:

Chronic Periodontitis is an infectious inflammatory disease, triggered by oral microorganisms which includes the red complex organisms, forms the etiology in causing periodontal disease, results in loss of supporting tissues of teeth, clinical attachment loss and alveolar bone loss resulting in tooth loss.[1] Current evidence has proved that many systemic conditions such as cardiovascular disease, type 2 diabetes mellitus (DM), and rheumatoid arthritis have association with chronic Periodontitis.

Rheumatoid arthritis (RA) is a systemic chronic autoimmune disease, characterized by periods of disease flares and remissions, resulting in permanent joint destruction and deformity. [14] Chronic dysregulation of inflammation is seen in the surrounding tissues are common in both periodontal disease and rheumatoid arthritis; this in turn leads to destruction of the periodontal attachment apparatus and also damage the cartilage in RA patients. Several studies demonstrate an epidemiological association between RA and PD. NHANES (National Health and Nutrition Examination Survey) proved that RA patients are four times more likely to develop Periodontitis than those without RA. [15]

This case–control study consisted of 60 subjects (30 RA, 30 NRA) matched with age- and gender and also with similar socioeconomic status. The mean age range of cases and controls in this study was in the range of 35-50 years, because the onset of RA is most frequent during the fourth and fifth decades of life, which is comparable to previous studies. [16]

In this study the females were more frequently affected compared with the males, this finding is in concurrence with the earlier reports stating that females are three times more likely to develop RA than males.[16] The reason that why females are more prone to RA could be one of the etiology. According to Scott J. Zashin autoimmune disease are more common in women, changes in hormone levels may affect the level of proteins in the blood that contribute to inflammation. Thus, our study showed that the age range and gender of individuals in the RA group reflects the same epidemiologic pattern and represents the general RA population. The rheumatoid arthritis group shows majority of the subjects are from a low socioeconomic status, which is in accordance with the previous reports.

In our study the cases had more number of missing teeth than controls; the difference was not statistically significant. Inspite of the fact that the patients in the cases group were taking Non Steroidal Anti Inflammatory Drugs (NSAIDs), as an analgesic, which act by providing an protective effect on the bone loss and subsequent tooth loss. [17] Almost identical results have been observed in other studies. [18, 19] In this present study the plaque score was significantly higher in the RA group when compared with that of control group, it could be one of the reason for periodontal destruction and also the dexterity of the hand in RA patients makes it difficult to have a proper oral hygiene. [5]

The hallmark of periodontal healthy subjects depends on the pocket depth and clinical attachment level. The RA subjects had greater PPD compared to controls and also in case of attachment loss; it was more in the RA group than the controls. The difference in PPD and CAL between cases and controls were statistically significant. The increase in the pocket depth in RA subjects was due to increase in the alveolar bone loss which causes periodontal destruction. [5, 20]

Recently, Kaur et al [21] in a systematic review reported that the periodontal parameter clinical attachment level (CAL) was greater in patients with RA than in subjects without RA, indicating that PD may be more severe in RA. Similarly in our study we found an increase in the progression of periodontal disease in RA patients.

The study by Ogrendik et al [22] stated that the IgG and IgA immunoglobulins which has been used against periopathogen has been found to be increased in the synovial fluids of the RA patients , the likelihood that it could be involved in the pathogenesis of rheumatoid arthritis.

Rosenstein et al [23] had put forward that, the enzyme peptidyl arginine deaminase(PAD) released by the primary periopathogen P.gingivalis has been associated with the pathogenesis of both chronic periodontitis and rheumatoid arthritis.

In our study, there was statically significant difference between the severity of periodontal disease and rheumatoid disease activity group. It has been noted in our study that as the severity of rheumatoid disease activity increases, the severity of chronic periodontitis also increases. Considering the periodontal disease severity in Group I subjects, 47% had mild periodontitis, 30% had moderate and 23% had severe periodontitis. The prevalence of lower number of subjects with severe periodontitis (23%) may be due to the

fact that all RA subjects were under medications like NSAIDs and Disease-Modifying Antirheumatic Drugs (DMARDs), such as methotrexate, sulfasalazine, chloroquine, leflunomide, could have decreased the severity of both periodontal disease activity. In RA patients the intake of NSAIDS will not reverse the periodontal damage until a proper periodontal therapy is carried out ,it may be noted that the alveolar bone loss would have happened much before, starting of RA management therapy. In addition to this ,the RA patients who are undergoing periodontal therapy was found to have an improvement in the DAS 28 score[24] and an reduction in the serum tumor necrosis factor-alpha (TNF-α) levels.[25]

Considering the RA status, the subjects with high DAS score had increased number of severe chronic periodontitis subjects which explains the fact that the severity of RA increases with severity of periodontal disease. These data are consistent with the findings of (Beatriz Rodriguez-Lozano et al 2016) [26] and (Mikuls et al 2014) [27] stating that the correlation exists between the rheumatoid disease activity and periodontitis.

Our study has proved the association of rheumatoid arthritis disease activity with Chronic periodontitis. However large number of sample size and further investigation is needed to support these hypotheses.

## CONCLUSION

Based on the result of this study, it was concluded that there is positive association between severity of RA and severity of chronic periodontitis, by assessing a defined group of individuals with Rheumatoid arthritis with standard clinical parameters. It is evident that individuals suffering from RA are more likely to experience periodontitis. It is very likely that the severity of chronic periodontitis increases with the severity of Rheumatoid arthritis. The possibility exists that both conditions result from a common underlying dysregulation of the host immunoinflammatory response. Evidence also suggests that RA may affect the periodontal disease severity by increasing the gingival tissue cytokines and MMP levels.

It is clear that there is a bidirectional relationship between the two, so careful screening of periodontitis subjects with a history of RA would be promising for the early detection and treatment of this chronic inflammatory disease.

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