

Review Article

Two-way relationship between rheumatoid arthritis and periodontal disease

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Received: 13 May 2016

Revised: 14 May 2016

Accepted: 07 June 2016

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ABSTRACT

The purpose of this literature review to find out what has been reported as a relationship between rheumatoid arthritis and periodontal disease. Both, the periodontal disease and rheumatoid arthritis, are chronic inflammatory diseases and share some common genetic factors. Both of the disease can produce severe destruction of connective tissue through host's immune response as well as various inflammatory pathways. A thorough literature review has demonstrated that rheumatoid arthritis can impact the severity of periodontitis and has more severe bone and tooth loss. In the same way, people who have periodontal diseases are more prone to developing rheumatoid arthritis, *P. gingivalis*, which is the key factor in the development of periodontal disease, has an endogenous enzyme which plays a crucial role in the development of the rheumatoid arthritis. The health promotion educational material and campaigns must be conducted to raise awareness and knowledge among professional and general population. Dentists and dental professionals should provide thorough information to their patients. Furthermore, an advanced research should be conducted to find out the type of relationship between RA and periodontal disease.

Keywords: Periodontal disease, Periodontitis, Rheumatoid arthritis, *P. Gingivalis*

INTRODUCTION

Periodontal disease is an asymptomatic infectious disease initiated by bacteria, predominantly gram negative anaerobic or facultative species, present in dental biofilm on tooth root surfaces.^{1,2} Long-term plaque accumulation induces chronic inflammation, which can lead to destruction of the attachment of the periodontal ligament and the adjacent alveolar bone Khantisopon et al.³

Periodontitis is a chronic oral infection that affects the tissues supporting the teeth and about 35 to 50% of adults are affected by the disease Monsarrat et al. There are three general types of periodontitis: chronic, aggressive and as a manifestation of systemic disease by Vahabi S et al.⁸ Gingivitis which is an immune-inflammatory response to the bacterial colonization of the tooth surface is the initial and beginning stage in the process of gum disease Monsarrat et al. Gingivitis may proceed into the

periodontitis. The main difference between gingivitis and periodontitis is that gingivitis is not associated with bone loss which is not true for periodontitis Monsarrat et al.⁵

Rheumatoid Arthritis (RA) is a chronic, destructive systemic autoimmune disease which is characterized by the accumulation and persistence of inflammatory infiltrates in the synovial membrane, and the inflammatory condition of joints, tendons, and periarticular structures Monsarrat et al.⁵ It is necessary to early diagnose and treat rheumatoid arthritis if it is not treated, it can lead to debilitating destruction of bone and cartilage of joints as well as ligaments and soft tissues surrounding the joints which can ultimately cause disability, impact on quality of life by producing pain and limitation of motion, and produce significant effects in terms of productivity loss and cost Monsarrat et al.⁵ Although the etiologies of periodontal disease and rheumatoid arthritis are markedly separate, both of them

share some pathogenic features; both the conditions are chronic inflammatory diseases and are associated with destruction of connective tissue through an inflammatory process and host's immune response Monsarrat et al.⁶ Furthermore, both of the disease share genetic factors in which polymorphism of IL1 alpha, IL1 beta, and IL4 has been observed by Vahabi S et al.⁸

To review the association between periodontal disease and Rheumatoid Arthritis an electronic search was performed using MEDLINE, PubMed, from 1978 to 2016. Steps performed are as follow:

Step 1. First the appropriate terms were extracted from articles, books and especially from site 'Medline Ebsco'. These terms were as follows:

- Rheumatoid arthritis
- Rheumatoid arthritis and periodontal disease
- Rheumatoid arthritis and dental disease
- Rheumatoid arthritis, periodontal disease and *P. gingivalis*

Step 2: When tried to search these terms, there were 113,883 articles for Rheumatoid Arthritis, 246 articles for rheumatoid arthritis and periodontal disease, 17 articles for rheumatoid arthritis and dental disease and finally 21 articles for rheumatoid arthritis, periodontal disease, and *P. gingivalis* terms were found.

Step 3: The titles of articles were reviewed and the appropriate ones were selected. In this step, 12 articles were selected.

Step 4: Reviewing the abstracts and selecting the final articles were done in this step. Total 8 articles were selected based on inclusion and exclusion criteria. Inclusion criteria were all the articles which directly evaluated the relation between periodontal disease and rheumatoid arthritis. Exclusion criteria were all the articles which did not show any related information regarding to the topic.

Impact of rheumatoid arthritis on periodontal tissue

Hippocrates suggested that pulling of teeth could cure arthritis which indicates that the relationship is extended back for centuries by Bhingam C and Malini M.¹ Apart from RA, periodontitis is associated with a wide range of systemic conditions, which includes coronary heart disease, myocardial infarction, stroke, diabetes, and preterm low birth weight Khantisopon et al.³

RA can impact pathogenesis, severity, and prevalence of periodontitis by emotional and motor impairment. Patients with RA have joint pain and functional limitation so patient could not perform adequate oral hygiene maintenance procedure which ultimately will lead to plaque accumulation, poor oral hygiene and periodontal destruction consequences. Furthermore, RA patients have

more reduction in salivary flow, known as sicca symptoms, which can lead to development of supra-gingival plaque and progress to periodontitis (Khantisopon et al).³

According to study by Monsarrat et al, patients with RA have greater incidence of dental plaque, more periodontal pocket depth and very poor clinical attachment level (CAL) which are the indication of periodontitis as compare to the patients who do not have RA. On the one hand, it is likely that patients with RA may encounter more difficulties in achieving good oral health because of joint pain or functional limitation Monsarrat et al.

According to a case-control study by Vahabi et al, various periodontal disease parameters and determinants including plaque index, bleeding on probing, pocket depth more than 4 mm, and percentage of site with clinical attachment level (CAL) more than 3 mm were significantly higher in RA patients as compare to the control group. These results indicate that RA patients are more prone to periodontal disease.

Another case-control study by Ishi E, Bertolo M, Rossa Jr. C, Kirkwood K, Onofre M, rheumatoid arthritis patients have higher level of serum Rheumatoid factor.⁸ According to this study, test group had fewer teeth, higher prevalence of site presenting plaque, higher visible plaque index, as well as higher frequency of site with advance clinical attachment loss.

Impact of periodontitis on RA

According to the study from Monsarrat et al, patients with periodontal diseases have higher incidence of RA as compare to the patient without periodontal (3.95% versus 0.66%).

This study demonstrates that the *Periodontium bacterium, Porphyromonas gingivalis* plays a central role in the development of rheumatoid arthritis. *P. gingivalis* has an endogenous enzyme peptidyl arginine deaminase which can lead to citrullination of arginine residuals and it is one of the crucial first steps in the development of RA.

According to study by Ogrendik M, *P. gingivalis* can promote the production of rheumatoid factor either locally in gingiva or systematically in serum as well as it promotes T cells to express IL-17, which play a principal role in the pathogenesis of the RA.⁷ Furthermore, higher level of oral bacterial anaerobic antibodies has been found in the serum and synovial fluid of the RA patients. Super antigens (Vbeta genes) of RA are expressed in higher number via *P. gingivalis* and *P. intermedia* and therefore are seen more frequently with case group of RA as compare to the control group. As bacterial DNA's allocation from infection site to the joint site is the real indication of transfer of bacterial DNA, a DNA-DNA hybridization and polymerase chain reaction has been

conducted and results have clearly supported the presence of oral bacteria in the synovial fluid of the RA patient.

DISCUSSION

RA and periodontal disease are chronic inflammatory diseases which have severe public health consequences including impact on quality of life, burden of cost and loss of productivity, and affect psychosocial well-being of the patient (Maresz et al).⁴

Various research studies have been demonstrated that these two chronic diseases can affect each other but none of the studies have proven that how exactly both of them are related. A future research should be generated in order to find an exact cause of the linkage between two diseases. Furthermore, health education and resources should be provided to the community to bring awareness among the people about the linkage and programs must be implemented to empower the people targeting this issue.

CONCLUSION

Various studies have demonstrated that a two-way relationship exist between rheumatoid arthritis and periodontal disease. As a public health professional, we should educate our community about how rheumatoid arthritis and periodontal disease are correlated. As being a part of public health member.

We should implement educational materials, posters and educational campaigns to become aware of this issue. Furthermore, dentists and dental professionals have to draw attention towards this health issue and make their patient informed about this two way relationship and in-turn provide knowledge to take a great care of their teeth along with more frequent regular health check-ups, scaling and root planning. A thorough history taking is the key element to both the dentist/dental professionals and rheumatologists.

Funding: No funding sources

Conflict of interest: None declared

Ethical approval: Not required

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Cite this article as: Mehta KJ. Two-way relationship between rheumatoid arthritis and periodontal disease. *Int J Res Med Sci* 2016;4:2511-3.