Caspian Journal of Dental Research
e-ISSN: 2322-2395 p-ISSN: 2251-9890
Babol University Of Medical Sciences

The Frequency Of Periodontal Disease Parameters In Patients With Arthritis Rheumatoid

Rayehehossadat Rezvaninejad [1], Esmaeel Rahmati [2], Seyed Amir Abas Noorbakhsh [3]
Ali Azarm [4], Raziyehsadat Rezvaninejad [5]*

1. MSc student, Faculty of Dentistry, McGill University, Montreal, QC, Canada.
2. Faculty of Dentistry, Student Research Committee, Hormozgan University of Medical Sciences, Hormozgan, Iran.
3. Dentist, Immunology of Infectious Diseases Research Center, Research Institute of Basic Medical Sciences, Rafsanjan University of Medical Sciences, Rafsanjan, Iran.
4. Dentistry Student, Student Research Committee, Rafsanjan University of Medical Sciences, Rafsanjan, Iran.
5. Assistant Professor, Department of Oral Medicine, School of Dentistry, Kerman University of Medical Sciences, Kerman, Iran.

Article type
Research Paper

Received: 7 Jul 2024
Revised: 15 Apr 2025
Accepted: 29 Apr 2025
Pub. online: 30 Apr 2025

ABSTRACT

Introduction: Periodontal disease, characterized by bone resorption and tooth loss, is common in people with rheumatoid arthritis (RA). The physical limitations associated with RA, compounded by immune system dysfunction, can predispose these patients to periodontal disease. The aim of this study was to investigate the relationship between the parameters of periodontal disease and RA in patients referred to Bandar Abbas Shahid Mohammadi Hospital.

Materials & Methods: A total of 113 patients diagnosed with RA were evaluated for periodontal status using indices such as plaque index, bleeding index, gingival index, and clinical attachment loss (CAL). Data collection through questionnaires that collected information on demographic variables and analyzed.

Results: Of the participants, 108 (95.5%) were female and 5 (4.5%) were male, with a mean age of 50 years. The mean gingival index was 1.7, with 8% of patients having a gingival index of zero and 92% having a gingival index of ≥1. The mean gingival bleeding index was 0.69, with 32% having a zero index and 68% showing bleeding on probing. The mean plaque index was reported as 1.7, with 9% having a zero index and 91% having an index of ≥1. The mean CAL was measured at 4.1 mm.

Conclusion: The periodontal indices in Studied patients with RA were significantly high, indicating poor periodontal health. This deterioration may be attributed to the chronic inflammatory nature of RA, host immunodeficiency and the physical challenges of maintaining oral hygiene. It is therefore very important for these patients to maintain oral hygiene and have regular and thorough check-ups by a dentist.

Keywords: Rheumatoid arthritis, Periodontal diseases, Gingival index, Dental plaque indexes, Periodontal attachment loss, Periodontal Diseases

Cite this article: Rezvaninezhad R, Rahmati E, Noorbakhsh SAA, Azarm A, Rezvaninezhad R. The Frequency Of Periodontal Disease Parameters In Patients With Arthritis Rheumatoid. Caspian J Dent Res 2024; 13(2): 65-73.

Publisher: Babol University of Medical Sciences

* **Corresponding Author:** Raziyehsadat Rezvaninejad, School of Dentistry, Department of Oral Medicine, Kerman University of Medical Sciences, Kerman, Iran
Tel: 0098 920 352 7072
E-mail: rezvaninezhad@gmail.com

Introduction

Periodontal diseases are a major public health problem. They are characterized by inflammatory destruction of the tooth-supporting structures, including the alveolar bone, caused by bacteria. When this disease is confined to the gingival tissue, it is called gingivitis. If, on the other hand, it involves the inflammatory changes to the supporting tissue and alveolar bone, it is classified as periodontitis. Prolonged destruction can lead to the formation of periodontal pockets along the root surfaces, which ultimately leads to tooth loss. Although periodontal disease is common, severe progressive periodontitis affects only 8-13% of the adult population worldwide. [1]

Rheumatoid arthritis (RA) is an autoimmune disease characterized by a chronic and progressive course characterized by inflammation of the synovium, leading to joint damage. [2, 3] Symptoms include swelling, persistent pain, sensitivity, stiffness in the joints and eventually joint deformities. [4] This can lead to fatigue, weight loss, anxiety, depression and subsequent disability. [5] Globally, 0.46% of this disease is dependent on geographic location and gender, and the prevalence is estimated to be three times higher in women than in men. [6] Further, the prevalence rate is 2-3% in kinship groups and is 2-3 times higher in women than in men. Moreover, the age group of 30-50 years is mostly affected. [7]

There is no definitive treatment for RA. [8] RA and chronic periodontitis are characterized as chronic inflammatory diseases caused by an exacerbated inflammatory response leading to the destruction of connective tissue and bone. The association of chronic inflammation in both RA and PD reflects a predominant adaptive immunophenotype, the role of smoking, the imbalance between proinflammatory and anti-inflammatory cytokines, and genetic ancestry as risk factors. [9] New evidence suggests a possible involvement of PD in the development and progression of RA through the citrullination of proteins induced by the periodontal pathogen Porphyromonas Gingivalis (PG) - and the subsequent production of autoantibodies. [10] Mangat et al. describe that during physiological citrullination, enzymes of endogenous origin, peptidyl arginine diminase, are responsible for the production of citrullinated peptides and the arginine group is replaced by citrulline. [9, 11]

RA patients have a high prevalence of periodontitis, especially of severe degree (29%). Conversely, periodontitis patients have a 69% higher risk of developing RA, which also makes periodontitis a risk factor for the duration of RA. [12, 13] It is thought that the autoimmunity of RA begins in the mucous membranes, such as the lungs, gastrointestinal tract and oral cavity. At these sites, the combination of mucosal inflammation and local bacterial dysbiosis could be responsible for triggering the autoimmune response in RA. [14] Due to the similarity of pathologic and clinical manifestations and the common and inevitable role of the immune response in these two diseases, it is necessary to determine the relationship between these two diseases in different societies. Therefore, the aim of this study was to investigate the relationship between the parameters of periodontal disease and RA in patients referred to Bandar Abbas Shahid Mohammadi Hospital in 2020.

Materials & Methods

This descriptive-analytical cross-sectional study was approved by the Ethics Committee of Bandar Abbas University of Medical Sciences (Ethics Code: IR.HUMS.REC.1398.449). The study population consisted of all patients diagnosed with RA, referred to Bandar Abbas Shahid Mohammadi Hospital between September 2019 and February 2020. After obtaining informed

consent, a total of 113 patients were selected for clinical examination and data collection through questionnaires that collected information on demographic variables such as age, gender, educational status and occupation. Inclusion criteria: Participants were included if they had given informed consent, had no concurrent rheumatologic diseases or malignancies, and had registered for a dental examination. Patients with less than ten teeth were excluded from the study.

Periodontal parameters, including Bleeding Index (BI) (Ainamo & Bay), Gingival Index (GI) (Loe & Sillness), and Plaque Index (PI) (Loe & Sillness), were measured by a trained dentist using a Williams periodontal probe. These measurements were documented in a pre-prepared checklist. Six specific teeth were examined: the maxillary left canine, maxillary left first molar, maxillary right first premolar, mandibular right first molar, mandibular right lateral incisor, and mandibular left premolar, using the method described by Loe & Silness. The number of teeth lost was determined by clinical examination and recorded. [15]

Clinical Attachment Loss (CAL) was evaluated by measuring the distance between the mucogingival line and the probing depth at four sites around each tooth: distobuccal, mesiobuccal, distolingual, and mesiolingual using the Williams probe. [1]

GI Scoring:

0 = No inflammation

1 = Mild inflammation with discoloration; no bleeding

2 = Moderate inflammation with discoloration; edema and hypertrophy; bleeding on probing (BOP)

3 = Severe inflammation with pronounced redness; ulceration; tendency for spontaneous bleeding. [15]

BI Evaluation:

0 = No bleeding

1 = BOP the gingival sulcus; bleeding observed ten seconds post-probing is considered positive [16]

PI Assessment:

PI was assessed on the distofacial, mesiofacial and linguofacial surfaces using Loe & Silness criteria:

0 = No plaque

1 = A thin layer of plaque detectable only by probing

2 = Moderate plaque accumulation visible to the naked eye

3 = Abundant plaque in the gingival pocket or along the gingival margin [15]

Statistical analyses were performed with SPSS 21 (SPSS Inc., Chicago, IL, U.S.A.), and analyzed using Chi-square and Mann-Whitney statistical tests as appropriate.

Results

This study involved 113 RA patients referred to Bandar Abbas Shahid Mohammadi Hospital from September 2019 to February 2020. The participants included 5 (4.42%) men and 108 (95.58%) women with a mean age of 50.7 years (range: 19-68 years). The majority of participants were housewives.The mean scores for GI, BI, PI, and CAL were calculated. The descriptive statistics derived from the data are illustrated in the graphs below for each research question.

Due to the limited number of male participants in this study, no gender-specific comparisons were made. The chi-square test revealed a significant association between age and PI (p=0.008), indicating that PI increased with age. The highest frequency of a PI score of 3 was observed in participants with a mean age of 53 years. Additionally, a significant relationship was found between age and BI (p=0.012), with BI also increasing with age. Furthermore, there was a statistically significant correlation between age and GI (p=0.012), suggesting that GI generally increases with age; however, this trend was not observed for GI scores of 1. The chi-square test indicated no significant relationship between occupation and BI (p=0.916), PI (p=0.449), or GI (p=0.054).

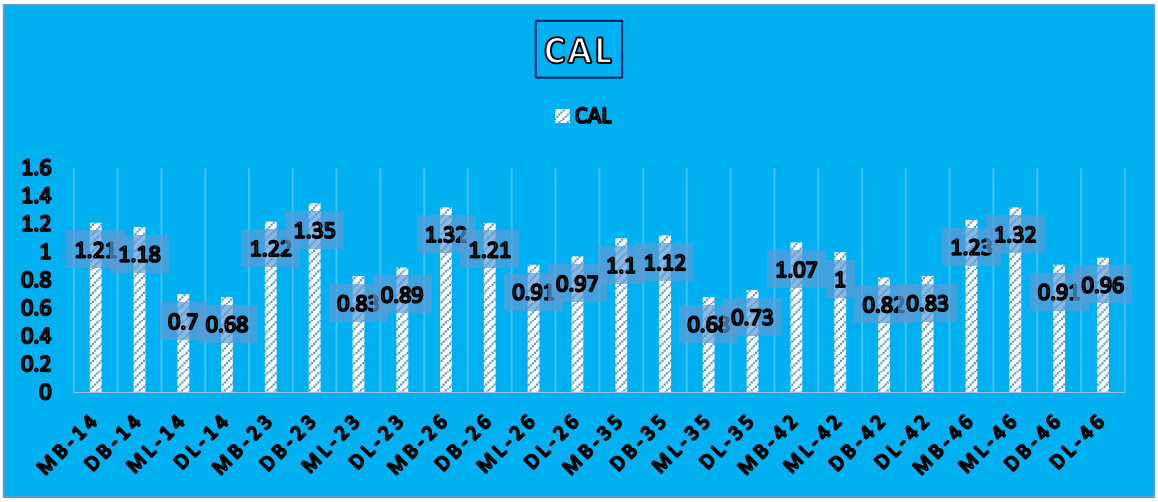

Figure 1. Mean CAL value for different parts of the teeth

Figure 1. Illustrates the mean CAL value for the different tooth regions. The highest CAL values were associated with the distobuccal surfaces of teeth #23 and #46, while the lowest values were recorded for the distolingual surfaces of teeth #14 and #35. No discernible pattern or consistent relationship was observed between these findings. Moreover, the analysis revealed that CAL value was higher in posterior teeth than in anterior teeth in patients with RA; however, no consistent order was observed in the other teeth examined.

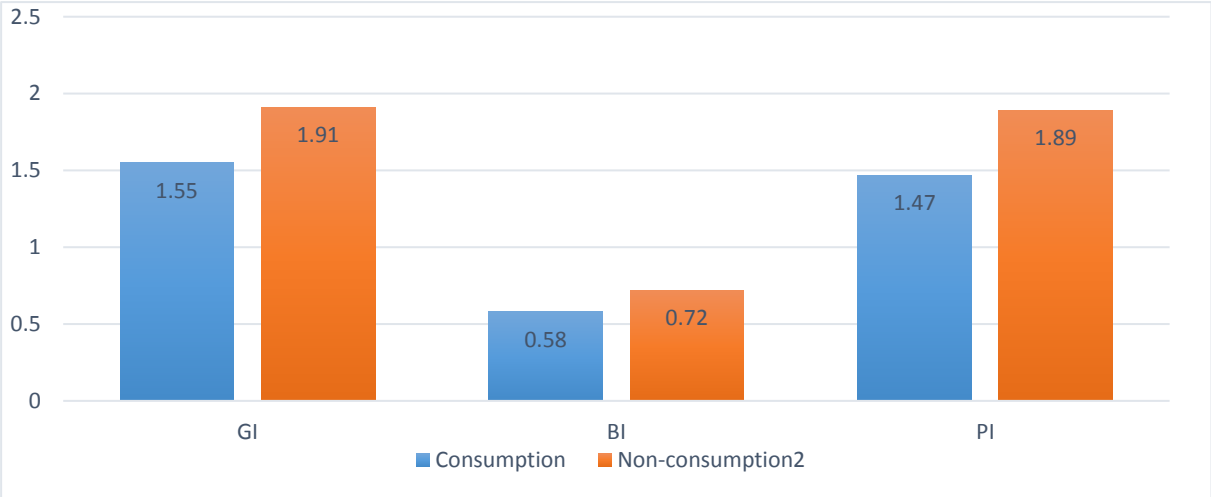

Figure 2. BI, GI, and PI scores of patients based on taking or not taking antibiotics in the last six months

Figure 2, presents the mean BI, GI and PI scores for patients who had taken or not taken antibiotics in the last six months. Not ably, The chi-square test revealed that all three indices showed statistically significant differences (P-value: PI:0.01, BI:0.03 and GI:0.03). The data indicated a significant relationship between antibiotic usage and a reduction in pocket depth among RA patients. Specifically, patients who reported using antibiotics in the previous six months demonstrated lower BI, GI, and PI scores.

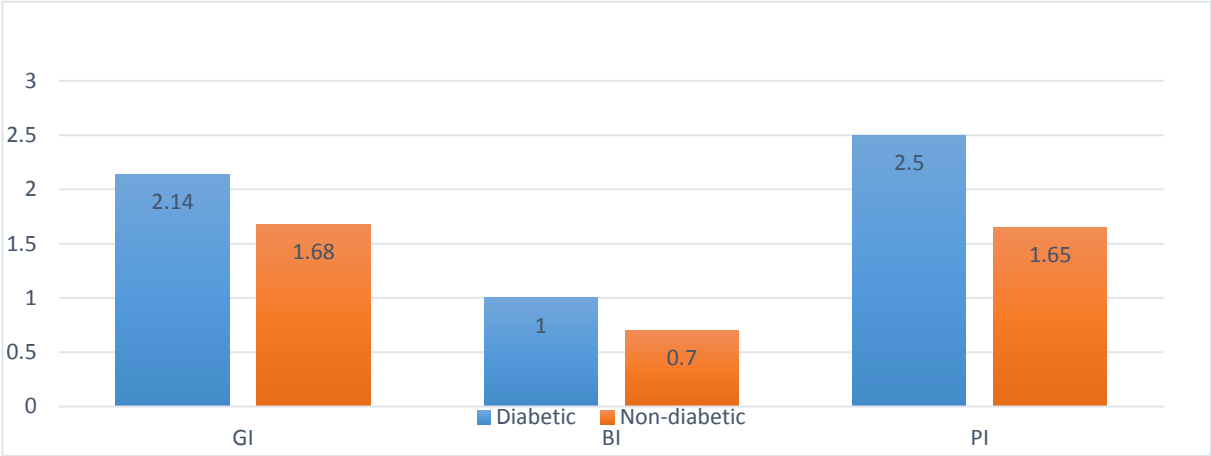

Figure 3. BI, GI, and PI scores of RA patients based on diabetic and non-diabetic patients

Figure 3. BI, GI, and PI scores of RA patients based on diabetic and non-diabetic patients According to Graph 3, Mann-Whitney tests revealed no significant differences in GI and BI scores (P-value: BI: 0.09 and GI:0.07); however, a significant difference was found for PI (p = 0.01). Furthermore, there was a significant association between diabetes and increased CAL, indicating that individuals with diabetes had higher indices of periodontal disease severity compared to non-diabetics.

Discussion

In this study, the mean GI was 1.73, with 9 patients having a GI of 0 and 104 patients with a GI of 1 or higher, indicating a high prevalence of gingival inflammation; in particular, minimal inflammation and discoloration were observed in 92% of patients. The mean BI score was 0.69, with 36 patients having a BI score of 0 and 77 having a BI score of 1, suggesting that 68% of participants had bleeding when probing the gingival sulcus within ten seconds. The mean PI was 1.70, 10 patients had a PI of 0 and 103 patients had a PI of 1 or more, which represents a high prevalence, i.e. a plaque layer was observed in 91% of the patients. The mean CAL in the studied patients was 4.1, which is considered a high rate but is similar to the results of many studies.

For example, Ghaliani et al. reported a mean CAL of 2.62 mm, which is lower than that observed in this study. [17] Taheri et al. determined a mean PI of 1.48, the number of extracted teeth was 9.57, and the papillary BI was 1.47. The mean PI of the above study was similar to the present study [18] In the study by Rovas et al. that investigated the relationship between periodontal status in patients with periodontitis and RA, the CAL was 2.31 mm and the BL was 44.14% that both indices were found to be lower than the present study.[19] The study by Mercado et al. on pocket depth and bone resorption indicated that RA patients had an average tooth loss of 11.6 teeth, similar to ours. They also reported that 44.6% of patients had a pocket depth of more than 3 mm. [20]

Yavozylmaz et al. concluded that there was no risk of exacerbation of periodontal problems in RA patients compared to the control group; [21] this finding is in contrast to the results of this study. A possible contributing factor to this discrepancy could be the extensive use of non-steroidal anti-inflammatory drugs (NSAIDs) by these patients to control inflammation, which may mitigate the destruction of periodontal tissues. Other limitations could be the smaller sample size compared to other studies and the inadequate assessment of the severity of periodontal disease due to on the use of only two indices: GI and PI. In the study by Kiani Yazdi et al., the mean number of teeth of the patients was 23.3, which was more than in the present study. This difference may be due to the lower mean age of the patients. The mean pocket depth was also 4.51 and the mean CAL score of all RA patients was 4.05, which is comparable to the present study. [22]

When examining the PI of the patients, it should be noted that patients with RA are unable to effectively brush their teeth and clean the surface plaque of their teeth due to wrist pain, mobility limitations, depression, and impatience. The high BI in the present study can also be due to the higher PI of the patients, the higher mean age of the patients compared to other studies, and the high consumption of tobacco, especially hookah, in Hormozgan province.Similar to our findings, Renvert's study identified a significant association between RA patients and control groups in terms of higher BOP rates and pocket depths greater than 5 mm; a regression analysis also indicated that RA patients were significantly more likely to have periodontitis compared to the control groups. [23]

Numerous studies have documented the prevalence of periodontal disease in RA patients, leading to gingival recession and premature tooth loss. [24-26] These patients need more regular check-ups and early dental treatment. Due to the severe mobility problems caused by RA and the economic problems in meeting dental costs, dental and periodontal problems are considered their next priority. Similar to the results of the present study, Lee et al. investigated periodontitis in RA patients in their study. To investigate periodontitis, they examined 3 criteria (probing depths (PD) ≥ 3 mm, BOP at sites > 10%

and CAL). They concluded that the prevalence of periodontal disease was significantly higher in patients with RA (92.8%) than in healthy controls ($p < 0.001$). [27]

In contrast to the results of the present study, the Posada-López study indicated that patients with RA had a lower severity of periodontal parameters and covariates such as age and diabetes were not associated with RA. [28] In the present study, the ratio between GI, PI and BI indices was higher in diabetic patients than in non-diabetic patients, but this difference was not statistically significant.As for other limitations of this study, it was difficult to find RA patients who had no heart disease and other systemic diseases related to periodontitis. Moreover, patients with RA were unable to maintain their oral health due to obvious systemic problems such as joint involvement. The present study showed that periodontal disease had a high prevalence in patients with RA, which is consistent with the results of most studies. However, due to the cross-sectional nature of the study, it was difficult to determine whether the periodontal disease was caused by the RA or whether both conditions had a common background, so longitudinal studies are needed to investigate this question.

Conclusion

Periodontal indices in patients with RA were significantly high, indices that indicate the severity of periodontal disease and generally unfavorable periodontal conditions. These findings suggest that factors associated with chronic inflammatory disease and host immunodeficiency contribute significantly to the oral health challenges of these patients; in addition, the effects of anti-rheumatic medications on gingival health should be further investigated.

Acknowledgments

This research project was approved by Hormozgan University of Medical Sciences, University of Oral Health Research Center. The authors would like to express their gratitude to all those who sincerely participated in the conduct of this study.

Conflict of interest:

All authors declare no conflict of interest.

Author’s Contribution

Rayehehossadat Rezvaninejad and A.A Noorbakhsh helped in the design, experimental studies, data acquisition, literature search, manuscript preparation, manuscript editing and manuscript review.

E. Rahmati and A. Azarm helped with intellectual content definition, data acquisition, data analysis, statistical analysis, manuscript preparation, manuscript editing, and manuscript review. The manuscript was drafted by Raziyehsadat Rezvaninejad. All authors have read and approved the final manuscript.

References

1. Fermin A, Satheesh E, Paulo C. The Periodontal Pocket. In: Carranza FA, Newman MG, Takei HH, Klokkevold PR. Newman and carranza's clinical periodontology. 2019; 704-20.
2. Moghadam MH, Jahanbin I, Nazarinia MA. The effect of educational program on self-efficacy of women with rheumatoid arthritis: a randomized controlled clinical trial. IJCBNM. 2018; 6:12-20
3. Khoja SS, Moore CG, Goodpaster BH, Delitto A, Piva SR. Skeletal muscle fat and its association with physical function in rheumatoid arthritis. AC&R. 2018; 70:333-42
4. Naqvi AA, Hassali MA, Aftab MT, Naqvi SB, Zehra F, Ahmad R , et all. Development of evidence based disease education literature for Pakistani rheumatoid arthritis patients. Diseases. 2017; 5:2
5. Akhlaghi M, Askarishahi M, Sabzmakan L. Quality of life and related factors in rheumatoid arthritis patients. J. Community Health Res. 2016; 2:1-11.
6. Almutairi K, Nossent J, Preen D, Keen H, Inderjeeth C. The global prevalence of rheumatoid arthritis: a meta-analysis based on a systematic review. Rheumatol. Int.2021; 41:863-77.
7. Lee SJ, Kavanaugh A. Pharmacological treatment of established rheumatoid arthritis. Clin. Rheumatol. 2003; 17:811-29
8. Conigliaro P, Triggianese P, De Martino E, Fonti GL, Chimenti MS, et all. Challenges in the treatment of rheumatoid arthritis. Autoimmun. Rev. 2019; 18:706-13.
9. Rivas AC, Creazzo G, Vargas E. Periodontal Disease and Rheumatoid Arthritis: Exploring New Associations of Autoimmune Pathogenesis. Int J Orl Health. 2023; 3:1-9
10. Perricone C, Ceccarelli F, Matteo S, Di Carlo G, Bogdanos DP, Lucchetti R, et all. Porphyromonas gingivalis and rheumatoid arthritis. Curr Opin Rheumatol. 2019; 31:517-24.
11. Montgomery AB, Lugli EB, Venables PJ. Is citrullination the missing link between periodontal disease and rheumatoid arthritis? Current Oral Health Reports. 2015; 2:30-6.
12. Rathi S, Chaturvedi S, Abdullah S, Rajput G, Alqahtani NM, Chaturvedi M, et all. Bavabeedu SS, Minervini G. Clinical trial to assess physiology and activity of masticatory muscles of complete denture wearer following vitamin D intervention. Medicina. 2023; 20: 59:1-15.
13. Minervini G, Franco R, Marrapodi MM, Fiorillo L, Cervino G, Cicciù M. Economic inequalities and temporomandibular disorders: A systematic review with meta-analysis. J Oral Rehabil. 2023; 50:715-23.
14. Inchingolo F, Inchingolo AM, Avantario P, Settanni V, Fatone MC, Piras F,et all. The Effects of Periodontal Treatment of Rheumatoid Arthritis and of Anti-Rheumatic Drugs on Periodontitis: A Systematic Review. Int J Mol Sci. 2023; 24:2-26.
15. Silness J, Löe H. Periodontal disease in pregnancy II. Correlation between oral hygiene and periodontal condition. Acta odontologica scandinavica. 1964; 22:121-35.
16. Lai YY, Zafar S, Leonard HM, Walsh LJ, Downs JA. Oral health education and promotion in special needs children: Systematic review and meta-analysis. Oral Dis. 2022; 28:66-75.
17. Ghaliani P, Hojati H. The Relationship between Rheumatoid Arthritis and Periodontitis. JIDS. 2010; 6:28-34.
18. Taheri M, Saghafi M, Najafi M, Radvar M, Marjani S, Javanbakht A, et al. Investigation of Periodontal Conditions in Patients with Rheumatoid Arthritis. JMDS. 2011; 35:283-8.
19. Rovas A, Puriene A, Punceviciene E, Butrimiene I, Stuopelyte K, Jarmalaite S. Associations of periodontal status in periodontitis and rheumatoid arthritis patients. Journal of periodontal & implant science. 2021; 51:124-34.
20. Mercado F, Marshall RI, Klestov AC, Bartold PM. Is there a relationship between rheumatoid arthritis and periodontal disease? J. Clin. Periodontol. 2000; 27:267-72.
21. Yavuzyilmaz E, Yamalik N, Çalguner M, Ersoy F, Baykara M, Yenlay I. Clinical and immunological characteristics of patients with rheumatoid arthritis and periodontal disease. J Nihon Univ Sch Dent. 1992; 34:89-95.
22. Kiani yazdi F, SH Sm, Masoumi S, Kamali S, Aflaki E. Investigating the relationship between periodontal disease and IL-17 serum level in patients with rheumatoid arthritis. J Dent Shiraz Univ Med Sci. 2012; 398-407. [in Persian].
23. Renvert S, Berglund JS, Persson GR, Söderlin MK. The association between rheumatoid arthritis and periodontal disease in a population-based cross-sectional case-control study. BMC Rheumatol. 2020; 4:1-8.

24. Eriksson K, Nise L, Alfredsson L, Catrina AI, Askling J, Lundberg K, et al. Seropositivity combined with smoking is associated with increased prevalence of periodontitis in patients with rheumatoid arthritis. Ann Rheum Dis. 2018; 77:1236–8
25. Kim JW, Park JB, Yim HW, Lee J, Kwok SK, Ju JH, et al. Rheumatoid arthritis is associated with early tooth loss: results from Korea National Health and nutrition examination survey V to VI. Korean J Intern Med. 2019; 34:1381–91.
26. Rodriguez-Lozano B, Gonzalez-Febles J, Garnier-Rodriguez JL, Dadlani S, Bustabad-Reyes S, Sanz M, et al. Association between severity of periodontitis and clinical activity in rheumatoid arthritis patients: a case-control study. Arthritis Res Ther. 2019; 21: 1- 12.
27. Lee YH, Hong SJ, Lee GJ, Shin SI, Hong JY, Chung SW, et al. Investigation of periodontitis, halitosis, xerostomia, and serological characteristics of patients with osteoarthritis and rheumatoid arthritis and identification of new biomarkers. Sci Rep. 2024; 14: 1- 15.
28. Posada-López A, Duque JD, Pineda-Tamayo RA, Bedoya-Giraldo E, Botero JE. Lack of association between periodontitis and rheumatoid arthritis. Reumatología Clínica (English Edition). 2023; 19:123-9