

Prevalence of caries disease in patients with Rheumatoid arthritis: Results of a comparative study

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World Journal of Advanced Research and Reviews, 2024, 24(02), 202–211

Publication history: Received on 20 September 2024; revised on 28 October 2024; accepted on 31 October 2024

Article DOI: <https://doi.org/10.30574/wjarr.2024.24.2.3322>

Abstract

Objectives: This study aims to determine the prevalence of dental caries in rheumatoid arthritis (RA) patients and compare it with controls.

Materials and Methods: We conducted a cross-sectional study between two departments of the Ibn Sina University Hospital in Rabat: the Conservative Dentistry Department at the Center for Consultation and Dental Treatment and the Rheumatology B Department at El Ayachi Hospital in Salé. We collected socio-demographic, disease, and oral health data for each patient, assessing caries prevalence using the DMFT index (Decayed, Missing, and Filled teeth) along with gingival and plaque indices (Löe and Silness)

Results: We recruited 61 patients, including 31 patients with rheumatoid arthritis (RA) and 30 control patients. The average age was 47.6 ± 13.1 years, mostly female, with 59.3% postmenopausal.

RA patients had a higher number of missing teeth (8.3 ± 7 [0; 19]), moderate to severe gingival inflammation in 64.6% of patients, and significant plaque buildup in 67.7% of cases. Only 38.7% of patients used proper brushing techniques, and 45.2% viewed their condition as a barrier to oral hygiene. The DMFT index in the RA group was 15.5, with an average of 2 [0; 4] filled teeth, compared to 0 [0; 2] in the control group ($p=0.05$). 67.7% of RA patients had visible plaque deposits, and 64.6% showed moderate to severe gingival inflammation

Conclusion: Patients with rheumatoid arthritis exhibited poorer oral health compared to the control group, highlighting the importance of multidisciplinary care, including regular dental consultations and treatment

Keywords: Dental caries; Rheumatoid arthritis; DMFT index; Controls

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1. Introduction

According to the World Health Organization (WHO), oral health is characterized by the absence of oral or facial pain, oral or pharyngeal cancer, infection or oral lesions, periodontal disease, tooth loosening and loss, and other diseases and disorders that limit a person's ability to bite, chew, smile, and speak, thereby affecting their psychosocial well-being. It is essential for overall health and quality of life. [1]

The condition of the oral cavity reflects individuals' general health. Many systemic conditions can alter the components of the oral cavity, including teeth, gums, mucous membranes, and the tongue. This relationship is bidirectional: poor oral health can also trigger certain diseases or exacerbate their manifestations. Additionally, it can increase the risk of systemic infections, particularly in cases of decreased immunity due to certain treatments.

The tooth, in particular, plays a central role in the oral cavity. Together with its periodontium, it forms the dental organ, which is essential for various oral functions such as chewing, swallowing, and speech. Teeth can be affected by several pathologies, primarily dental caries and its complications. Dental caries has been studied from various angles and in many contexts, including cancer, cardiovascular, renal diseases, and in children.

However, studies on dental health in musculoskeletal system diseases remain scarce. Rheumatologists are showing increasing interest in oral health, especially in patients treated for osteoporosis or those undergoing biotherapies. Existing research mainly focuses on the mandibular bone and the risk of necrosis associated with osteoporosis treatments. Pathologies and alterations of the gums have also been extensively studied in the context of autoimmune diseases, particularly rheumatoid arthritis (RA). Numerous studies have confirmed the role of periodontitis in the pathophysiology of RA.

The objective of this work is to determine the prevalence of dental caries in patients with RA and to compare the prevalence of dental caries between patients with rheumatoid arthritis and control patients.

2. Material and methods

We conducted a cross-sectional study between two departments of the Ibn Sina Hospital Center in Rabat: the Conservative Dentistry Department of the Dental Consultation and Treatment Center (CCTD) and the Rheumatology B Department of El Ayachi Hospital in Salé.

2.1. Inclusion Criteria

Our study included patients suffering from rheumatoid arthritis (RA) whose diagnosis was established according to the ACR/EULAR 2010 criteria and who are followed at Al Ayachi Hospital [2].

2.2. Exclusion Criteria

Any patient under the age of 18 and/or diagnosed with an inflammatory rheumatism other than RA was excluded.

A questionnaire consisting of three sections was developed.

2.3. Patient Characteristics

The first part of the questionnaire specifies the socio-demographic characteristics, including:

- Age, gender, marital status, and number of children;
- Level of education, socio-economic status, health coverage, and place of residence;
- Comorbidities,
- Surgical history,
- Smoking status,
- Menopause status for women.

2.4. Rheumatological Characteristics

The second part of the questionnaire describes:

- Characteristics of RA: age of onset and time taken to consult a rheumatologist, duration of the disease, joint and

synovial indices, sedimentation rate (SR), Disease Activity Score 28 (DAS28) [3], Health Assessment Questionnaire (HAQ) [4], Visual Analog Scale (VAS) for pain[5], and the rheumatological hand score[6];

- Ongoing treatments (corticosteroids, non-steroidal anti-inflammatory drugs (NSAIDs), conventional and biological disease-modifying therapies);
- The influence of RA on oral hygiene practices.

2.5. Oral Health Characteristics

The third part specifies:

- The state and symptoms of oral health;
- The Decayed, Missing, and Filled Teeth (DMFT) index of Klein and Palmer; [7]
- The gingival and plaque indices of Loe and Silness. [8,9]

3. Results

We recruited 61 patients, including 31 patients with rheumatoid arthritis (RA) and 30 control patients .

For each RA patient, a control patient was selected.

3.1. Description of the RA Sample According to Sociodemographic Characteristics

The average age of the RA patients was 47.6 ± 13.1 years (range: 18-74), with a predominance of females, of whom 59.3% were postmenopausal.

The sociodemographic characteristics of the RA patients are presented in Table 1

Table 1 Caractéristiques des patients PR

Items	RA Patients N=31
Age (years)	47.6 +/- 13.1 (18-74)
Gender: Female (%)	87.1
Marital Status:	
Single	19.4
Married	58.1
Divorced	9.7
Widowed	12.9
Place of Residence:	
Urban	96.8
Rural	3.2
Illiteracy:	
Yes	38.7
No	61.3
Socioeconomic Status	
Active Professional (%)	32.3
Stay-at-home Parent (%)	58.1
Retired (%)	9.7
Social Coverage:	

Yes (%)	80.6
No (%)	19.4
Active Smoker (%)	3.2
Former Smoker (%)	6.5
Comorbidities (%)	22.6
Menopause (%)	59.3

3.2. Description of the Sample According to Rheumatoid Arthritis Characteristics

Table 2 summarizes the characteristics related to rheumatoid arthritis (RA). The mean age of onset of the disease was 37.9 ± 15.9 years (range: 11 to 67) with a median time to treatment of 12 months (range: 12 to 30).

Patients presented with moderately to highly active RA in 66.8% of cases.

Patients were treated with corticosteroids, methotrexate, and biologic therapies in 77.4%, 77.4%, and 38.7% of cases, respectively.

Table 2 Characteristics of Rheumatoid Arthritis

Items	RA Patients N=31
Age at onset (years)	37.9 +/- 15.9 [11 ; 67]
Time to consultation with a rheumatologist (months)*	12 [12,30]
Duration of disease progression (years)*	6 [4 ; 10]
VAS (0-10) (Visual Analog Scale)	3.6 +/- 2.1 [0 ; 7]
ESR (mm/1st hour) (Erythrocyte Sedimentation Rate)	31.9 +/- 24.5 [2 ; 110]
DAS28	4 +/- 1.3 [1.3 ; 6.5]
Activity level:	
DAS \leq 2.6 (RA in remission) (%)	12.9
2.6 < DAS \leq 3.2 (Mildly active RA) (%)	19.4
3.2 < DAS \leq 5 (Moderately active RA) (%)	41.9
DAS > 5.1 (Highly active RA) (%)	25.8
Health Assessment Questionnaire* (HAQ)	0.5 [0 ; 1.5]
Duruoz Rheumatoid Hand Score*	11 [0 ; 34]
Corticosteroid therapy (%)	77.4
Daily corticosteroid dose (mg)	6,9 +/- 3.2 [1 ; 15]
Non-Steroidal Anti-Inflammatory Drugs (NSAIDs) (%)	22.6
Analgesics (%)	41.9
Conventional Disease-Modifying Anti-Rheumatic Drugs (C DMARDs) (%)	
None	12.9
Synthetic antimalarials (APS)	0
Sulfasalazine	3.2
Methotrexate (MTX)	77.4
Leflunomide (LEF)	3.2

APS + MTX	3.2
Biological Disease-Modifying Anti-Rheumatic Drugs(B DMARDs)(%)	38.7

(*) Result expressed as median and quartiles.

3.3. Description of the sample according to the DMFT index

For the dental examination, the results are presented in Table 3.

The RA patients had missing teeth extracted due to caries or periodontal mobility. The average number of teeth missing due to caries was 8.3 ± 7 [0; 19] for the RA group and 5.5 ± 4.7 [0; 21] for the control group, with a p-value of 0.06



Figure 1 Missing teeth, carious teeth, and discolored teeth - Residual roots - Extrinsic stains - Dental abrasions - Gingival inflammation



Figure 2 Significant tooth loss – Teeth filled with amalgam with recurrent caries – Abrasion with dentin exposure at the level of the upper centrals



Figure 3 Anterior bridge and posterior crowns in the maxilla – Loss of lower molars – Calculus deposits at the level of the lower incisor-canine block

The average DMFT index for the group of patients with rheumatoid arthritis was 15.5, while that of the control group was 14.7

Table 3 Dental Examination

Items	RA Patients N=31	Controls N=30	P-value
Number of carious teeth	4.5+/-3.3 [0 ; 14]	8.4+/-4.4 [2 ; 20]	
Number of teeth missing due to caries	8.3+/-7 [0 ; 19]	5.5+/-4.7 [0 ; 21]	0.06
Number of permanently filled teeth*	2 [0 ; 4]	0 [0 ; 2]	0.05

(*) Result expressed as median and quartiles

3.4. Description of the sample according to the Loe and Silness plaque and gingival indices

Plaque deposits were visible and abundant in 67.7% of RA patients, and gingival inflammation was moderate to severe in 64.6% of them.

Only one RA patient presented for periodontal examination with an absence of plaque.

The results of the periodontal examination are presented in Table 4.

Table 4 Periodontal Examination

Items	RA patients N=31	Controls N=30
Löe and Silness Plaque Index		
0: Absence of plaque (%)	3.2	0
1: Plaque film not visible to the naked eye (%)	29	16.7
2: Abundant bacterial plaque visible to the naked eye (%)	29	63.3
3: Abundant bacterial plaque up to 2mm thick (%)	38.7	20
Löe and Silness Gingival Index		
0: Normal gingiva (%)	3.2	0
1: Mild gingival inflammation (%)	32.3	23.3
2: Moderate inflammation (%)	45.2	56.7
3: Severe inflammation (%)	19.4	20

4. Discussion

The questionnaire we developed addressed socio-demographic characteristics, general health, oral health characteristics, and characteristics of rheumatoid arthritis (RA).

Regarding the socio-demographic and general health aspects, and in accordance with the literature, our study shows a significant female predominance at 87.1% [10,11].

Postmenopausal women represent 59.3%, and more than half of the patients are married (58%) with children (90%).

We found a modest socio-economic level, with a decrease in work capacity and/or a low education level. In fact, 38.7% of our RA patients are illiterate, and more than half (58.1%) are unemployed.

One in five patients (19.4%) has no medical coverage, and 32.3% of RA patients are covered by the solidarity health insurance.

We assessed oral health as either satisfactory or poor. The results of our study indicate that more than two-thirds of our RA patients (67.7%) have poor oral health. RA patients exhibit more tooth loss, periodontitis, and poor oral hygiene. These results are similar to those found in other studies, where patients with RA were more prone to periodontal disease and exhibited poorer oral hygiene [12,13]. This was reflected in a greater accumulation of bacterial plaque.

Despite the severe state of their oral health, only 45.1% of our patients visit their dentist annually. These results are similar to those of the study by Gonzales-Chavez et al. [12] where patients visited the dentist annually in only 33.3% of cases. Half of our RA patients (54.9%) visit the dentist only in case of pain or resort to extraction of the affected tooth by a quack.

4.1. RA and the DMFT index

For the dental examination, we used the DMFT index of Klein and Palmer [14] to enumerate carious teeth, teeth missing due to caries, and permanently filled teeth, and to calculate an average.

The average DMFT for our RA group is 15.5, while that of the control group is 14.7.

In Hamm, Germany, Schmickler et al. conducted a study in 2016 on periodontal status, microbiological parameters, and rheumatological parameters in a large cohort of patients with RA. This study found results comparable to ours: DMFT-RA of 19.3 and DMFT -controls of 16.9, with $p < 0.01$ [15].

Other studies have found a non-significant difference:

Silvestre-Rangil et al. conducted a study in Valencia in 2018 on the oral manifestations of RA in 73 patients. This study reported a DMFT-RA of 11.84 and a DMFT -controls of 10.56; $p = 0.25$ [16].

The study by Pischon et al., conducted in Berlin in 2008, examined the association between RA, oral hygiene, and periodontitis. The DMFT index for the RA group was 18.54 and 18.12 for the control group, with $p = 0.74$ [17].

The number of missing teeth among our RA patients was high, with an average of 8.3 ± 7 [0; 19]. The studies by Gonzales-Chavez et al. [12], Schmickler et al. [15] and Pischon et al. [22] reported lower values, with average numbers of missing teeth being 6.9, 5.99, and 6.58, respectively, in RA patients. We also found a significant association between advanced age and the number of missing teeth ($p < 0.001$) and between advanced age and the individual DMFT index ($p = 0.015$). However, there was no significant association between DAS28 and the number of missing teeth ($p = 0.69$).

Our RA patients had an average of 4.5 ± 3.3 [0; 14] carious teeth, which is higher than the average of 3.07 reported by Schmickler et al. [15].

A significant association was found between illiteracy and the number of carious teeth ($p = 0.04$). Illiterate individuals may have little to no knowledge regarding oral health: 45.2% do not brush their teeth, and 61.3% brush incorrectly.

The number of permanently filled teeth was significantly higher in RA subjects compared to the control group in our study ($p = 0.005$).

4.2. RA and Gingival Health Status

The importance of plaque deposits was assessed using the Plaque Index of Löe and Silness [18] and the severity of gingival inflammation was evaluated using the Gingival Index of Löe and Silness [19].

4.2.1. Plaque Index of Löe and Silness

- 0: Absence of plaque
- 1: Plaque film not visible to the naked eye
- 2: Abundant bacterial plaque visible to the naked eye
- 3: Abundant bacterial plaque up to 2 mm thick

4.2.2. Gingival Index of Löe and Silness

- 0: Normal gingival fibromucosa
- 1: Mild gingival inflammation, slight color change, no bleeding on probing

- 2: Moderate inflammation: redness, swelling, glazed appearance, bleeding on probing
- 3: Severe inflammation, significant swelling, tendency to ulceration and spontaneous bleeding

The periodontal examination revealed plaque and inflammation indices ≥ 2 in 67.7% and 64.6% of cases, respectively. In this context of generalized periodontitis, the overall high bacterial load would also increase the risk of caries.

Our study also found a significant association between medical coverage and the plaque index ($p=0.014$), gingival index ($p=0.03$), and halitosis ($p=0.02$). This indicates that patients with medical coverage are more likely to visit their dentist more frequently. They may be more aware of the importance of oral health and learn and apply the correct plaque control methods. This could lead to improved oral health: they would have less plaque buildup and consequently less periodontal inflammation.

Moreover, certain medications, particularly corticosteroids, may increase the risk of infections and decrease bone density. Their use by RA patients could predispose them to oral health deterioration [20,21].

Strengths and Weaknesses of the Study

The strength of our study was the detailed description of the oral health status of the patients. However, similar to the study by Pischon et al. [23], a major weakness was the small number of patients. Additionally, since the control group was recruited from a dental care center, it was not representative of the general population.

5. Recommendations

Our study reinforces the assumption of a correlation between rheumatoid arthritis (RA) and deterioration of oral health. This is the first national study addressing the impact of oral health on RA. The high prevalence of oral health issues among our patients prompts us to:

- Expand the study by recruiting a larger number of patients and opting for a control group from the general population.
- Analyze the relationship between oral health and rheumatoid arthritis.
- Adapt and improve dental care for RA patients: Patients should be referred to a dentist as soon as the disease is diagnosed. Regular follow-up, according to current recommendations, should be mandatory.
- Additionally, since the manual dexterity of RA patients is often reduced, handling a conventional toothbrush becomes difficult. It would be beneficial to adapt toothbrush handles for RA patients and, if possible, promote the use of electric toothbrushes, although this may not be financially accessible to most RA patients in our context.

In the short term, we propose strengthening the collaboration between dentists and rheumatologists:

- At University Hospital Centers:
 - Schedule informational sessions between rheumatologists and dentists.
 - Develop recommendations for dentists, rheumatologists, and RA patients.
 - Strengthen and deepen scientific research.
- At Health Centers:

To facilitate access to dental care considering periods of immobility, disability, and pain among RA patients:

- Raise patient awareness about the importance of oral hygiene and regular check-ups.
- Offer specialized dental consultations.
- Address oral health issues.
- Implement specific awareness programs to prevent the deterioration of the quality of life related to oral health among RA patients.

Display oral health awareness posters in health centers (similar to those for cancer or cardiovascular disease patients)

6. Conclusion

Rheumatoid arthritis presents a general health issue that affects both rheumatologists and dentists within their respective fields. Our study demonstrated that oral health is significantly impaired in patients with rheumatoid arthritis compared to the control group.

Our results highlight the importance of raising awareness among patients and their families, as well as the need for effective and ongoing communication between dentists and rheumatologists to ensure comprehensive care for the patient across all aspects of their condition.

Compliance with ethical standards

Acknowledgments

The authors would like to express their gratitude to the patients who participated in this study.

Disclosure of conflict of interest

The authors declare no competing interest.

Authors' contributions

All authors have read and agreed to the final version of this manuscript and have equally contributed to its content and to the management of the manuscript.

Statement of informed consent

The patient has given their informed consent for publishing the photos.

References

- [1] World Health Organization. "Oral Health Report Worldwide" [Online] 2003. https://apps.who.int/iris/bitstream/handle/10665/68507/WHO_NMH_NPH_ORH_03.2_fre.pdf?sequence=1&isAllowed=y.
- [2] Aletaha D, Neogi T. Rheumatoid arthritis classification criteria : an American College of Rheumatology/European League Against Rheumatism collaborative initiative. *Ann Rheum Dis* 2010 ; 69.
- [3] Fransen J, Stucki G, van Riel PL. Rheumatoid arthritis measures : Disease Activity Score (DAS), Disease Activity Score-28 (DAS28), Rapid Assessment of Disease Activity in Rheumatology (RADAR), and Rheumatoid Arthritis Disease Activity Index (RADAI). *Arthritis Rheum* 2003 ; 49 Suppl : S214-24
- [4] Abourazzak FE, Benbouazza K, Amine B, et al. Psychometric evaluation of a Moroccan version of health assessment questionnaire for use in Moroccan patients with rheumatoid arthritis. *Rheumatol Int*. 2008 ; 28 (12) :1197-203.
- [5] Jensen MP, Karoly P. Self-report scales and procedures for assessing pain in adults. Turk DC, Melzack R, editors. *Handbook of pain assessment*. New York : The Guilford Press ; 1992 ; (135-51).
- [6] Duruoz M, Poiraudreau S, Fermanian J, et al. Development and validation of a rheumatoid hand functional disability scale that assesses functional handicap. *J Rheumatol* 1996 ; 23(7) : 1167-72
- [7] Klein H, Palmer C E, Knutson J W. Dental status and dental needs of elementary school children. *Pub Health Rep* 1938 ; 53 : 751-65
- [8] Silness J, Loë H. Periodontal disease in pregnancy : Correlation between oral hygiene and periodontal condition. *Acta Odontol. Scand*. 1964 ; 22 : 121-35
- [9] Loë H. The gingival index, the plaque index and the retention index system. *J. Periodontol*. 1967 ; 38 : 610-16.
- [10] Greenwald RA, Kirkwood K. Adult periodontitis as a model for rheumatoid arthritis (with emphasis on treatment strategies). *J Rheumatol* 1999 ; 26 :1650-3.
- [11] Ayravainen L, Heikkinen AM, Kuuliala A, et al. Activity of rheumatoid arthritis correlates with oral inflammatory burden. *Rheumatology intertational* 2018.
- [12] Gonzales-Chavez SA, Pacheco-Tena C, Campos Torres RM, Quinonez-Flores CM, Reyes-Cordero G, Caravero Frescas TdJ. Alteraciones temporomandibulares y odontológicas en pacientes con artritis reumatoide. *Reumatologia Clinica* 2018

- [13] Hernández Cuellar MV, Hernández Cuellar IM, Amaro Hernández R. Correlación etiopatogénica entre periodontitis y artritis reumatoide. *Revista Cubana de Reumatología*. 2013 ; 15 : 30-5
- [14] Ismail A I, Sohn W, Tellez M, Amaya A, Sen A, Hasson H & Pitts N B. The International Caries Detection and Assessment System (ICDAS): an integrated system for measuring dental caries. *Community Dentistry and Oral Epidemiology* 2007; 35(3): 170-8.
- [15] Schmikler J, Rupperecht A, Patschan S et al. Cross-sectional Evaluation of Periodontal Status, Microbiological and Rheumatoid Parameters in a large Cohort of Patients With rheumatoid Arthritis. *Journal of Periodontology* 2016.
- [16] Silvestre-Rangil J, Bagán L, Silvestre FJ, Bagán JV. Oral manifestations of rheumatoid arthritis : A cross-sectional study of 73 patients. *Clin Oral Investig*. 2016 ; 20 : 2575-80.
- [17] Pischon N, Pischon T, Kröger J et al. Association Among Rheumatoid Arthritis, Oral Hygiene and Periodontitis. *J Periodontol* 2008.
- [18] Silness J, Löe H. Periodontal disease in pregnancy : Correlation between oral hygiene and periodontal condition. *Acta Odontol. Scand*. 1964 ; 22 : 121-35.
- [19] Löe H. The gingival index, the plaque index and the retention index system. *J. Periodontol*. 1967 ; 38 : 610-16.
- [20] Greenwald RA, Kirkwood K. Adult periodontitis as a model for rheumatoid arthritis (with emphasis on treatment strategies). *J Rheumatol* 1999 ; 26 :1650-3.
- [21] Golub LM, Payne JB, Reinhardt RA, Nieman G. Can systemic diseases co-induce (not just exacerbate) periodontitis ? A hypothetical “two-hit” model. *J Dent Res* 2006 ; 85 : 102-5.
- [22] Pischon N, Pischon T, Kröger J et al. Association Among Rheumatoid Arthritis, Oral Hygiene and Periodontitis. *J Periodontol* 2008.