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ORAL HEALTH STATUS IN PATIENTS WITH RHEUMATOID ARTHRITIS

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To investigate the prevalence and structure of dental disease among patients with rheumatoid arthritis in Azerbaijan, 123 patients with rheumatoid arthritis underwent dental examinations. The control group consisted of 130 individuals without any somatic diseases. The oral hygiene status was assessed using the Greene-Vermillion Hygiene Index. The periodontal status was evaluated using the Mühlemann Bleeding Index, Svarkova Iodine Test, Gingival Index, and the Fuchs and Ramfjord indices. Periodontitis was identified in 63.4 % of RA patients, markedly higher than in the control group, where it was observed in only 33.9 %. The findings revealed significant differences between the two cohorts across several oral health indicators (Svarkova Iodine, the Fuchs and Ramfjord indices). These results indicate that patients with rheumatoid arthritis exhibit a higher prevalence of several stomatological conditions (particularly periodontitis, gingivitis, pulpitis, and mucosal diseases) compared to individuals without somatic diseases.

Key words: rheumatoid arthritis, periodontitis, oral hygiene, Svarkova Iodine Test, Fuchs index, Ramfjord index.

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СТАН ЗДОРОВ'Я РОТОВОЇ ПОЛОСТІ У ХВОРИХ НА РЕВМАТОЇДНИЙ АРТРИТ

З метою вивчення поширеності та структури стоматологічних захворювань серед хворих на ревматоїдний артрит в Азербайджані проведено стоматологічне обстеження 123 пацієнтів з діагнозом ревматоїдний артрит. Контрольну групу склали 130 осіб без соматичних захворювань. Стан гігієни порожнини рота оцінювався за допомогою індексів гігієни Гріна-Вермільона. Стан пародонту оцінювався за допомогою індексу кровоточивості Мюлеманна, йодного тесту Сваркової, ясенного індексу та індексів Фукса і Рамфьорда. Пародонтит був виявлений у 63,4 % хворих на РА, що значно вище, ніж у контрольній групі, де він спостерігався тільки у 33,9 %. Отримані дані виявили значущі відмінності між двома когортами за кількома показниками здоров'я порожнини рота (йодний тест Сваркової, індекси Фукса і Рамфьорда). Отримані результати свідчать про те, що у пацієнтів з ревматоїдним артритом спостерігається більш висока поширеність ряду стоматологічних захворювань (зокрема, пародонтиту, гінгівіту, пульпіту і захворювань слизової оболонки) в порівнянні з особами без соматичних захворювань.

Ключові слова: ревматоїдний артрит, пародонтит, гігієна порожнини рота, йодний тест Сваркової, індекс Фукса, індекс Рамфьорда.

Recent studies have shown a connection between oral health status and a range of chronic diseases, including rheumatoid arthritis (RA). RA is characterized not only by joint pain and joint damage but also by systemic inflammation and comorbidities that contribute to increased mortality [6, 10]. As one of the most common autoimmune arthropathies, RA affects approximately 0.24 % to 0.65 % of the global population [4].

More than 10 % of the global population suffers from severe periodontal disease (PD), which is considered one of the primary oral diseases leading to tooth loss [1]. Although statistics vary, individuals with RA are 2.5 times more likely to experience tooth loss compared to healthy individuals, and severe PD cases are more prevalent among them [2]. The severity of PD correlates with arthritis activity, and recent studies suggest that non-surgical periodontal treatment can reduce inflammation and improve RA outcomes [7].

Periodontitis (PD) is a widespread chronic inflammatory disease characterized by the destruction of the supporting structures of the teeth, including alveolar bone, periodontal ligament, and cementum. It is considered a significant factor in tooth loss and one of the most serious threats to oral health [3, 9]. Various studies have revealed statistically significant associations between periodontitis and several systemic diseases, including cardiovascular diseases, diabetes mellitus, rheumatoid arthritis, and osteoporosis [8, 11, 12].

Understanding the underlying processes of periodontal disease in RA patients is crucial for improving both oral health and the clinical course of rheumatoid arthritis. PD and RA share standard features in terms of inflammation-related tissue and bone loss, as well as genetic and environmental risk factors. Immune responses to infections have been proposed as a key mechanism linking these two chronic inflammatory conditions [8]. Secondary Sjögren's syndrome, which is frequently observed in RA, can further complicate the clinical course of PD.

Several mechanisms have been proposed regarding the role of periodontal diseases in the pathogenesis of systemic diseases. Firstly, individuals with periodontitis may exhibit immune dysfunction, making them more susceptible to systemic inflammatory and autoimmune processes. On the other hand, infectious and opportunistic microorganisms residing in periodontal pockets – through bacterial antigens, Gram-negative bacteria, cytokines, and other pro-inflammatory mediators – can amplify systemic inflammatory responses and worsen chronic diseases [3]. Therefore, it is essential to consider periodontal diseases not only as localized oral conditions but also as significant risk factors for systemic health.

The purpose of the study was to investigate the prevalence and structure of dental diseases among patients with rheumatoid arthritis in Azerbaijan.

Materials and methods. Between January 2021 and September 2023, a total of 123 patients diagnosed with rheumatoid arthritis by a rheumatologist who applied as inpatients or outpatients to the Educational-Therapeutic Clinic of the Azerbaijan Medical University underwent dental examinations as part of the study. For comparison purposes, 130 individuals without any somatic diseases were also included in the dental examinations.

Inclusion criteria were as follows: age between 18 and 65 years, a history of a somatic disease for at least 3 years, confirmation of diagnosis by a clinical specialist, and the patient's informed consent to participate in the study.

Exclusion criteria included: age over 65 years, presence of primary osteoporosis, other somatic pathologies, oncological diseases, use of oral contraceptives, pregnancy, and lactation.

The present study was conducted in strict accordance with internationally accepted bioethical principles governing biomedical research involving human participants (the Declaration of Helsinki, the International Ethical Guidelines for Health-related Research Involving Humans of the Council for International Organizations of Medical Sciences, and the principles of Good Clinical Practice). All participants were informed in detail about the objectives of the study, the scope of dental examinations, potential benefits, minimal risks associated with participation, and their right to refuse participation or withdraw at any stage without consequences for their medical care. Written informed consent was obtained from all participants before inclusion in the study. All procedures were non-invasive, consistent with routine dental examinations, and posed no additional risk to participants beyond standard clinical practice. Only adult patients (≥18 years) with confirmed diagnoses of rheumatoid arthritis were enrolled. Individuals with legal incapacity or cognitive impairment that could limit autonomous decision-making were omitted. Therefore, no proxy consent procedures were required. The control group was also composed exclusively of adult volunteers without somatic diseases, who likewise provided written informed consent. Confidentiality and anonymity of personal data were strictly maintained throughout all stages of the research. Individual identifiers were removed from the dataset, and all data were processed in aggregated form in accordance with national personal data protection regulations.

The oral hygiene status of all patients was assessed using the Greene-Vermillion Hygiene Indices and the Simplified Oral Hygiene Index (OHI-S). Evaluation was based on the following scale:

– 0–1: satisfactory oral hygiene;
– 1.1–2: moderate oral hygiene;
– 2.1–3: unsatisfactory oral hygiene.

To assess tooth condition, the DMFT index (Decayed, Missing, and Filled Teeth) was used. The periodontal status was evaluated using the Mühlemann Bleeding Index, Svarkova Iodine Test, the CPI (Community Periodontal Index), GI (Gingival Index), and the Fuchs and Ramfjord indices.

Statistical processing and graphical representation of the collected data were performed using a modern statistical software package. The SPSS software (version 28.0) was used for statistical analysis. The following parameters were calculated: mean (M), and the reliability of the obtained data was assessed using t-tests (Student's t-test). A correlation analysis was conducted to determine relationships among various indicators. Results were considered statistically significant at $p<0.05$.

Results of the study and their discussion. At the initial stage, we analyzed a cohort of patients with rheumatoid arthritis. Based on the general examination results, we identified the key patient characteristics. The mean duration of rheumatic disease was 6.54±2.71 years, and only 87 % of all patients received RA treatment.

The results were presented in a table that shows the mean age, level of education, and general characteristics of patients with rheumatoid arthritis (Table 1).

Table 1

General characteristics of patients with rheumatoid arthritis

Indicators	n	%
Gender		
Woman	104	84.5
Man	19	15.5
Education level		
Secondary education/vocational education	84	68.3
Higher education	39	31.7
Age		
Mean (SD)	48.7 (8.6)	
Min- max	29.00–64.00	
Duration of rheumatic disease (years)		
Mean (SD)	6.54 (2.71)	
Min- max	3.0–12.61	
RA treatment		
+	107	87
_	16	13
Cigarette use		
Yes	14	11
No	109	89

The prevalence of major dental diseases was studied and compared in patients with rheumatoid arthritis and individuals without somatic diseases. The comparative analysis revealed significant differences between the two groups across several oral health indicators. Thus, periodontitis was detected in 63.4 % of patients with RA, significantly higher than in the control group, where it was observed in only 33.9 %. This difference was highly statistically significant ($p<0.001$), indicating a strong correlation between RA and the development of periodontal disease. The obtained results are presented in Table 2.

The prevalence of gingivitis was also elevated among RA patients, recorded at 15.5 %, compared to 10.0 % in the control group. Despite the absolute difference being relatively modest, the difference reached statistical significance ($p<0.001$), underscoring a potentially heightened inflammatory susceptibility in RA. Dental caries demonstrated high prevalence rates in both groups, affecting 88.7 % of RA patients and 85.3 % of controls. However, this difference did not reach statistical significance ($p>0.05$), suggesting that the presence of RA does not significantly increase the risk of caries. In the case of pulpitis, a statistically significant difference was observed: 33.3 % of RA patients were affected, compared with 26.0 % in the control group ($p<0.05$), possibly reflecting the cumulative impact of chronic inflammation on dental pulp health. Oral mucosal diseases were approximately 1.5 times more frequent in patients with RA compared to controls ($p<0.01$), suggesting a potential association between systemic autoimmune inflammation and mucosal involvement.

Table 2

Prevalence of major dental diseases by groups

Common dental diseases	Patients with rheumatoid arthritis n=123		People without somatic disease n=130		Reliability coefficient P
	Absolute	%	Absolute	%	
Periodontitits	78	63.4	44	33.9	<0.001
Gingivitis	19	15.5	13	10.0	<0.001
Caries	109	88.7	111	85.3	>0.05
Pulpitis	41	33.3	34	26.0	<0.05
Apical Periodontitis	7	5.9	6	4.6	<0.05
Mucous membrane diseases	16	13.0	11	8.5	<0.01
Non-carious disease of the hard tissue	25	20.3	20	15.4	<0.05

Likewise, non-carious hard-tissue lesions were observed approximately 1.62 times more often in the RA group than in the control group ($p<0.05$). This may point toward changes in mineral metabolism or enamel integrity associated with chronic systemic disease. Interestingly, the prevalence of apical periodontitis was reported again with a different value (5.9 % in RA patients vs. 4.6 % in controls), showing only a marginal statistical difference ($p<0.05$). This inconsistency should be clarified to ensure data accuracy. Some of the most common dental diseases in patients with rheumatoid arthritis are illustrated with descriptive pictures (Fig. 1).

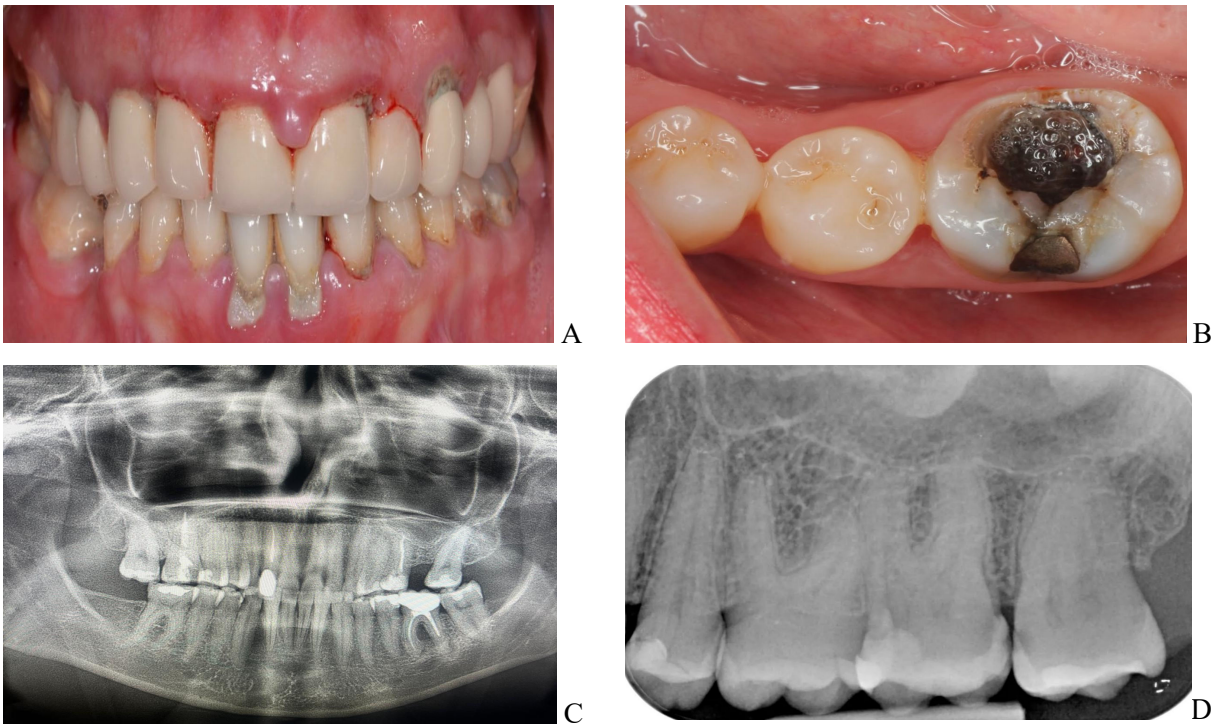

Fig. 1. The most common dental diseases in patients with rheumatoid arthritis: A – Periodontitis; B – Caries; C – Complex injury (caries, gingival bleeding, pulpitis, tooth displacement); D – Pulpitis.

In the evaluation of periodontal health, calculus was identified in 50 out of 123 patients with rheumatoid arthritis (40.7 %), while periodontal pockets were present in 36.6 % of the participants. Notably, 11 of the 25 patients who maintained satisfactory oral hygiene exhibited high levels of calculus. Additionally, the study revealed that 28 % of the 50 patients with poor oral hygiene had periodontal pocket depths measuring 6 mm or more.

Among various clinical manifestations, dental plaque and calculus were the most frequent, occurring in 40.7 % of rheumatoid arthritis patients. Other periodontal indices were also assessed in these patients and compared with a control group without systemic diseases. The Svarkov iodine index was 3.42±0.93 in rheumatoid arthritis patients (n=123), which differed significantly from the control group (3.05±0.88; $p<0.05$). The gingival index was 1.20±0.75 in patients with rheumatoid arthritis and 1.28±0.81 in the comparison group; this difference was not statistically significant ($p>0.05$).

The Müller bleeding index values were 3.40±0.78 in rheumatoid arthritis patients and 3.28±0.70 in controls, showing no significant difference ($p>0.05$). Similarly, the Ramfjord index did not show an

important difference between the two groups (3.60±1.10 vs. 3.50±1.15; p>0.05). However, the Fuchs index revealed a significant difference between rheumatoid arthritis patients and controls (0.80±0.15 vs**.** 1.65±0.10**;** p<0.01).

Thus, the evaluation of periodontal indices demonstrated that the Svarkov iodine and Fuchs indices differed significantly between rheumatoid arthritis patients and healthy controls (p<0.05 and p<0.01, respectively).

The correlation between RA and periodontitis has been the subject of numerous studies, but the findings are controversial [2, 7, 8]. RA arthritis and periodontitis are both chronic inflammatory disorders that share standard features in their pathophysiology, histological presentation, and demographic distribution. Although earlier studies have suggested a potential link between these two conditions, recent evidence has questioned the strength and consistency of this association [5, 10, 12].

Evidence from interventional studies indicates that effective local management of periodontitis can attenuate systemic inflammation and improve surrogate biomarkers of these comorbid conditions, suggesting a possible causal relationship. Experimental research using preclinical disease models further supports this bidirectional link and provides valuable mechanistic insights into the underlying biological pathways. In his review, Hajishengallis G (2022) highlighted recent progress in elucidating the link between periodontitis and systemic diseases, offering perspectives for novel therapeutic strategies to reduce the burden of periodontitis-associated comorbidities [3].

A comprehensive literature search was conducted by Fuggle NR et al. (2016) across databases, including MEDLINE, EMBASE, and PubMed, using keywords related to RA and periodontitis. Studies were included if they reported data on the prevalence of periodontitis or specific periodontal parameters among individuals with RA, compared with a control group. A total of 21 studies met the inclusion criteria and were included in the meta-analysis. Seventeen of these studies (n=153,492 participants) compared RA patients with healthy controls, while four (n=1378 participants) compared RA with osteoarthritis (OA). The pooled results demonstrated a significantly higher prevalence of periodontitis among RA patients relative to healthy controls (p=0.006). Additionally, individuals with RA exhibited greater mean probing depth, an increased likelihood of bleeding on probing (BOP), and more pronounced clinical attachment loss. In contrast, no significant difference in periodontitis prevalence was found between the RA and OA groups, though the risk of BOP was higher in OA than in RA [2].

Overall, the findings of this systematic review and meta-analysis support a significant association between rheumatoid arthritis and periodontitis compared with healthy individuals, consistent with our results. However, this relationship was not observed when RA was compared to osteoarthritis, suggesting disease-specific inflammatory mechanisms may underlie the observed link [2]. We did not assess the correlation with OA; it might be the purpose of our further studies.

Developing a comprehensive, mechanistic understanding of the comorbidities associated with periodontitis could pave the way for innovative therapeutic strategies that address both periodontitis and its related systemic disorders. Some of these emerging approaches may focus on central rather than solely local mechanisms – for example, targeting maladaptive reprogramming of hematopoietic progenitor cells in the bone marrow, which serves as a key regulatory hub interconnecting various comorbid conditions [5]. Consequently, it is essential to accelerate the translation of insights gained from fundamental and clinical research into everyday clinical practice.

Despite the clinical significance of the findings, several limitations should be noted. First, the study was cross-sectional, precluding the possibility of establishing a causal relationship between rheumatoid arthritis and the development of dental and periodontal diseases. Consequently, it is impossible to determine whether rheumatoid arthritis directly contributes to the observed oral pathology or whether the two conditions share common risk factors. Second, the relatively small sample size and recruitment from a single geographic region limit the generalizability of the results to other ethnic or regional populations, underscoring the need for further research.

Conclusions

1. Periodontitis was identified in 63.4 % of RA patients, markedly higher than in the control group, where it was observed in only 33.9 %.

2. The findings revealed significant differences between the two cohorts across several oral health indicators (Svarkova Iodine, the Fuchs and Ramfjord indices).

These results indicate that patients with rheumatoid arthritis exhibit a higher prevalence of several stomatological conditions – particularly periodontitis, gingivitis, pulpitis, and mucosal diseases – compared

to individuals without somatic diseases. In contrast, the prevalence of dental caries did not differ significantly between groups. The increased burden of inflammatory oral diseases in RA patients may be linked to underlying immunopathological mechanisms. These findings underscore the importance of careful monitoring and early management of oral health in patients with rheumatoid arthritis.

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