Original paper

Oral health-related quality of life in a group of patients with rheumatoid arthritis

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Conflict of interest
None declared

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Abstract

Background. Rheumatoid arthritis (RA) and periodontitis (PD) are chronic diseases that are associated with connective tissue and bone destruction, which affects the quality of life of the people suffering from these conditions. The identification of social conditions and the determinants of RA and PD would permit the elaboration of policies and strategies based on social reality.

Objectives. The aim of the present study was to identify the relationship between oral health-related quality of life (OHRQoL) and the indicators of general health and oral health in patients with RA.

Material and methods. A cross-sectional study involving 59 patients with RA was conducted between 2019 and 2020. Demographic, general health, periodontal, and oral health parameters were collected. In addition, the Oral Health Impact Profile-14 (OHIP-14) questionnaire was administered to each patient. A description of the OHIP-14 dimensions according to different variables was performed. The relationship between OHRQoL and general/oral health indicators was analyzed with logistic and linear regression analyses.

Results. The highest OHIP-14 scores were found in people that were 60 years of age and over, single, had low educational achievements, a low socioeconomic status, were unemployed, and had no health affiliation. In the adjusted model, the prevalence of the impact on OHRQoL was 1.34 (1.10–5.29) times greater in those with erosive RA than in those without, and 2.22 (1.16–29.50) times greater in those who self-reported morning stiffness. Regarding the stage of PD, those with stage IV had a prevalence of the impact on the OHRQoL of 70%, an average extent of 3.4 ±4.5 and a severity score of 11.5 ±22.0, with statistically significant differences.

Conclusions. The dimensions with the greatest impact on the OHRQoL of patients were physical pain, discomfort and psychological disability. The type of RA and the severity of PD are indicators of worse scores on the OHRQoL scale.

Keywords: periodontitis, quality of life, oral health, rheumatoid arthritis

Introduction

Chronic diseases are characterized by a long duration and slow progression. They manifest themselves during adulthood and carry with them a number of associated consequences. Most of the time, the pain, anxiety, and disability caused by these chronic diseases compromise the health-related quality of life (HRQOL) of patients.[1] Both rheumatoid arthritis (RA) and periodontitis (PD) are chronic diseases that cause connective tissue and bone destruction.[2] These two diseases are currently considered to share etiopathological mechanisms and therefore are said to be related both biologically and epidemiologically.[2] RA is defined as an inflammatory, systemic, autoimmune disease involving the loss of control of the autologous immune response leading to effector elements (humoral and cellular) that will generate a specific immune response against the patient's own autoantigens or tissues.[3,4] Currently, the etiology of RA is not entirely clear, although the interrelationship between genetic and environmental factors plays an important role in a patient's susceptibility to RA.[4] Its prevalence among the world population varies between 0.2% and 5.0% and has a prevalence of approximately 1% in Colombia. It occurs more often in women than in men, with a ratio of 4:1, and increases with age.[5]

Oral health is closely related to health in general and the HRQOL perceived by people. Functional, social, and psychological aspects are essential for the integral development of the human being throughout life, which in turn allows optimal interpersonal relationships.[6] The presence of PD can cause additional complications such as pain, discomfort, and low self-esteem.[7] According to various studies, patients suffering from rheumatic diseases have a reduced quality of life, especially those presenting with oral manifestations and physical effects due to oral and dental diseases which cause psychosocial deficiencies.[8]

Oral health is an important component of one's HRQOL, and different approaches have been made to isolate these effects through the preparation of different questionnaires, among which is the Oral Health Impact Profile (OHIP) by Locker. It is used to conceptualize a biopsychosocial approach to the deficiencies, disabilities, and handicaps of oral health.[6] The most recent version of this instrument is the OHIP-14, which evaluates the impact of oral diseases on HRQOL using seven factors: 1) functional limitation: problems pronouncing words, worsening sense of taste; 2) physical pain: mouth pain, discomfort/pain with eating; 3) psychological discomfort: teeth self-awareness, feelings about the teeth or mouth appearance; 4) physical disability: problems with diet/eating; 5) psychological disability: problems relaxing, sleeping, or feeling embarrassed because of teeth/mouth problems; 6) social disability: difficulties in social relationships, or in carrying out daily activities; and 7) handicap: the feeling of a less satisfying life, inability to function properly due to dental problems.[6,9] The hierarchy captures outcomes that have an increasingly disruptive impact on people's lives. The instruments used for analyzing the OHIP have been validated in several countries.[6,10–13] On the other hand, there is an instrument that measures the oral health self-perception in patients with the periodontal disease without leaving aside the multidimensional theoretical model of oral health.[14]

Although the health and oral health-related quality of life (OHRQOL) has been studied in populations with different characteristics and RA patients.[15–17] However, there are no local (Colombia and Medellín) studies using OHRQOL instruments to investigate the quality of life of RA patients currently available. Given the scarcity of research on the aforementioned aspect, this study is needed to provide information that encourages the creation of a research line that promotes prevention strategies in patients with chronic diseases by advocating for an interdisciplinary approach.

Considering the above, this study aimed to determine the relationship between OHRQOL and general and oral health indicators in a group of patients with RA, as well as its associated sociodemographic and clinical factors.

Methods

Design and setting

A cross-sectional study was carried out using a structured survey, a periodontal exam, and a hematological exam in adult patients older than 18 years, who consulted a clinic specializing in the treatment of patients with RA in Medellín, Colombia. This manuscript was written according to the STROBE guidelines for observational studies.[18]

Participants and selection criteria

RA patients were recruited between March 2019 and March 2020 from a specialized clinic in Medellín, Colombia. Individuals were included according to the following criteria: age ≥18 years, RA diagnosis according to the American College of Rheumatology[19] with a disease activity score in 28 joints – C-reactive protein (DAS28-CRP) value ≥3.2 – and no changes in RA medications in the previous 3 months and throughout follow-up, and at least 15 teeth excluding third molars. People who reported periodontal treatment or antibiotic use in the previous 3 months, HIV, liver disease, head and neck radiation therapy, pregnancy, and cyclosporine use were excluded. Smoking, hypertension medication use, and hyperlipidemia were not exclusion criteria and were recorded accordingly. In the consultation with the treating physician, the selection criteria were confirmed. For example, patients on cyclosporine for a transplant were not included in the study, while hypertensive patients controlled with medication were included since the results would not be affected. For patients who met these criteria, we explained the purpose of the research. Those who agreed to participate were provided informed consent forms and an explanation of the procedure, and all their questions were answered. Signed informed consent forms were collected prior to the initiation of the research study.

Information gathering

A survey containing variables such as sociodemographic and clinical factors, RA self-perception, and questions from the OHIP-14 was administered. Subsequently, appointments were scheduled for blood tests to be performed at the Universidad de Antioquia and a periodontal examination for non-surgical treatment or prophylaxis, as well as an explanation about oral hygiene.

OHIP-14 questionnaire

Regarding the OHRQOL, the results were obtained through the use of the OHIP-14, which consisted of 14 questions distributed in 7 dimensions: functional limitation; physical pain; psychological discomfort; physical disability; psychological disability; social disability; and handicap. Each question has 5 answer options, and each one is assigned a score: 0 – never; 1 – almost never; 2 – sometimes; 3 – frequently; and 4 – always.[6,9,10]

The OHIP-14 analysis allowed the use of 3 summary variables of the functional and psychological consequences of oral health problems[20]:

1) Prevalence: percentage of individuals who report one or more items “frequently” or “always”;
2) Extension: number of items reported as “frequently” or “always”; and
3) Severity: the sum of all the ordinal value responses, and scores in a range from 0 to 56, with the higher value indicating a greater impact of oral health on one’s quality of life.

Such measures have been used in other research on the international level[20,21] and in the city of Medellín.[22,23]

Physical examination

Patients received a full mouth periodontal examination, excluding the third molars. The following clinical parameters were recorded with a millimeter periodontal probe (UNC15) at 6 sites: probing pocket depth (PPD); bleeding on probing (BOP); and clinical attachment loss (CAL). The stage of PD was determined according to the current classification of periodontal disease.[24] At the same time, we identified cases of periodontal health and gingival diseases and conditions on an intact and a reduced periodontium.[25] The standardization was carried out by a periodontist dentist in patients with characteristics similar to those of our study. They underwent dental physical examination and measurements of the oral clinical variables until a kappa, and a 0.80 or higher intraclass correlation coefficient (ICC) was obtained.

Serological markers: all patients underwent peripheral blood tests for anti-citrullinated protein antibodies (ACPAs; U/mL), ultrasensitive C-reactive protein (CRP; mg/L), and rheumatoid factor (RF; U/mL). Serological tests were performed in a clinical laboratory.

RA patients were examined by a trained rheumatologist during the study and the rheumatologist confirmed the diagnosis. Medical information was obtained from their medical records, including RA duration and current medication for RA (non-steroidal anti-inflammatory drugs (NSAIDs), biological and non-biological disease-modifying antirheumatic drugs (DMARDs), and corticosteroids). Non-biologic DMARDs included hydroxychloroquine, methotrexate, sulfasalazine, and leflunomide. Biologic DMARDs included adalimumab, etanercept, abatacept, golimumab, infliximab, rituximab, and tocilizumab.

Statistical analysis

An initial exploratory and descriptive analysis was performed to determine the distribution of the variables, and appropriate tests (Kolmogorov–Smirnov) were performed to assess normality. Continuous variables are presented with the corresponding central tendency. Dispersion measures and parametric or non-parametric tests were used to determine the differences between the indicated groups. Categorical variables are presented as frequencies, and differences between the groups were tested using the χ^2 tests.

In addition, to determine the influence of the independent variables on OHIP and its dimensions, Spearman’s rank correlation coefficient and a multivariate linear regression analysis were performed to evaluate the simultaneous and reciprocal effect of the explanatory variables. Compliance with the assumptions of linearity, non-collinearity, normality, constant variance, and correlation of residuals was determined.

A logistic regression analysis was carried out to test the association between the OHIP covariates and prevalence. The crude odds ratio (*OR*, 95% confidence interval (*CI*)) and the adjusted *OR* of the covariates are presented in the multivariate analysis, in which variables were included according to the Hosmer–Lemeshow criterion ($p \leq 0.25$) or according to biological plausibility. The power of the study was calculated at 87.3% for cross-sectional studies. All data was analyzed using IBM SPSS Statistics for Windows, v. 25.0 (IBM Corp., Armonk, USA), and statistical significance was assumed when the *p*-value was ≤0.05.

Results

Out of the 59 RA patients, 81.4% were women. Considering both sexes, individuals were aged between 30 and 73 years (average 54.5 ±9.2 years) and had a disease duration between 1 and 45 years (average 10.2 ±8.2 years). Additionally, 72.9% of the patients at the time of the study did not work. The dental variables measured for all patients were 23.1 ±3.9 teeth, CAL average of 3.2 ±2.2 mm, PPD average of 3.1 ±1.9 mm, and BOP average of 20.5 ±14.3%. The summary of the blood parameters for the study population was as follows: ACPAs of 222.7 ±298.6 U/mL, RF of 218.1 ±505.5 U/mL, and CRP of 6.9 ±10.1 mg/L.

OHIP-14 results

The results of the OHIP-14 included comparisons regarding the prevalence, extent, and severity, according to the sociodemographic variables, of RA and periodontal diseases, as well as the analysis of the dimensions.

The prevalence of the impact on OHRQOL is shown in Table 1. The highest impact was found among women (83.3%), married people (61.1%), the middle socioeconomic class (66.7%), people affiliated with the health care contributory and special regime (61.1%), and people who did not work (77.8%). Similar results were observed for the OHIP extent, with a higher average (2.69 ±3.16) in people aged 60 years and over. Regarding severity, higher median scores were observed in people with no education (9.0 (19.0)), lower class (8.0 (21.0)), and those who were not affiliated with the health care system (13.0 (–)).

When comparing the impact of OHIP according to habits, systemic conditions, and periodontal conditions, a higher prevalence was observed in those who did not smoke, did not consume alcohol, did not exercise, and consumed corticosteroids and DMARDs. The average extent was higher in those who did not exercise (2.3 ±3.7), had hypertension (2.5 ±3.9), had osteoporosis (2.7 ±4.7), used corticosteroids (2.1 ±3.5), and was on DMARDs (1.9 ±3.3). Regarding severity, the highest scores were reported in patients with diabetes (9.0 (19.0)). In addition, statistically significant differences in terms of prevalence, extent, and severity were found regarding the stage of PD. Those with stage IV occurred at a prevalence of 70.0%, an extension of 3.4 ±4.5, and a severity of 11.5 (22.0) (Table 2).

Table 3 shows statistically significant differences in RA type according to the number of affected joints and OHIP prevalence and extent, with a prevalence of 77.8% for polyarticular arthritis and an average extent of 5.0 ±4.4 for those with oligoarticular RA and severity with a median value of 21.0 (30.0). Regarding RA symptoms self-perception, those who reported having swelling, pain, and morning stiffness had a higher OHIP prevalence (72.2%). In terms of extension, a higher difference was found in those who reported pain (2.2 ±3.6). On the topic of severity, there was a higher difference between those who reported morning stiffness (7.0 (19)) compared to those who did not. In those who reported

Table 1. Summary outcomes of the Oral Health Impact Profile-14 (OHIP-14) questionnaire as a proxy of oral health-related quality of life (OHRQoL) according to sociodemographic variables in patients with rheumatoid arthritis (RA) (*N* = 59)

Variables		Sample		OHRQoL (summary outcomes of OHIP-14)			
		n	%	prevalence (%)	extent (*M* ±*SD*)	severity (OHIP-14 score)	
						M ±*SD*	*Me* (*IQR*)
Sex	male	11	18.6	16.7	1.6 ±2.6	9.7 ±10.6	8.0 (20.0)
	female	48	81.4	83.3	1.8 ±3.4	10.1 ±11.5	6.0 (15.0)
Age [years]	27–59	42	71.2	55.6	1.4 ±3.2	9.0 ±11.1	6.0 (11.0)
	60 and more	17	28.8	44.4	2.7 ±3.2	12.5 ±11.8	8.0 (22.0)
Marital status	married	35	59.3	61.1	1.5 ±2.5	9.2 ±9.8	7.0 (17.0)
	living alone	24	40.7	38.9	2.2 ±3.9	11.1 ±13.2	5.0 (18.0)
Education	≤primary	22	37.3	44.4	2.4 ±3.8	12.5 ±12.5	9.0 (19.0)
	secondary	31	52.5	44.4	1.4 ±2.8	8.7 ±10.7	4.0 (14.0)
	≥university	6	10.2	11.2	1.2 ±2.0	7.2 ±8.1	4.5 (12.0)
Socioeconomic status	low	13	22.0	33.3	2.8 ±4.2	12.6 ±14.1	8.0 (21.0)
	medium	42	71.2	66.7	1.6 ±3.0	9.4 ±10.8	5.0 (18.0)
	high	4	6.8	0.0		8.2 ±4.1	7.5 (8.0)
Social security (health insurance)	none	2	3.4	5.6	2.0 ±2.8	13.0 ±12.7	13.0
	paying regime/special	43	72.9	61.1	1.6 ±3.0	9.6 ±10.4	7.0 (16.0)
	subsidized	14	23.7	33.3	2.2±4.0	10.7 ±14.0	6.0 (16.0)
Employment situation	employed	16	27.1	22.2	1.1 ±2.4	7.2 ±9.0	5.0 (10.0)
	unemployed	43	72.9	77.8	2.0 ±3.4	11.0 ±11.9	7.0 (19.0)

M – mean; *SD* – standard deviation; *Me* – median; *IQR* – interquartile range; statistical significance: * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$ (non-parametric tests: Mann–Whitney *U* test for dichotomous variables; Kruskal–Wallis test for polychotomous variables; and χ^2 test for categorical variables).

Table 2. Summary outcomes of the OHIP-14 questionnaire as a proxy of OHRQoL according to habits, and periodontal and systemic condition in patients with rheumatoid arthritis (RA) (*N* = 59)

Variables		Sample		OHRQoL (summary outcomes of OHIP-14)			
		n	%	prevalence (%)	extent (*M* ±*SD*)	severity (OHIP-14 score)	
						M ±*SD*	*Me* (*IQR*)
Smoking	yes	4	6.8	11.1	1.2 ±1.9	9.5 ±9.2	8.0 (18.0)
	no	55	93.2	88.9	1.8 ±3.3	10.0 ±11.5	6.0 (16.0)
Alcohol consumption	yes	3	5.1	5.6	0.33 ±0.6	7.3 ±1.1	8.0 (–)
	no	56	94.9	94.4	1.8 ±3.3	10.1 ±11.6	6.0 (18.0)
Practicing exercise (sports)	yes	22	62.7	27.8	1.1 ±2.2	9.3 ±9.6	7.5 (13.0)
	no	37	37.3	72.2	2.3 ±3.7	10.9 ±12.4	6.0 (20.0)
Diabetes	yes	6	10.2	11.1	1.8 ±2.8	10.2 ±8.8	9.0 (19.0)
	no	53	89.8	88.9	1.7 ±3.2	10.0 ±11.6	6.0 (15.0)
Arterial hypertension	yes	19	32.2	38.9	2.5 ±3.9	11.7 ±13.9	8.0 (21.0)
	no	40	67.8	61.1	1.5 ±2.9	9.5 ±10.2	6.0 (13.0)
Osteoporosis	yes	10	16.9	16.7	2.7 ±4.7	11.9 ±15.6	4.5 (23.0)
	no	49	83.1	83.3	1.6 ±2.9	9.6 ±10.5	6.5 (15.0)
NSAIDs consumption	yes	8	13.8	11.1	1.0 ±2.1	9.2 ±7.8	8.0 (13.0)
	no	50	86.2	88.9	1.9 ±3.4	10.4 ±11.9	6.0 (19.0)
Corticosteroids consumption	yes	35	60.3	61.1	2.1 ±3.5	11.0 ±12.2	7.0 (20.0)
	no	23	39.7	38.9	1.4 ±2.7	8.5 ±10.1	6.0 (11.0)
DMARDs consumption	yes	53	91.4	94.4	1.9 ±3.3	10.5 ±11.8	6.0 (19.0)
	no	5	8.6	5.6	1.2 ±2.6	8.8 ±7.6	8.0 (11.0)
Periodontitis	yes	31	59.6	32.3	1.9 ±3.5	10.5 ±12.0	8.0 (14.0)
	no	21	40.4	37.5	1.6 ±2.7	9.8 ±10.5	4.0 (19.0)
Stage of periodontal disease†	I	0	0.0	–	–	–	–
	II	1	3.2	0.0*	–	–	–
	III	18	58.1	30.0*	0.9 ±2.4*	6.9 ±8.9*	5.0 (11.0)*
	IV	12	38.7	70.0*	3.4 ±4.5*	16.6 ±14.2*	11.5 (22.0)*

NSAIDs – non-steroidal anti-inflammatory drugs; DMARDs – disease-modifying antirheumatic drugs; statistical significance: * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$ (non-parametric tests: Mann–Whitney *U* test for dichotomous variables; Kruskal–Wallis test for polychotomous variables; and χ^2 test for categorical variables). † Classification of periodontitis based on the stages defined by severity (according to the level of interdental clinical attachment loss (CAL), radiographic bone loss and tooth loss), complexity, extent, and distribution.[24]

fatigue and depression, the severity (9.0 (19)) was not statistically significantly different.

When comparing the OHIP-14 dimensions in patients who have and do not have PD, higher indicators were found in those who experienced it in the dimensions of physical pain (1.5 (4.0)) and psychological disability (1.5 (3.0)) (Table 4).

Table 5 shows the correlations between the OHIP-14 dimensions and the sociodemographic, habits, clinical dental variables, and RA-related blood parameters (all variables of quantitative nature). A statistically significant correlation between age and the dimensions of physical (0.35) and psychological (0.27) disability was observed. Also, a statistically significant correlation was found between the number of teeth present and all dimensions, the extension, and OHIP-14 total impact. The average BOP was correlated with the dimensions of physical (0.30), psychological (0.46), and social (0.27) disability, as well as with handicap (0.43). RA blood parameters showed low correlations with the different dimensions. It is observed that ACPAs presented the highest inverse correlation with functional limitation, while RF presented a positive correlation with the dimension of physical pain. These correlations were not statistically significant.

In the linear regression model, age was a positive predictive value (0.38) for the physical disability dimension, which is in contrast to the duration in years of RA, which was a negative predictive value (−0.30). The number of teeth present was a negative predictive value for the OHIP-14 total score, psychosocial disability dimension, and handicap dimension (−0.34, −0.36 and −0.31, respectively), meaning the fewer the number of teeth, the worse the reported indicators. The average BOP had a positive predictive value for the psychological disability dimension (0.31). These results were explained by the model between 10% and 30% (Table 6).

Table 3. Summary outcomes of the OHIP-14 questionnaire as a proxy of OHRQoL according to clinical and self-perception variables in patients with rheumatoid arthritis (RA) ($N = 59$)

Variables		Sample		OHRQoL (summary outcomes of OHIP-14)			
		n	%	prevalence (%)	extent (*M* ±*SD*)	severity (OHIP-14 score) *M* ±*SD*	severity (OHIP-14 score) *Me* (*IQR*)
RA-related clinical variables							
Type of RA	polyarticular	53	89.8	77.8*	1.5 ±3.0*	9.3 ±10.8	6.0 (13.0)
	oligoarticular	5	8.5	22.2*	5.0 ±4.4*	18.4 ±15.1	21.0 (30.0)
	monoarticular	1	1.7	0.0*			
RA activity	remission	30	53.6	55.6	1.5 ±2.6	9.0 ±9.2	6.5 (13.0)
	low	6	10.7	11.1	2.6 ±3.4	13.0 ±10.9	9.0 (18.0)
	moderate	10	17.9	16.7	2.1 ±3.7	10.2 ±13.9	2.0 (23.0)
	high	10	17.8	16.7	2.6 ±4.6	13.0 ±15.6	4.0 (21.0)
Erosive RA	yes	22	42.3	50.0	1.6 ±2.7	9.6 ±9.8	7.0 (20.0)
	no	30	57.7	50.0	1.2 ±2.6	8.2 ±9.6	5.0 (14.0)
Alternative therapies	yes	1	1.7	5.9			
	no	57	98.3	94.1	1.7 ±3.2	9.8 ±11.4	6.0 (15.0)
Self-perception variables							
Swelling	yes	44	74.6	72.2	1.9 ±3.3	10.8 ±11.9	7.0 (19.0)
	no	15	25.4	27.8	1.4 ±2.9	7.7 ±9.3	6.0 (7.0)
Pain	yes	46	78.0	72.2	2.2 ±3.6	10.8 ±12.0	7.0 (21.0)
	no	13	22.0	27.8	1.6 ±3.1	9.8 ±11.2	6.0 (14.0)
Morning stiffness	yes	16	27.1	72.2	1.8 ±3.2	10.6 ±11.5	7.0 (19.0)
	no	43	72.9	27.8	1.6 ±3.1	8.6 ±11.0	4.5 (10.0)
Fatigue and depression	yes	27	45.8	55.6	1.9 ±3.2	11.3 ±10.8	9.0 (19.0)
	no	32	54.2	44.4	1.6 ±3.2	8.4 ±11.8	4.0 (8.0)
Family support	yes	59	100.0	100.0	1.0 ±2.1	8.5 ±9.5	5.5 (14.0)
	no	0	0.0	0.0	–	–	–

Statistical significance: * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$ (non-parametric tests: Mann–Whitney *U* test for dichotomous variables; Kruskal–Wallis test for polychotomous variables; and χ^2 test for categorical variables).

Finally, the logistic regression analysis aiming to observe associations between the OHIP-14 prevalence indicator and the variables of person, habits, and RA clinics in patients with and without PD was performed (Table 7). The results showed that after adjusting for sociodemographic variables, the prevalence of the impact on HRQOL was 1.3 (95% *CI*:1.10–5.29) times more in patients with erosive RA than in those without it, and 2.2 (95% *CI*:1.16–29.50) times more in those who self-reported morning stiffness. On the other hand, in the crude model, an association was observed between the prevalence of polyarticular RA and having a periodontal stage between III and IV. Finally, having access to an alternative treatment for RA was regarded as a protective factor.

Table 4. OHIP-14 dimensions according to the presence of periodontitis in patients with rheumatoid arthritis (RA) ($N = 59$)

OHIP-14 dimensions	All		Periodontitis		No periodontitis		*p*-value
	M ±*SD*	*Me* (*IQR*)	*M* ±*SD*	*Me* (*IQR*)	*M* ±*SD*	*Me* (*IQR*)	
Functional limitation	0.9 ±1.8	0.0 (1.0)	0.9 ±2.1	0.0 (0.0)	0.9 ±1.3	0.0 (2.0)	0.432
Physical pain	2.3 ±2.4	2.0 (4.0)	2.4 ±2.7	1.5 (4.0)	1.9 ±2.1	1.0 (4.0)	0.797
Psychological discomfort	2.2 ±2.4	2.0 (4.0)	1.9 ±2.4	0.5 (4.0)	2.5 ±2.2	2.0 (4.0)	0.154
Physical disability	1.7 ±2.3	0.0 (3.0)	1.8 ±2.3	0.0 (4.0)	1.6 ±2.5	0.0 (3.0)	0.650
Psychological disability	1.6 ±2.0	1.0 (3.0)	1.8 ±2.1	1.5 (3.0)	1.4 ±1.9	0.0 (3.0)	0.563
Social disability	0.5 ±1.2	0.0 (0.0)	0.5 ±1.4	0.0 (0.0)	0.4 ±0.9	0.0 (1.0)	0.891
Handicap	0.9 ±1.7	0.0 (2.0)	0.8 ±1.6	0.0 (2.0)	0.9 ±1.6	0.0 (2.0)	0.745

Mann–Whitney/Kruskal–Wallis tests.

Table 5. Correlation between the OHIP-14 dimensions and different variables in patients with rheumatoid arthritis (RA) (*N* = 59)

Variables	Extent	OHIP-14 score	Functional limitation	Physical pain	Psychological discomfort	Physical disability	Psychological disability	Social disability	Handicap
Age	0.20	0.25	0.18	0.14	0.25	0.35**	0.27*	0.13	0.05
RA duration	−0.14	0.08	−0.10	0.11	0.04	0.00	0.06	0.00	−0.06
Number of sleeping hours	−0.06	−0.06	−0.25	0.01	−0.10	−0.05	−0.07	−0.24	−0.03
Number of teeth	−0.42**	−0.44**	−0.28*	0.28*	−0.36**	−0.40**	−0.51**	−0.31*	−0.041**
Mean BOP	0.33*	0.33*	0.10	0.25	0.17	0.30*	0.46**	0.27*	0.43**
Mean CAL	0.08	0.01	−0.11	−0.02	−0.05	0.07	0.18	−0.06	−0.00
Mean PPD	0.09	0.11	0.02	0.10	−0.06	0.03	0.23	0.21	0.19
ACPAs	−0.18	−0.06	−0.30	−0.05	−0.05	−0.01	−0.03	0.04	−0.02
RF	−0.07	0.06	−0.03	0.11	0.06	0.04	0.07	−0.01	0.06
CRP	−0.02	0.01	−0.05	0.07	0.02	−0.03	0.05	−0.02	−0.09

BOP – bleeding on probing; PPD – probing pocket depth; CAL – clinical attachment loss; ACPAs – anti-citrullinated protein antibodies; RF –rheumatoid factor; CRP – C-reactive protein; * statistically significant correlation at $p < 0.05$ (bilateral); ** statistically significant correlation at $p < 0.01$ (bilateral).

Table 6. Multivariate lineal regression model for the scores in the OHIP-14 dimensions in patients with rheumatoid arthritis (RA) (*N* = 59)

OHIP-14 dimensions (dependent variables)	Independent variables included in the model	Standardized coefficient (β)	Determination coefficient (%)
Extent	age	0.15	17.0
	RA duration	−0.05	
	number of teeth	−0.32	
	mean BOP	0.20	
	ACPAs	−0.14	
OHIP-14 score	age	0.10	17.0
	RA duration	−0.34*	
	number of teeth	0.15	
	mean BOP	−0.02	
Functional limitation	age	0.07	5.0
	RA duration	−0.06	
	number of sleeping hours	−0.21	
	number of teeth	−0.22	
	mean BOP	0.22	
	mean CAL	0.043	
	ACPAs	−0.02	
Physical pain	age	0,21	4.3
	RA duration	−0,22	
	number of sleeping hours	−0,09	
	number of teeth	−0,11	
	mean BOP	0,12	
	mean PPD	0,10	
	RF	0,17	
Psychological discomfort	age	0.22	8.0
	RA duration	−0.10	
	number of sleeping hours	−0.50	
	number of teeth	−0.31	
	mean BOP	0.06	
	ACPAs	−0.03	
	RF	−0.10	
Physical disability	age	0.38*	24.4
	RA duration	−0.30*	
	number of teeth	−0.25	
	mean BOP	0.11	
	ACPAs	−0.56	
	RF	0.13	
Psychological disability	age	0.10	29.2
	RA duration	−0.09	
	number of teeth	−0.36*	
	mean BOP	0.31*	
	ACPAs	−0.04	
	RF	0.06	
Social disability	age	0.08	6.8
	RA duration	0.03	
	number of sleeping hours	−0.08	
	number of teeth	−0.08	
	mean BOP	0.09	
	RF	0.08	
Handicap	age	0.13	10.9
	number of teeth	−0.31*	
	mean BOP	0.19	
	mean PPD	0.12	
	ACPAs	−0.08	
	RF	−0.03	
	CPR	−0.07	

Statistical significance: * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

Table 7. Evaluating the association between the prevalence outcome of OHIP-14 and different variables by means of multivariate regression logistic analysis in patients with rheumatoid arthritis (RA) (*N* = 59)

Variable		Prevalence outcome of OHIP-14	
		crude *OR* (95% *CI*)	adjusted *OR*† (95% *CI*)
Sex	male	1.00	1.00
	female	1.21 (0.28–5.22)	1.45 (0.30–6.87)
Age [years]	27–59	1.00	1.00
	60 and more	2.80 (0.87–9.33)	2.89 (0.86–9.72)
Socioeconomic status	low	0.41 (0.12–1.47)	2.64 (0.69–10.12)
	medium/high	1.00	1.00
Practicing exercise (sports)	yes	1.00	1.00
	no	0.54 (0.16–1.81)	1.20 (0.29–4.79)
Type of RA	monoarticular	1.00	1.00
	polyarticular	**1.45 (1.22–1.72)**	NC
Remission	yes	1.12 (0.36–3.47)	0.80 (0.18–3.48)
	no	1.00	1.00
Erosive RA	yes	1.53 (0.45–5.26)	**1.34 (1.10–5.29)**
	no	1.00	1.00
Swelling	yes	0.84 (0.24–2.94)	0.76 (0.09–6.45)
	no	1.00	1.00
Pain	yes	0.63 (0.17–2.28)	0.35 (0.02–5.27)
	no	1.00	1.00
Morning stiffness	yes	0.95 (0.27– 3.30)	**2.22 (1.16–29.5)**
	no	1.00	1.00
Periodontitis	yes	1.13 (0.43–3.70)	0.52 (0.10–4.20)
	no	1.00	1.00
Stage of periodontal disease	I and II	1.00	1.00
	III and IV	**1.48 (1.20–1.90)**	NC
Alternative therapies	yes	**0.28 (0.19–0.42)**	NC
	no	1.00	1.00

OD – odds ratio; *CI* – confidence interval; NC – not calculated; † regression logistic model. All the variables presented in the table were included in the adjusted model.

Discussion

The main findings of this study indicate that the majority of surveyed RA patients report a low overall OHIP-14 score resulting in a low impact of oral health on their HRQOL (or a moderate/good HRQOL). However, there were differences with respect to some sociodemographic, general health, oral, and RA clinical variables. The dental variables that were most related to the OHRQOL dimensions were the PD stage, the number of teeth, and BOP. In a similar study, these variables were also significant.[26] In RA patients, the most related variable was RA type, defined by the number of affected joints and morning stiffness, a symptom that has been reported to impact the quality of life and a patient's optimism.[27]

Regarding age, despite the fact that people under 60 years of age report similar results in terms of OHIP-14 prevalence, those aged 60 and over had the highest scores regarding the extent and severity to which the OHRQOL had an impact on the oral health-related quality of life. This is explained by the physical deterioration in dental tissues due to increasing age and the physical impairments caused by RA.[28,29] These physiological changes can cause the perception of the OHRQOL to be diminished due to the presence of bleeding, tooth mobility, pain, occlusal trauma, as well as the use of certain medications, among others. Since oral diseases can spread and exacerbate systemic diseases or vice versa, cause discomfort, and increase the stigma experienced, it can have a potentially profound effect on behavior.[30]

In addition, the whole population being studied reported family support in handling RA, which had a low impact on the OHIP-14. A study carried out on RA patients in Serbia showed that the predictive values for suffering anxiety and fatigue were tied to the need for help and attention from other people as well as educational level.[31] A social gradient is observed in relation to the level of education of RA patients, with higher scores being observed in those with lower levels of education. Likewise, the lower class has the lowest quality of life, followed by the middle class. This has to do with the educational level and access to information regarding general and oral health, as well as the ability to understand instructions given by medical providers.[31] This can alter the ability to access health services, treatments, and programs offered by local institutions, especially for this particular population. These sociodemographic characteristics shape the way patients must address the disease process.[32] The lack of employment also makes the population in this study feel vulnerable in terms of their OHRQOL. This aspect concerns economic income and the possibility of having the resources to travel to the places where health care is provided. The degree of RA activity, quality of life, and functional capacity are mutually related to the work performance of the population studied. We found that the strongest association was with functional capacity.[33]

People who do not regularly exercise showed a higher prevalence of the OHRQOL impact compared to those who do exercise. This may be related to the fact that physical activity in RA patients improves the symptoms of the disease, which can influence general well-being and, in turn, be reflected in the perception of oral health and the possibility of self-care. A study conducted in Sweden resulted in a decrease in pain, an increase in quality of life, and greater self-efficacy in arthritis patients who participated in a supervised exercise and education program.[34]

As for people who have other systemic diseases such as diabetes, high blood pressure (HBP), and osteoporosis, the reported scores were similar to those who do not have any other systemic disease. This may be because the diseases are controlled at the time of consultation and treatment of RA, which changes the perception of oral health. In Chico's study, 59.0% of RA patients had HBP and in our study it was 32.2%.[35] In a study similar to this one, 95% of RA patients used non-biologic DMARDs and 20% used biologic ones. In the current study, the scores of patients on DMARDs were very similar to those not receiving DMARDs, since medication consumption controls RA symptoms, this could be reflected in the perception of both general and oral well-being.[36]

The OHIP-14 impact prevalence is similar in those with and without PD and only causes a slight variation in the severity of the impact. The impact on the OHRQOL perception is evident in those who have stage III and IV PD, in which the prevalence, extent, and severity result in worse scores in the OHRQOL. Similar results are reported in Jordanian adults with characteristics similar to the patients of this study.[37] Disease activity dictates the symptomatology exhibited by a patient and affects the measured blood indicators. The greater extent and severity of the OHIP-14 impact are reported in those experiencing high RA activity. Comparable results have been reported by other researchers.[38] When inquiring if the patients received alternative treatment — apart from the conventional one — such as homeopathy, bioenergetics, and natural treatments, among others, we found that only one person answered in the affirmative. People who answered in the negative reported the highest impact scores on the OHIP-14. These results corresponded with a study using complementary therapies in RA treatment and show how supportive treatments tend to improve a patient's perception of their quality of life.[39]

With regard to RA, self-perception variables such as swelling, joint pain, and morning stiffness produce a higher impact on OHRQOL. It is also evident that the variables associated with OHRQOL impact in RA patients are erosive RA and perceiving morning stiffness, both being risk factors.[38] Results were similar to those who reported fatigue and depression. In a study carried out on women with RA, the tendency was to be more vulnerable and less optimistic when the presence of daily pain was experienced.[27,40]

When comparing the different dimensions of OHIP-14, similar results are found in people with and without PD. Our findings identified the variables that are most correlated with the OHIP dimensions were age, number of teeth present, and periodontal bleeding. Out of these, the number of teeth has the highest and most significant correlations with all dimensions, showing an important biological gradient, meaning the lower the number of teeth, the greater the effect on the different dimensions. The previous results significantly differ from those of one study showing the effect of the different dimensions and global score of oral diseases and health-related quality exhibited by RA patients.[40] On the other hand, the more periodontal bleeding, the higher the impact on the dimensions of physical, psychological, social disability, and handicap. Also, the older the age, the higher the impact on physical and psychological disability in patients. Mühlberg's results are quite similar, demonstrating that RA patients showed a worse HRQOL than patients without RA, advocating for more intensive care of dental, medical, and psychological factors.[26]

As strengths of this research, it is important to mention the contribution it makes to the topic of oral health and quality of life in RA patients because few studies establish a relationship and comparison between these variables, which are crucial for the comprehensive treatment of people with this disease. We are aware that the use of non-probability sampling poses a limitation to our study since the results cannot be generalized as parametric estimates.

Follow-up studies are suggested to obtain information on changes over time and provide causality results to guide the comprehensive treatment of patients. Concerted efforts between rheumatologists and dentists in the management of oral health are recommended.

Considering the importance of studying the relationship between systemic conditions and oral health and their impact on quality of life, further research could identify other important aspects and determinants. For instance, studies should focus on joint disorders such as temporomandibular joint disorders in patients with PD and RA and their influence on the quality of life using qualitative and mixed methods approaches. Finally, studies focused on other oral manifestations of systemic diseases and mental health problems in patients with oral diseases could be useful in recognizing the impact of these pathologies on HRQOL and OHRQOL.

Conclusions

The findings of this study show the impact of oral health on a RA patient's quality of life. Differences regarding sociodemographic, clinical, and self-perception variables were found according to the prevalence, extent, and severity indicators of the OHIP-14. The dimensions with the greatest impact on the patient's quality of life were physical pain, psychological distress, and disability, both for patients with PD and for those without it. Multivariate models showed that some factors and conditions have more influence on the OHRQOL of these patients, for example, RA type and periodontal status are related to worse indicators. Based on these results, the establishment of epidemiological surveillance systems targeting oral health and systemic conditions could improve the monitoring of these patients and contribute to their general, social, and health well-being to help improve their quality of life.

Ethics approval and consent to participate

The protocol of this study was reviewed and approved by the Institutional Review Board at the Faculty of Dentistry of the University of Antioquia, Medellín, Colombia (Act 05-2016). Signed informed consent forms were collected prior to the initiation of the research study.

Data availability

The datasets generated and/or analyzed during the current study are available from the corresponding author on reasonable request.

Consent for publication

Not applicable.

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