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COMPARISON OF ORAL HEALTH CONDITIONS AND SALIVARY CHANGES IN PATIENTS WITH RHEUMATOID ARTHRITIS: A CROSS-SECTIONAL STUDY

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ABSTRACT

Aim: to evaluate the association of oral health conditions, caries index and salivary changes in patients with and without Rheumatoid Arthritis (RA) in an assisted population by the specialized component of pharmaceutical assistance. **Method:** In this study, 87 patients participated, of who 64 were in the test group (patients diagnosed with RA), and 23 patients in the control group (Patients without the disease). **Results:** Of the patients analyzed, a higher prevalence was observed of AR affecting adults over the age of 50, with predilection for the female sex. Of the patients analyzed, 59.4% reported a feeling of dry mouth, and the DMF-T (Decayed, missing and filled teeth) index was 22.86%. The reduction in salivary flow and buffering capacity of these patients was notable, contributing to factors for the appearance of caries. Based on the results revealed, RA was associated with aging and negative impact on the oral health conditions of these patients.

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INTRODUCTION

Rheumatoid Arthritis (RA) is an autoimmune disorder of a chronic inflammatory order, which generally affects the joints, causing deterioration of bone and cartilage. Normally it runs chronic course but with variable periods of remission and exacerbation (GOELDNER *et al.,* 2011). In spite of not having a defined cause, RA can be considered a public health question, since it already affects 1% of the world population. RA has a predilection for the female sex in a ratio of 3:1, and for ages between 20 and 60 years (SILVEIRA, 2006). Studies have demonstrated that individuals with RA have changes in functional capacity of the masticatory system (CARVALHO *et al.,* 2009; ABRÃO *et al.,* 2016). It is common for persons with this pathology to present orofacial lesions, which could frequently be neglected during an unprepared clinical conduct. The most common manifestations are temporomandibular dysfunction, periodontal disease, inflammatory myopathies, systemic sclerosis, Sjorgen syndrome, systemic emphysematous lupus and hyposalivation and/or xerostomia (ABRÃO *et al.,* 2016; BRAGA *et al.,* 2007). Xerostomia and/or hyposalivation become outstanding when these conditions are associated with the dental caries index. These situations are common in patients with RA, and could lead to a reduction in the salivary cleaning capacity of the individual, resulting in an increase in the dental biofilm index, thus favoring the appearance of caries lesions (CARVALHO *et al.,* 2009; ABRÃO *et al.,* 2016; SILVA *et al*., 2016). Saliva is a mixture of fluids composed of water and organic and inorganic molecules, secreted by the major and minor salivary glands. It has different indispensable functions for maintaining oral health, such as protection, guaranteeing lubrication of the mouth, washing and pellicle formation; buffering, with maintenance of the Hydrogen Ionic potential (pH) and neutralization of acidity; helps with starch, protein and lipid digestion. It has antimicrobial action, by generating antiviral and antifungal barriers (MOURA *et al.,* 2007). Saliva is an important factor in the integrity of the tooth, particularly in the demineralization and remineralization process and in maturation of the enamel. Therefore, maintaining its integrity is fundamental, because it could be considered the first line of

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defense of the oral cavity defense (FALCAO, 2013). The lack of dexterity of these patients is the essence of a deficient oral hygiene, and there greater bacterial plaque accumulation. There is a way to compensate the functional restriction by increasing the time and frequency of tooth brushing (cleaning). On the other hand, there is a higher plaque index in patients with RA, partly due to the lack of motivation of these patients, considering emotional factors and physical limitations due to upper limb motor impairment and involvement of the temporomandibular joints that make mouth opening difficult (LIMA, 2010). Lima (2010) reported that the dental clinical exam in patients with RA frequently revealed a large amount of dental caries, tooth losses, unsatisfactory tooth restorations and poor oral hygiene. In these cases, caries lesions are usually rampant and in unusual sites. Therefore, the aim of the present study was to evaluate the existence of association of the oral health condition, caries index and salivary changes in patients with and without rheumatoid arthritis.

MATERIALS AND METHODS

This was a cross-sectional study. The oral health condition of the patients who accepted participation in the study was examined at the Nucleus of Dental Studies of the "Faculdade Independente do Nordeste (FAINOR)" in Vitória da Conquista – Bahia, on a day previously scheduled with the patient, between the months of November, 2017 and June, 2018. The present study was approved by the Research Ethics Committee of the "Faculdade Independente do Nordeste (FAINOR)". Included in the study were patients who presented for the clinical evaluation, and those who signed the Term of Free and Informed Consent (TFIC) after having been informed about the content and purpose of the research. Excluded from the study were those who refused to sign the Term of Consent and refused to undergo the salivary test, clinical evaluation or those who did not respond to the questionnaire. A total of 87 participants were selected, with a mean age of 51 year. The study groups were composed in the following manner: 64 patients diagnosed with RA, attended at the Specialized Component of Pharmaceutical Assistance ("Componente Especializado da Assistência Farmacêutica -CEAF") at the pharmacy of a Regional Nucleus of Health of Bahia, who used both biological and non-biological Disease-modifying antirheumatic drugs (DMARDs) for treatment of the disease; and 23 patients for the Control Group, without diagnosis of RA disease.

Initially, the participants responded to a questionnaire with 16 questions, about self-perception of oral health. The data were transcribed and analyzed by unit, frequency and by central theme group by categories, in accordance with the proposal of Bardin in 1977. Afterwards, the clinical exams began, performed by a previously calibrated examiner and note-taker. As a mechanism of control, a maximum number of five exams were established per period of activity, to prevent fatigue from interfering in the results obtained. Intraexaminer agreement was verified before and during data collection, in the sense of checking whether the consistency obtained in training was maintained in the field. During the survey, agreement was achieved by practicing the exam in duplicate, in which the examiner re-examined around 10% of the sample. The individuals were initially submitted to the salivary flow test, and were instructed not to eat food, smoke and chew gum in the 2 hours preceding the test, so that there would be standardization of the samples collected. Saliva was quantitatively evaluated. For this purpose, individuals were instructed to spit into a beaker (10 ml) for five minutes, without making an effort to produce saliva. After collection a 5-minute rest was determined. Right after this, the patient was asked to chew a piece of dental floss (Hillo; Aperibé - RJ) for 1 minute, and then spit into another beaker (10 ml) made available, for another 4 minutes. For both groups, the dental caries index was evaluated in accordance with the codes and criteria recommended by the World Health Organization (WHO) 11 and adapted by the SB Brazil 2010 project, which expressed the sum of the decayed, missing and filled teeth (Table 1).

Table 1. Summary of Codes and Criteria for DMF-T

Codes (Permanent Teeth - Crown)	Condition
0	Healthy
1	Carious
2	Restored but with caries
3	Restored without caries
4	Lost due to caries
5	Lost due to other reasons
6	Presents sealant
7	Bridge or crown abutment
8	Not erupted - root not exposed
T	Trauma (fracture)
9	Tooth excluded

Source: SB Brasil 2010.

For this exam, an oral mirror (Golgran; São Caetano do Sul - SP) and WHO periodontal probe(Golgran; São Caetano do Sul - SP) were used. Before the exam, prophylaxis of all the teeth was performed, with prophylactic paste Prophy Care; Aparecida - SP) and Robinson brush (Preven; São Paulo - SP), in addition to drying the tooth surfaces with jets of air and gauze (Cremer; Blumenal - SC) with the purpose of facilitating the oral cavity exam performed. The data obtained in the clinical exam for evaluating the caries index were noted on specific charts according to the condition of the dental crown, to facilitate tabulation. After the values had been attributed, the arithmetic means were calculated, and according to the results, the dental caries history of the patients attended was evaluated. The mean value from 0.1 to 1.1 was considered very low prevalence; from 1.2 to 2.6 - low prevalence; from 2.7 to 4.4 - moderate prevalence; from 4.5 a 6.5 - high prevalence, and ≥ 6.6 - very high prevalence (CYPRIANO *et al*., 2005). After performing the clinical exams, evaluation of the salivary parameters proceeded in the laboratory. Initially the saliva was weighed and the volume produced by the patient, both for unstimulated and stimulated saliva, was established with the aid of a precision balance (Quimis; Diadema - SP). The pH, using a pH-meter (Quimis; Diadema - SP), and the temperature, using a thermometer (Quimis; Diadema - SP) of each sample was measured 3 consecutive times. After this drops of 35% HCl were deposited on the samples until their pH values were reduced by 1 point, for the purpose of verifying their buffering capacity.

The values obtained in these procedures were noted on a specific chart to facilitate tabulation. After performing all the above-mentioned tests, the samples that were collected were frozen by using Assay Buffer 13 (Enzo Life Sciences – Nova York). The descriptive statistic procedures were used to express the results as measures of central tendency (mean or median), dispersion (standard deviation - SD, or interquartile amplitude) and frequencies (relative and absolute).

Table 2. Comparison of sociodemographic characteristics between patients without RA and with RA

Variable	Without Rheumatoid Arthritis (n = 23)		With Rheumatoid Arthritis (n = 64)		p-value
	n	%	n	%	
Sex					
Male	3	13.0	10	15.6	1.000
Female	20	87.0	54	84.4	
Color/race					
Yellow/Brown	11	43.5	36	56.2	0.264
White	6	28.25	21	32.8	
Black	6	28.25	7	11.0	
Marital Status					
Married	10	43.5	37	57.8	0.488
Divorced/widowed	5	21.7	11	17.2	
Single	8	34.8	16	25.0	
Educational level					
≤ Complete Primary Schooling	17	73.9	41	64.0	0.547
≥ High/technical school	6	26.1	23	36.0	

* Fisher Exact Test, except for educational level, for which the chi-square test was used.

Table 3. Comparison of oral health conditions between patients without RA and with RA

Variable	Without Rheumatoid Arthritis		With Rheumatoid Arthritis	
	n	%	n	%
Oral health condition				
Extremely Poor	7	30.4	20	31.3
Regular	10	43.5	32	50.0
Good	6	26.1	12	18.8
p-value	0.770			
Bleeding gums				
Yes	10	43.5	23	37.1
No	13	56.5	39	62.9
†p-value	0.775			
Loose teeth				
Yes	8	34.8	15	25.9
No	15	65.2	43	74.1
†p-value	0.596			
Mouthwash use				
Yes	0	0.0	7	11.9
No	23	100.0	52	88.1
p-value	0.182			
Dry mouth				
Yes	6	26.1	38	59.4
No	17	73.9	26	40.6
†p-value	0.013			
Pain in and burning of tongue				
Yes	2	8.7	7	10.9
No	21	91.3	57	89.1
p-value	1.000			
Difficulty with swallowing foods				
Yes	2	8.7	17	26.6
No	21	91.3	47	73.4
†p-value	0.138			
Hoarse voice				
Yes	0	0.0	22	34.9
No	23	100.0	41	65.1
†p-value	0.003			
Sudden increase in caries/tooth losses				
Yes	9	39.1	25	45.5
No	14	60.9	30	54.5
†p-value	0.792			
Removable Prosthesis.				
Yes	7	30.4	38	59.4
No	16	69.6	26	40.6
†p-value	0.032			

*Exact Fisher Test †Chi Square test

The normality of data was tested by means of the Shapiro-Wilk and Kolmogorov-Smirnov tests. The frequencies were compared between the two groups (without rheumatoid arthritis and with rheumatoid arthritis) by means of the Chi-square or Exact Fisher tests (in the cases in which there was expected frequency below 5). The quantitative variables were compared between the groups using the Mann-Whitney test. The level of significance adopted was 5% ($p \leq 0.05$) and the analyses were made in the program IBM SPSS Statistics for Windows (IBM SPSS 21.0, 2012, Armonk, NY: IBM Corp.).

RESULTS

As shown in Table 2, both the Group with RA and the Group without RA showed predilection for the female sex, for color yellow/brown. The majority of the participants showed marital status of being married, and educational level of complete primary education. In comparison with the Control Group (*i.e.*, without rheumatoid arthritis), the Group with RA presented an older age (Figure 1A), as well as a higher monthly family income *per capita* (Figure 1B).

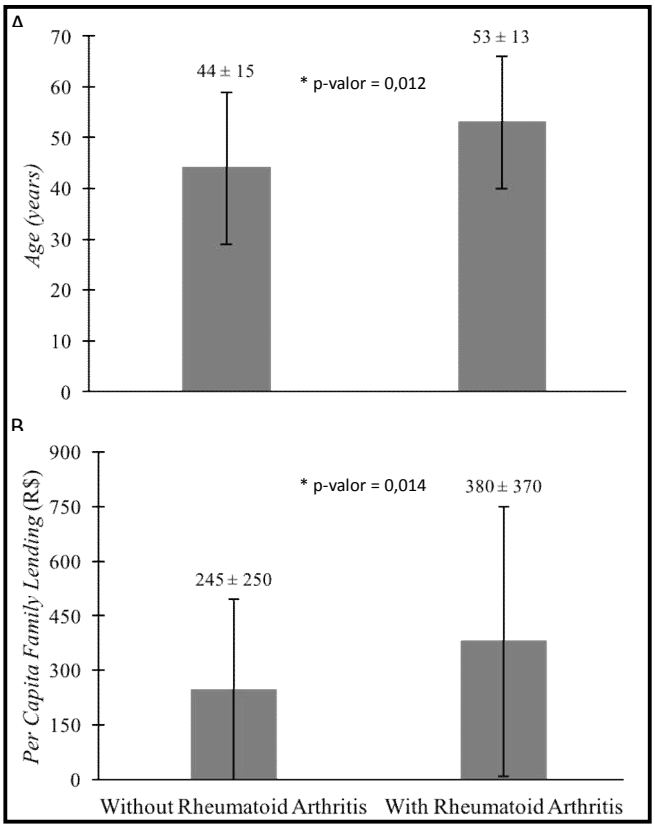

Figure 1. Comparison of age (A) and monthly family income (B) between patients without, and those with rheumatoid arthritis. Columns represent means, and error bars, the interquartile amplitudes. *Mann-Whitney Test

Table 4. Comparison of decayed, lost, filled teeth index between patients without and those with RA

Variable	Without Rheumatoid Arthritis		With Rheumatoid Arthritis		p-value
	Mean ± SD	%	Mean ± SD	%	
Condition of crowns					
Healthy	11.17 ± 5.69		8.27 ± 7.21		0.028
Carious	2.35 ± 3.01		1.48 ± 2.47		0.143
Restored but with caries	1.13 ± 1.82		0.83 ± 1.41		0.461
Restored without caries	4.52 ± 4.04		3.65 ± 5.38		0.125
Lost due to caries	7.87 ± 8.43		12.00 ± 11.69		0.263
Lost due to other reasons	1.87 ± 5.39		4.94 ± 10.10		0.578
Sealant	0.17 ± 0.65		0.63 ± 3.22		0.413
Bridge or crown abutment	0.00 ± 0.00		0.10 ± 0.56		0.394
Crown not erupted	0.00 ± 0.00		0.10 ± 0.64		0.394
Fracture or trauma	1.83 ± 3.08		0.22 ± 1.24		0.001
DMF-T composition					
Component D	3.48 ± 4.44	18.70	2.27 ± 2.73	9.93	0.271
Component M	10.83 ± 8.80	58.19	16.72 ± 11.15	73.14	0.030
Component F	4.30 ± 4.04	23.11	3.88 ± 5.59	16.97	0.170
Total DMF-T	18.61 ± 6.63	100.0	22.86 ± 8.02	100.0	0.011

SD: Standard Deviation; DMF-T/dmf-t: number of decayed, missing, lost/exfoliated and filled teeth *Mann-Whitney Test

Table 5. Comparison of the salivary patterns between patients without RA and with RA

Variable	Without Rheumatoid Arthritis	With Rheumatoid Arthritis	p-value
	Mean ± SD	Mean ± SD	
Unstimulated saliva			
Volume (ml)	3.72 ± 1.79	2.68 ± 1.33	0.199
Weight (g)	3.78 ± 1.92	2.42 ± 1.23	0.057
Temperature (°C)	23.74 ± 1.27	25.70 ± 1.79	< 0.001
pH	6.89 ± 0.79	7.08 ± 0.67	0.048
Stimulated saliva			
Volume (ml)	5.11 ± 4.28	5.01 ± 2.35	0.175
Weight (g)	5.11 ± 4.28	4.49 ± 2.15	0.982
Temperature (°C)	23.78 ± 1.24	25.96 ± 1.70	< 0.001
pH	7.29 ± 6.63	7.34 ± 0.67	0.984
Quantity of acid (1ml)†	0.019 ± 0.000	0.027 ± 0.015	0.017

SD = standard deviation * Mann-Whitney Test; † quantity of acid required for acidifying the saliva.

The results of the associations tested between the oral health condition and RA are presented in Table 3. The results indicated that patients with RA presented higher frequency of dry mouth feeling, difficulty with swallowing food, hoarse voice and use of removable dental prostheses when compared with patients of the Control Group. No significant difference was observed between the group with regard to self-evaluation of oral health, bleeding gums, loose teeth, use of mouth wash, pain in and burning of the tongue, and sudden increase in dental caries and/or tooth losses. Evaluation of the condition of crowns indicated that patients without RA had a higher number of healthy crowns, while those with the disease had a larger quantity of crowns with fractures or traumas. The mean DMF-T index between the patients without and with RA was 18.61 (SD = 6.63) and 22.86 (SD = 8.02), respectively. In the two groups there was predominance of the missing component, which represented 58% of the index in the individuals without rheumatoid arthritis, and 73% in those with the disease. The DMF-T index was higher among patients with RA, who presented a significantly higher number of missing teeth (Table 4). Analyses of the salivary parameters are shown in Table 5. The results for unstimulated saliva showed that the Group with RA had warmer and more basic saliva, with lower volume and weight in comparison with that of the Control Group. The stimulated saliva data indicated that the Group with RA presented higher temperatures and lower buffering capacity values (represented by the quantity of acid required to acidify the saliva), in comparison with the group without the disease. No significant difference in volume, weight and pH of stimulated saliva was observed between the groups.

DISCUSSION

According to Silva et al. (2018), is an auto-immune pathology, in which the peripheral articulations are compromised. In a similar manner, some authors have recently characterized RA by eruptions and remissions associated with pain, and in some cases, incapacitating joint deformities (ANDRADE *et al*., 2018; PAVESI *et al*., 2018; RODRIGUES *et al.,* 2019). Pereira *et al*. (2017), traced a sociodemographic profile of those afflicted with this disease, followed up at an outpatient-school of Rheumatology in Piaui. They observed that 90% of the patients were women. In a similar manner, in this study, it was possible to verify that there is interference of sex in RA, also showing a predilection for the female sex. Whereas, Louzada Jr *et al*. (2007) and Alamanos and Drosos (2005), affirmed that 1% of the adult population presented RA, with a trend towards higher prevalence with the increase in age. As observed in the present investigation, an association was noted between aging and RA. As regards quality of life, Rodrigues *et al.* 2019; and Silva et al. (2016) considered that patients with RA had various deficiencies. The authors associated this situation with both the medications that are used by these individuals, and by the very condition imposed (on them) by arthritis. These situations interfered directly in oral health of the person suffering from this clinical condition. Therefore, when approached and compared relative to oral conditions, the patients with RA mainly complained of a dry mouth feeling (59.4%). Ahola *et al*. (2015) analyzed the effects of rheumatic diseases on the oral symptoms, with a sample of 995 individuals (564 with RA and 431 as Control Group),showing evidence that the chief complaint of the Groups of analysis was the dry mouth feeling (19.6%) while in their Control Group only 2.9% presented this situation. In the study conducted by Torres et al. (2016) the dry mouth feeling was observed in 53.85 of the individuals analyzed; According to Lima (2010), the subjective feeling of dry mouth, also known as xerostomia, in the majority of cases, was considered a psychological expression (without pathology of the salivary glands). Bagatini *et al.* (2011) emphasized that medication with action on the central nervous system used by patients with RA, generally presented xerostomia as a side effect. Another important factor found in this study was the observation of high prevalence of hoarse voice(34.95%., According to Castro et al. (2012) this was due to the fact that RA may affect the larynx and cricothyroid joint (CTJ). In the latter, the mechanism (of action) occurs by a restriction of the joint function, fixing the unilateral or bilateral vocal fold by means of an ankylosis. Evidence of this association may be seen in this study, considering that no individual in the Control Group; that is, those without RA presented hoarseness (Table 3).

The authors pointed out that there was a strong relationship of the appearance of periodontal diseases (PD) in patients with RA, due to the prevalence of bacteria that favored the installation of these oral diseases. This fact is of concern, and may justify the high percentage of individuals in this research, who had lost their teeth (Abrão *et al*, 2016). In spite of this strong relationship between RA and PD, it was possible to suggest that dental caries also presented an important relationship with the loss of teeth of the individuals analyzed (Table 4). In his study, Lima (2010) was able to note an extensive association between RA and dental caries, loss of teeth and poor oral hygiene. In the same way, with the present results the important association between lack of saliva and caries could be observed. Since dental caries results from a process of accentuated dental demineralization, this is aggravated in these patients due to the low buffer capacity of their saliva (MACEDO, 2004; SOUZA, 2016; CRUZ *et al.*, 2013; LAINE *et al*., 2014). The reduction in salivary flow (hyposalivation) is considered a common disturbance in patients with autoimmune conditions, such as RA and as adverse effects caused by some medications (FALCÃO *et al*., 2013). For unstimulated saliva, the present study showed that the Group with RA had a reduction in salivary flow when compared with the Control Group (Table 5). Corroborating the findings of this study, Lima (2010) affirmed that the comorbidities that appear with aging and the medications used, were the main factors for reduction in salivary flow, particularly those that affect the immune system.

The buffer capacity of saliva is an important condition in resistance to dental caries, and the reduced salivary flow that is normally associated with a low buffer capacity of saliva may lead to greater susceptibility not only to dental caries but also to infections of the oral mucosa and periodontitis (BRETAS *et al*., 2008). In the present study, a reduced (saliva) buffer capacity of the patients with RA could be observed (Table 5), thus explaining he high caries index and lost teeth in this same group. In his study, Miguel (2006) recommended performing supervised therapies with fluorides, encouragementof oral hygiene and improvement in self-esteem with the purpose of compensating the low salivary flow, and low buffering capacity of saliva. In spite of the limitations of this study, it is valid to emphasize the relevance of this study to the day to day work in the dental office. This has become important so that a protocol can be defined for Rheumatologist physicians to refer patients to Dentists. The Rheumatologist/Dentist must be apt to diagnose the oral changes resulting from RA, and prepare an adequate treatment plan for these patients with the disease.

Based on these considerations, it is pertinent for this topic to continue being the focus of constant analysis and study.

Conclusion

Based on the results presented, it was possible to conclude that RA was associated with aging and economic conditions, seeing that the patients with this disease presented higher age and family income per capita. The results also showed negative impact on the oral health conditions, since patients with this pathology reported higher frequency of dry mouth feeling, hoarse voice, and use of removable dentures. In addition they presented a lower number of healthy crowns, higher number of crowns with fracture or trauma, higher number of missing teeth, and higher DMF-T index. Therefore, RA influences salivary function, change in parameters such as temperature, pH and buffer capacity, thus being one of the primordial factors for the appearance of dental caries.

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