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ORIGINAL ARTICLE

WILEY ORAL DISEASES

"Assessment of relationship between xerostomia and oral health-related quality of life in patients with rheumatoid arthritis"

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Objective: To determine the relationship between xerostomia and oral health-related quality of life in patients with rheumatoid arthritis.

Materials and Method: Two hundred patients with rheumatoid arthritis were assessed using Fox and OHIP-14 questionnaires concerning xerostomia and oral health-related quality of life, respectively. The sum of decayed, missing, and filled teeth (DMFT) was determined via an intra-oral examination. In addition, intergroup comparisons were evaluated using *t* test, chi-square, regression, and Tukey analysis.

Result: Among rheumatoid arthritis patients, 51% had been afflicted with xerostomia. We found a statistically significant relationship between xerostomia and oral health-related quality of life (*p*-value=.004), as xerostomia cases have significantly worse oral health-related quality of life. Also, there was a statistically significant association between oral health-related quality of life and gender as well as DMFT.

Conclusion: Because there seem to be a high prevalence of xerostomia in patients with rheumatoid arthritis, screening in such population is highly recommended. Therefore, educational programs and/or workshops should be encouraged among healthcare providers to prevent worsening of oral health-related quality of life.

KEYWORDS
OHRQoL, rheumatoid arthritis, xerostomia

1 | INTRODUCTION

Xerostomia is a subjective feeling of dry mouth. It is deemed as a prevalent but often neglected complaint. Patients with dry mouth showed symptoms that are commonly attributed to chronic diseases, medication use, and medical treatments, such as radiotherapy to the head and neck region (von Bültzinglöwen et al., 2007; Plemons, Al-Hashimi, & Marek, 2014; Porter, Scully, & Hegarty, 2004). Xerostomia can have a noxious effect on different aspects of oral function and quality of life by creating complications in chewing, swallowing, taste, and speech (Cassolato & Turnbull, 2003; Jensen & Vissink, 2014). Also, lack of lubrication has its own complications, for instance, reduced retention of denture and mucosal damage (Fox, 2008). Moreover, xerostomia is often found in patients with a considerable amount of caries, missing, and filled teeth (DMFT) (Ekström, Khosravani, Castagnola, & Messana, 2011; Villa, Connell, & Abati, 2015).

Rheumatoid arthritis (RA) is the most common inflammatory arthritis, affecting from 0.5 to 1% of the general population worldwide (Lee & Weinblatt, 2001), and xerostomia is a pervasive complaint in these patients (Aletaha et al., 2010; Silvestre-Rangil, Bagán, Silvestre, & Bagán, 2016). Approximately 50% of patients with RA suffer from xerostomia (Arneberg, Bjertness, Storhaug, Glennas, & Bjerkhoel, 1992; Zalewska, Waszkiewicz, Szajda, & Waszkiel, 2011). The consequence of RA on the physical, psychological, and social functioning

of the patient, which are important factors in the quality of life, has been documented (Ahola et al., 2015; Reisine & Tanzer, 1994; Silva et al., 2016). Studies have investigated the relation between RA and xerostomia and patients' quality of life (Cassolato & Turnbull, 2003; Eberhardt, Larsson, & Nived, 1993; Guobis, Baseviciene, Paipaliene, Niedzelskiene, & Januseviciūte, 2008).

To our knowledge, there is no prior data on the prevalence of xerostomia and its effects on RA patients in Iran. The purpose of our study was to determine the correlation between xerostomia and oral health-related quality of life in patients with rheumatoid arthritis in Iran.

2 | METHODS AND MATERIALS

Our study was approved by the "Ethics Committee" of Kerman University of Medical Sciences (code k/89/172). All participants read and signed our consent form.

This was a cross-sectional clinical study; patients were sequentially selected from the RA clinic at the Shafa Hospital in Kerman for a period of 3 months. All participants met the diagnostic criteria stablished by the American Association of Rheumatology in 1998.

Patients on any medication known to induce dry mouth (such as TCA in doses higher than 10 mg, antihistamine, anticholinergic drugs, diuretics, antipsychotics), a previous history of head and neck radiation, diabetes or sarcoidosis, patients without tendency to take part in such an investigation, patients who could not understand the questions correctly were not considered for the research.

The purpose of investigation was explained to the patients, and after getting a written consent, a questionnaire containing demographic characteristics, duration of RA, and patients' medication was completed. Patients' teeth were then examined with a mirror accompanied by an explorer, and the DMFT index was calculated. DMFT index is the sum of the decayed, missing, and filled teeth (D+M+F) (Zailai, Quadri, Nayeem, Inamdar, & Tadakamadla, 2014). Oral examination was carried out by an undergraduate dental student, with the supervision of an oral medicine specialist.

After the oral examination, Fox questionnaire—which contains nine questions related to xerostomia—was completed by the patients. If participants were illiterate or could not read for any reasons, an investigator would help the patients with the questions. The complaint of dryness while having a meal or of difficulty in swallowing dry food, or the need to sip liquids to aid in swallowing was the significant risk factor for salivary dysfunction (Zarei & Azma, 2008). Patients who had a positive response to at least one of the questions number 1, 2, 3, and 9 from nine questions of Fox questionnaire were deemed a xerostomic patient (Table 1).(Fox, Busch, & Baum, 1987; Zarei & Azma, 2008).

In addition to xerostomia, oral health-related quality of life (OHRQoL) was assessed by Oral Health Impact Profile-14 questionnaire (OHIP-14) (Navabi, Nakhaee, & Mirzadeh, 2010; Slade, 1997). Among oral-specific means, the OHIP is presently one of the most comprehensive measures of the impact of oral condition on health-related quality of life (Allen & McMillan, 1999; Nikbin, Bayani, Jenabian, & Motallebnejad, 2014; Slade & Spencer, 1994; Vikram & Singh, 2014). This questionnaire contains 14 questions and examines the effect of oral health on daily physical, psychological, and social behavior of people. Fourteen items of OHIP-14 are subdivided into seven domains: (i) Functional limitation, (ii) Physical discomfort (pain), (iii) Psychological discomfort, (iv) Physical disability, (v) Psychological disability, (vi) Social disability, (vii) Handicap. Our study assessed the relationship of xerostomia in each one of the seven domains of OHIP-14 questionnaire separately (Slade & Spencer, 1994).

TABLE 1 Fox questionnaire

1	Do you sip liquids to aid in swallowing dry food?
2	Does your mouth feel dry when eating a meal?
3	Do you have difficulties swallowing any food?
4	Does your mouth feel dry at nights or in the morning?
5	Does your mouth feel dry at other times of the day?
6	Do you keep a glass of water by your bed?
7	Do you chew gum daily to relieve oral dryness?
8	Do you use hard candies or mints daily to relieve oral dryness?
9	Does the amount of saliva in your mouth seem to be too little, too much or you don't notice it?

Validity and reliability of the original English version of OHIP have been evaluated in epidemiological and cross-cultural studies (Vikram & Singh, 2014). This instrument and Fox questionnaire have been translated to and validated in Persian language (Navabi et al., 2010; Zarei & Azma, 2008).

Statistical analysis was performed using SPSS. Patients with and without xerostomia were compared using *t* test, chi-square, and regression analysis. Linear regression from backward stepwise was used to evaluate the effects of independent variables (gender, age, duration of RA, taking medication, DMFT, and denture wearing) on OHRQoL.

3 | RESULTS

Among patients with RA, 200 persons took part in this study. Demographic characteristics and prevalence of xerostomia are shown in Table 2. The mean OHRQoL score in RA patients with and without xerostomia was 10.9 and 7.7, respectively, and the difference was statistically significant (Table 3).

Examination of patients' teeth showed that 51 were edentulous. The mean DMFT score of the remaining 149 patients was 14.9. Although the mean DMFT score of RA patients with xerostomia was slightly higher than RA patients without xerostomia (16.6 *vs* 15.7), the difference was not statistically significant ($p = .3$) (Table 3).

Using regression analysis, this study statistically revealed significant correlation between OHRQoL score and gender, DMFT, presence of xerostomia, and wearing dentures (Table 4). However, this study failed to show any relationship between OHRQoL score and patients' age.

Patients were divided into three groups based on the duration of their rheumatoid arthritis: <3 years, 3–7 years, and: >7 years.

TABLE 2 Demographic features of study population in two groups (with and without xerostomia)

		With xerostomia	Without xerostomia	Total	*p*-Value
Gender Frequency (percentage)	Female	86 (43.0%)	81 (40.5%)	167 (83.5%)	.998*
	Male	17 (8.5%)	16 (8.0%)	33 (16.5%)	
Age (year)	Mean ±*SD*	50.94 ± 15.25	49.04 ± 11.88	50.02 ± 13.72	.325▪
Duration of RA (month)	Mean ±*SD*	60.60 ± 80.61	64.06 ± 76.58	62.28 ± 74.41	.743▪

*Chi-square test.
▪*t* test.

TABLE 3 OHRQoL score and mean DMFT score of study population in two groups (with and without xerostomia)

	Frequency (percentage)	Mean ±*SD*	*p*-Value*
OHRQoL score:			
With xerostomia	103 (51.5%)	10.97 ± 8.81	**.004**
Without xerostomia	97 (48.5%)	7.72 ± 7.10	
Mean DMFT score:			
With xerostomia	103 (51.5%)	16.60 ± 6.57	.363
Without xerostomia	97 (48.5%)	15.79 ± 5.92	

**t* test.
*Bold letter refers to statistically significant values.

TABLE 4 Relation of OHRQoL score with gender, DMFT score, and xerostomia (by regression analysis)

	B(coefficient of regression)	*p*-Value
Gender	−3.336	.022*
DMFT score	0.442	.000
Xerostomia	2.963	.006
Denture wearing	−2.370	.027

*females had higher OHRQoL score.

Demographic features of the study are illustrated in Table 5. Statistical analysis showed that the frequency of xerostomia in these groups was not significantly different. However, there was a significant correlation between duration of RA and higher OHRQoL score (Table 6) but no significant relation between the duration of RA and DMFT score. (Table 7).

The association between xerostomia and the seven domains of OHIP-14 questionnaire was statistically significant in some domains including Functional limitation, Physical discomfort (pain), Physical disability, and Social disability. (Table 8).

4 | DISCUSSION

Our study demonstrated that there was a correlation between xerostomia and oral health-related quality of life (OHRQoL). Similar findings between xerostomia and OHRQoL have been previously reported in the general population (Enoki et al., 2014; Gerdin, Einarson, Jonsson, Aronsson, & Johansson, 2005; Hahnel, Schwarz, Zeman, Schäfer, & Behr, 2014; Locker, 2003; Monsarrat et al., 2014; Thomson, Lawrence, Broadbent, & Poulton, 2006; Zalewska et al., 2011).

The perception of xerostomia is subjective and is frequently considered as a psychological expression (Bergdahl & Bergdahl, 2001; Osailan, Pramanik, Shirlaw, Proctor, & Challacombe, 2012). In 2011, Zalewska concluded that objective measurements of saliva should be performed in RA patients (Zalewska et al., 2011). However, sometimes poor patient compliance with saliva collection makes it difficult to do the tests for saliva secretion rate. Several questionnaires have been used to diagnose xerostomia and hyposalivation. Fox questionnaire has been designed to assess the severity of dry mouth and predict true hyposalivation (Fox et al., 1987; Villa et al., 2015). In our study, we did a pilot study prior to the main study to determine the sample size. In the pilot to measure resting whole saliva, spitting method was used. Unfortunately, patients were found to be non-compliance with this method of saliva collection and we had to use questionnaire instead of objective measurements.

The current study, which was based on the Fox questionnaire, showed that 51.5% of patients with RA suffered from xerostomia. Other studies have found that 11.6% to 50% of RA patients were affected by xerostomia (Arneberg et al., 1992; Geterud et al., 1991; Guobis et al., 2008; Hsu et al., 2014; Reisine & Tanzer, 1994; Russell & Reisine, 1998). Various prevalence of xerostomia could emerge from a variety of factors such as target population, methodology, and diagnosis criteria. Nonetheless, the most common screening instrument is questionnaires (Gurrero et al., 2002; Sánchez-Guerrero et al., 2006).

It was shown that the severity of oral dryness is not necessarily related to a decrease in the flow rate of saliva (Fox et al., 1987). Based on our findings, xerostomia can affect OHRQoL and does not have significant relationship with DMFT as an adverse effect of real hyposalivation. These findings show that emotional aspects of xerostomia

TABLE 5 Demographic features of study population based on duration of rheumatoid arthritis

Duration of rheumatoid arthritis	Number (%)		Mean age (years.)			Number	
	Female	Male	Female	Male	All patients	With xerostomia	Without xerostomia
<3 years	56 (83.6%)	11 (16.4%)	54	47	53	35	32
3-7 years	59 (84.3%)	11 (15.7%)	51	58	52	37	33
>7 years	52 (82.5%)	11 (17.5%)	56	59	56	31	32

TABLE 6 OHRQoL scores based on duration of rheumatoid arthritis

Duration of rheumatoid arthritis		Number (%)	OHRQoL mean score (±*SD*)	*p*-value*	
1	<3 years	67 (%33.5)	9.08 (±7.47)	2	.26
				3	.57
2	3-7 years	70 (%35.0)	11.24 (±9.31)	1	.26
				3	**.03**
3	7 < years	63 (%31.5)	7.66 (±7.17)	1	.57
				2	**.03**

*Analysis of variance and Tukey post hoc test.
*Bold letters refer to statistically significant values.

TABLE 7 Mean DMFT score of patients who had teeth based on duration of rheumatoid arthritis

Duration of rheumatoid arthritis		Number of patients	DMFT (±*SD*)	*p*-value*	
1	<3 years	53	14.98 (±6.42)	2	.69
				3	.70
2	3-7 years	52	13.92 (±6.89)	1	.69
				3	.25
3	>7 years	44	16.07 (±6.63)	1	.70
				2	.25

*Analysis of variance and Tukey post hoc test.

may have an effect on OHRQoL in RA patients. In other words, clinical and psychological aspects of xerostomia on OHRQoL have to be considered together.

Next to the feeling of oral dryness—which appears to be the main complaint of xerostomia patients—difficulty in swallowing and speaking, suffering from burning mouth, increased thirst, loss of taste, unpleasant taste and odor, and sensitive teeth have also been reported (Fox, 2008; Guggenheimer & Moore, 2003).

Mastication is another aspect of OHRQoL. Many studies have focused on the number of teeth lost or replaced and their location in dental arch (Hsu et al., 2014; Kim et al., 2009; Larsson, 2010). Emami et al. showed that oral and general health may be harmed by missing teeth (Emami, de Souza, Kabawat, & Feine, 2013). Tramini et al. demonstrated that OHRQoL can be affected by the number of remaining teeth (Tramini, Montal, & Valcarcel, 2007). Our results support this notion, as statistical analysis showed that RA patients with dentures had better OHRQoL than high DMFT patients who had not replaced their missing teeth, especially in female patients. Thus, replacement of missed teeth can have positive effects on OHRQoL. (Table 4).

Chronic systemic diseases can affect patients' attitude toward their surroundings and health conditions such as xerostomia. Based on our results, women with RA suffer more from dental problems than men. This may be due to their hormonal difference as mentioned by others (Cutolo, Balleari, Giusti, Monachesi, & Accardo, 1986; Silman & Pearson, 2002).

In our study, RA patients were divided into three groups based on the duration of rheumatoid arthritis: <3 years, 3–7 years, and >7 years. Statistical analysis showed that the frequency of xerostomia in these

TABLE 8 The relation of seven domains of OHIP-14 questionnaire and xerostomia

Domains	Mean score ±*SD*		*p*-Value*
	With xerostomia	Without xerostomia	
Functional limitation	1.34 ± 1.47	0.95 ± 1.25	**.045**
Physical discomfort (pain)	2.43 ± 2.25	1.58 ± 1.52	**.002**
Psychological discomfort	1.60 ± 1.63	1.50 ± 1.65	.678
Physical disability	1.55 ± 1.93	0.79 ± 1.31	**.001**
Psychological disability	1.69 ± 2.04	1.47 ± 1.74	.406
Social disability	1.05 ± 1.67	0.63 ± 1.23	**.045**
Handicap	1.27 ± 2.17	0.76 ± 1.77	.071

**t* test.
*Bold letters refer to statistically significant values.

groups was not significantly different. Other research with similar assessment of RA was not found. Due to our results, there was a significant correlation between duration of RA >7 years and higher OHRQoL score (p = .027), but this study failed to show any correlation between duration <7 years and OHRQoL (p = .936) (Table 6). Also, there was no significant correlation between duration of RA and DMFT score (Table 7). These findings show that chronicity of xerostomia by itself can worsen OHRQoL.

Our study assessed the relation between xerostomia and seven domains of OHIP-14 questionnaire and showed that xerostomia often results in functional and physical problems for the patients, but with no significant physiological complications, as a consequence, the involved patients may ignore xerostomia. Xerostomia can affect oral health in RA patients because it is a common event in RA. Ignored xerostomia can lead to significant oral repercussions (Ghezzi, Lange, & Ship, 2000). The previous investigation showed that xerostomia in RA patients may be a forerunner of decline in quantity and quality of saliva and may be expression of impairment of the salivary immune system of the oral cavity (Zalewska et al., 2011, 2013).

Untreated xerostomia may significantly worsen patient's quality of life, so determining adequate treatment for xerostomia is essential (Guobis et al., 2008; Zalewska et al., 2011; Daniels, McNally, Matthews, Sketris, & Hayden, 2013; Jensen & Vissink, 2014; Silva et al., 2016). Owing to a lack of definitive treatment for xerostomia, symptomatic treatment, to prevent its side effects, is one of the most important therapeutic goals. Patients' awareness and education will be helpful to control xerostomia and improved OHRQoL.

In this study, all patients, who used drugs and suffered from serious adverse effect of dry mouth, were excluded. However, it was impractical to omit all the drugs with minor side effects of dry mouth. Xerogenic drugs worsen OHRQol in RA patients and the clinicians need to pay more attention to this. Thus, more awareness and education of healthcare providers and patients are necessary to improve oral health, minimized teeth loss, and other oral problems. An oral medicine specialist and/or oral medicine training program in Iran can play a critical role for better quality of life in such patients.

5 | CONCLUSION

We found a high prevalence of xerostomia among patients with RA in Iran. Xerostomia was associated with worse OHRQoL. Therefore, patients and healthcare providers should be aware of the consequences of xerostomia in oral health. Routine courses to patients and providers should be offered by oral medicine specialists, so as to prevent the effects of xerostomia in oral health-related quality of life and Quality of Life. In future studies in this population, we intend to measure saliva flow and try to measure resting whole saliva using methods other than spitting.

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

AUTHOR CONTRIBUTIONS

All authors have contributed equally to this work and have given their approval for the publication of the results.

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