

Prevalence and Association of Periodontal Disease among Rheumatoid Arthritis Patients in Qatar: A Cross Sectional Study

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Received date: February 28, 2014, Accepted date: March 29, 2014, Published date: April 05, 2014

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Abstract

Objective: The goal of this study was to examine the prevalence of periodontal disease among rheumatoid arthritis patients in Qatar, along with investigating the association between the two diseases.

Methods: A total of 92 participants (43 cases with rheumatoid arthritis and 49 controls without rheumatoid arthritis) were recruited from the outpatient rheumatology clinic at Hamad Medical Corporation in Doha, Qatar. The ACR/EULAR 2010 for the diagnosis criteria for rheumatoid arthritis were used to diagnose participants.

Results: The overall prevalence of periodontal disease was 73.9% (95% CI: 64.2 to 82.1). The percentage of periodontal disease was observed to be higher among the rheumatoid arthritis group compared to the non-rheumatoid arthritis group (76.7% vs 71.4%; p=0.562). Patients older than 50 years of age were significantly associated with an increased risk for periodontal disease [unadjusted OR=4.11; 95% CI (1.42, 11.43); p=0.009]. Having rheumatoid arthritis [unadjusted OR=1.32; 95% CI (0.52, 3.38); p=0.563], females [unadjusted OR=1.55; 95% CI (0.51, 4.74); p=0.437], rheumatoid disease duration more than 10 years [unadjusted OR= 1.33; 95% CI (0.32, 5.59); p=0.684], and body mass index of less than 30 [unadjusted OR=1.17; 95% CI (0.46, 3.01); p=0.740] were positively associated with an increased risk for periodontal disease.

Conclusions: This is the first study to assess periodontal disease among rheumatoid arthritis patients in Qatar. Future work might need to involve a larger, more representative sample.

Keywords: Periodontal disease; Gingivitis; Rheumatoid arthritis; Inflammation; Periodontitis; Prevalence; Qatar; Dry mouth; Epidemiology

Introduction

Rheumatoid arthritis (RA) is an autoimmune disease, associated with a chronic inflammatory status, and increased levels of cytokines which are implicated in the destruction of joints [1]. The disease can develop at any age but most often occurs in people between age 25 and 50, and is more common among women, with a worldwide prevalence rate of approximately 1% [2]. Periodontal disease (PD) is an infection of the tissue that surrounds and supports the tooth structure, resulting also in a chronic inflammatory status. The severe generalized form of periodontal disease has a global prevalence rate of 5%-15%. Several associations have been reported between PD and other diseases such as RA, hypertension, and diabetes [3].

Berthelot et al. [4] indicate that a significant association exists between these two common chronic inflammatory conditions, as both shares a similar pathological process. Abbas et al. [5] show that individuals at risk of developing RA are at the same time at risk of developing periodontitis, or vice versa. An Indian study, conducted on 70 participants, shows that patients with RA have higher incidence rates of periodontal disease related abnormalities, such as deep pockets, missing teeth, along with severe or moderate bone loss, when compared to controls [6].

A recent study shows that 62% and 52% of early and established RA patients, respectively, have severe periodontal disease, compared to 22% among healthy controls. While 16% and 32% of early and established RA patients, respectively had moderate periodontal disease, compared to 17% among healthy controls [7]. Other studies found individuals with RA to have more significant periodontitis compared to non-RA patients [8,9]. An Iraqi study showed that patients with RA are twice as likely to have periodontal disease in comparison to non-RA patients [5]. The aim of this cross sectional pilot study was to examine the prevalence of periodontal disease among rheumatoid arthritis patients in Qatar, along with investigating the association between the two diseases.

Methods

The study was conducted between December of 2012 and December of 2013, at Hamad Medical Corporation, Doha, Qatar, upon IRB approval (12186/12). A total of 92 individuals were recruited from the outpatient clinic at Hamad Medical Corporation, 43 patients with RA while 49 non-RA individuals who also don't have any

inflammatory rheumatic diseases were recruited as the control group. A waiver of a signed informed consent was filled out and approved by the patients before being examined by a rheumatologist and a periodontist in order to examine the status of their RA and PD, respectively. All oral examinations and measurements were done by the same periodontist.

The inclusion criteria for the RA group included subjects (a) meeting ACR/EULAR 2010 criteria for RA [10], and (b) willing to participate in the study. While for the non-RA group, it included subjects (a) with no diagnoses of RA or other inflammatory rheumatic diseases, and (b) willing to participate in the study. The exclusion criteria for the RA group excluded subjects that (a) are not able to tolerate any of the study procedures, (b) not fulfilling the ACR/EULAR 2010 criteria for RA, and (c) being diagnosed with diabetes I or II. While for the non-RA group, it excluded subjects who (a) are not able to tolerate any of the study procedures, and were (b) diagnosed with diabetes I or II.

Data collection instruments included a patient questionnaire which collected socio-demographic data along with anthropometric measurements, duration of rheumatoid arthritis and the presence of dry mouth and clinical examination by a rheumatologist based on ACR/EULAR 2010 criteria for RA, and a clinical oral examination by a periodontist using a calibrated periodontal probe and an intra-oral peri-apical radiographic X-ray. Periodontal disease was classified as mild, moderate and severe based on the 1999 International Workshop for a Classification of Periodontal Diseases and Conditions criteria [11].

Statistical analysis

Qualitative and quantitative data values were expressed as frequency along with percentage and mean \pm SD with median and range. Descriptive statistics were used to summarize demographic and all other clinical characteristics of the participants. The prevalence of PD among rheumatoid arthritis was estimated and presented along with 95% CI. Associations between two or more qualitative or categorical variables were assessed using chi-square test. For small cell frequencies, chi-square test with continuity correction factor or Fisher exact test was applied. Quantitative variables means between two independent groups were analyzed using unpaired 't' test.

The results were presented with the associated 95% confidence interval. Mann Whitney U test was applied for non-normal or skewed data. Univariate and multivariate logistic regression analysis were carried out to assess the association of various potential predictors and covariates such as such as age, gender, educational status, RA, BMI and rheumatoid disease duration with outcome variable PD. Logistic regression analysis results were presented in terms of odds ratio (OR) and associated 95% CI. Pictorial presentations of the key results were made using appropriate statistical graphs. A two-sided P value < 0.05 was considered to be statistically significant. All Statistical analyses were done using statistical packages SPSS 19.0 (SPSS Inc. Chicago, IL).

Results

During the study period, December 2012 to December of 2013, a total of 92 participants (43 patients with RA and 49 participants with non-RA) were recruited in the study. Among the participants; 43 (46.7%) were in the RA group and 49 (53.3%) were in the non-RA group. Mean age in the non-RA group was higher 48.82 ± 12.37 years compared to the RA group 45.88 ± 10.88 years (p=0.214). Similarly,

BMI was found to be higher among non-RA group compared to RA group $(31.98 \pm 5.69 \text{ vs. } 30.81 \pm 5.11; \text{ p}=307)$. The percentage of periodontal disease (PD) was observed to be higher among the RA group (33/43; 76.7%) compared to the non-RA group (35/49; 71.4%), however the difference was not statistically significant (p=0.562) as shown in Table 1.

	Periodontal Disease (n)	Percent Prevalence (95% CI)	P-value			
Overall	68/92	73.9 (64.2, 82.1)				
Rheumatoid arthritis						
Yes	33/43	76.7 (62.1, 87.0)	0.562			
No	35/49	71.4 (57.5, 82.2)				
Gender						
Male	12/18	66.7 (43.6, 83.9)	0.615			
Female	56/74	75.7 (64.7, 84.1)				
Age (years)						
<50 years	29/47	61.7 (47.4, 74.2)	0.006			
≥ 50 years	39/45	86.7 (73.5, 94.1)				
Education						
University and Graduate	38/55	69.1 (56.6, 80.2)	0.267			
High school	19/25	76.0 (56.3, 88.8)				
None	11/12	91.7 (62.5, 100)				
Rheumatoid arthritis disease duration						
≤ 10 years	17/23	73.9 (53.4, 88.7)	0.662			
>10 years	16/20	80 (57.8, 92.5)				
Body mass index (BMI)						
>30	37/51	72.5 (59.1, 83.6)	0.740			
≤ 30	31/41	75.6 (60.5, 86.4)				

Table 1: Prevalence of periodontal disease among rheumatoid arthritis

 group and non-rheumatoid arthritis group: demographics and other

 clinical characteristics

Table 1 portrays the prevalence of PD among RA, demographic and other clinical characteristics. The overall prevalence of PD was 73.9% (95% CI: 64.2, 82.1). The prevalence of PD among the RA group was 76.7% (33 of 43; 95% CI: 62.1%–87%) compared with 71.4% (35 of 49; 95% CI: 57.5%–82.2%) in the non-RA group. Significantly higher prevalence occurred among patients older than 50 years of age (86.7%; 95% CI: 73.5, 94.1) compared to patients less than 50 years of age (61.7%; 95% CI: 47.4, 74.2); p=0.006. Higher prevalence occurred in females (75.7%; 95% CI: 64.7, 84.1), rheumatoid disease duration more than 10 years (80%; 95% CI: 57.8, 92.5), and BMI less than 30 (75.6%; 95% CI: 60.5, 86.4), however, the differences between the groups did not achieve statistical significance (p>0.05). Higher education was inversely associated with PD. The sample size was small and confidence intervals were wide in the above statistical comparisons, suggesting that the study was underpowered to detect a difference

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which is quite obvious and expected as this study was designed as initial pilot study.

The results of logistic regression analysis testing for each predictive variable and its association with PD are presented in Table 2. The results were presented with odds ratio (OR) and associated 95% confidence interval (CI). Patients older than 50 years of age was significantly associated with an increased risk for PD [OR=4.11; 95% CI (1.42, 11.43); p=0.009]. Being RA [OR= 1.32; 95% CI (0.52, 3.38); p=0.563], females [OR= 1.55; 95% CI (0.51, 4.74); p=0.437], rheumatoid disease duration more than 10 years [OR= 1.33; 95% CI (0.32, 5.59); p=0.684], and BMI less than 30 [OR=1.17; 95% CI (0.46, 3.01); p=0.740] were positively associated with an increased risk for PD. In multivariable logistic regression analysis controlling for all other potential covariates such as age, gender, educational status, RA, BMI and rheumatoid disease duration, being higher age at diagnosis [adjusted OR=4.03; 95%CI (1.4, 11.5); p=0.008] remained significantly associated with PD.

	Percent of PD	Odds ratio (OR)	95% CI for OR	P-value			
Rheumatoid arthritis							
No	71.4	1.0 (reference)	0 52 2 29	0.563			
Yes	76.7	1.32	0.52, 5.56				
Gender							
Male	66.7	1.0 (reference)	0 51 4 74	0.437			
Female	75.7	1.55	0.51, 4.74				
Age (years)							
< 50 years	61.7	1.0 (reference)	1 40 11 40	0.009			
≥ 50 years	86.7	4.03	1.42, 11.43				
Education							
University and Graduate	69.1	1.0 (reference)	0.48, 4.18	0.528 0.142			
High School	76.0	1.42					
None	91.7	4.92	0.00, 41.22				
Rheumatoid disease duration							
≤ 10 years	73.9	1.0 (reference)	0.24 5 69	0.648			
> 10 years	80.0	1.28	0.54, 5.00				
Body mass index (BMI)							
> 30	72.5	1.0 (reference)	0.46.3.01	0.740			
≤ 30	75.6	1.17	0.40, 5.01				

Table 2: Association of various predictors with periodontal disease among rheumatoid arthritis: Logistic regression analysis

Discussion

While other studies [5-9] support the notion of a higher periodontal disease involvement in RA patients; our study did not show a significant difference between RA patients and non-RA patients, but without doubt shows a very high prevalence rate among both RA patients and the general population, when compared to the aforementioned studies. Significantly higher prevalence occurred among patients older than 50 years of age (86.7%) compared to

patients less than 50 years of age (61.7%), p=0.006. Higher prevalence occurred in females, rheumatoid disease duration more than 10 years, and BMI less than 30, however, the differences between the groups did not achieve statistical significance (p>0.05). Higher education was positively associated with reduced PD. The sample size was small and confidence intervals were wide in the above statistical comparisons, suggesting that the study was underpowered to detect a difference which is quite obvious and expected as this study was designed as initial pilot study (Figure 1).



Among our sample, the majority of the RA group had localized 57.6%) and moderate (57.5%) periodontal disease vs. generalized

(57.6%) and moderate (57.5%) periodontal disease vs. generalized (57.1%) and moderate (65.7%) periodontal disease for the non RA group. In regards to gingivitis, there was a significant difference between the groups regarding the prevalence (p=0.027) as more controls (93.3%) and (6.7%) had localized and generalized gingivitis, respectively; compared to the RA group which had (55.6%) and (44.4%) for the localized and generalized gingivitis, respectively.

When looking at the RA group alone; (37%) had dry mouth, while (47%) had disease duration of ten years or more. While (73.9%) of those with a disease duration of less than 10 years had periodontal disease compared to (80%) of those with a disease duration of ten years or more. The latter group also had more localized periodontal disease (55.0% vs. 34.8%), but lower prevalence of generalized periodontal disease (25.0% vs. 39.1%). On the other hand, those with disease duration of less than ten years had a higher prevalence of localized gingivitis (17.4% vs. 5.0%) and a lower prevalence of generalized gingivitis (8.7% vs. 10.0%). In regards to periodontal disease severity, those with a disease duration of more than ten years had higher prevalence of mild periodontal disease (35.0% vs. 26.1%), but lower prevalence of moderate periodontal disease (40.0% vs. 47.9%) when compared to those with a disease duration of less than ten years.

Moreover, when comparing those with RA based on the presence of dry mouth, (90.9%) of those with dry mouth had periodontal disease compared to (71.9%) among those without dry mouth. Further comparisons of patients with and without dry mouth are shown in Table 3.

Disease duration also seems not to be an influencing factor among our sample of rheumatoid arthritis patients as no significant difference was found between those with less than ten years of disease and those with more than ten years. This also applies to the prevalence of

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gingivitis, both localized and generalized. This comes in disagreement with other studies which found that periodontal disease severity coincides with RA disease activity [12-14]. As for the existence of dry mouth, this also seems not to play a role in influencing periodontal disease parameters in our study, unlike Antoniazzi et al. study which found dry mouth to negatively impact periodontal and gingival conditions among patients with Sjogren's syndrome [15].

	Dry Mouth / RA group		p-value			
	Yes	No				
	(n=11)	(n=32)				
Periodontal Disease						
Yes	10 (90.9%)	23 (71.9%)	0.197			
No	1 (9.1%)	9 (28.1%)				
PD Area						
N/A	1 (9.1%)	9 (28.1%)	0.263			
Localized	7 (63.6%)	12 (37.5%)				
Generalized	3 (27.3%)	11 (34.4%)				
PD Severity						
N/A	1 (9.1%)	9 (28.1%)	0.403			
Mild	3 (27.3%)	10 (31.3%)				
Moderate	7 (63.6%)	12 (37.5%)				
Severe	0 (0%)	1 (3.1%)				
Gingivitis						
N/A	10 (90.9%)	24 (75.0%)	0.371			
Yes	0 (0%)	5 (15.6%)				
No	1 (9.1%)	3 (9.4%)				

Table 3: Periodontal disease and gingivitis among RA group based on presence of dry mouth

Several limitations to our study do exist. First, smoking was not taken into consideration as a confounding factor, thus, its role remains undetermined among our sample, whether among RA or non-RA participants. However, the results of a recent study conducted on nonsmoking RA patients showed a significantly higher prevalence and association of periodontal disease among non-smoking RA patients compared to controls [16]. Second, based on the study design, it wouldn't be possible to ascertain any causal relationship between RA and PD.

Third, the sample size was too small to aid in detecting any significant differences between the groups. Fourth, the non-RA group seems to be non-representative of the general population, as the prevalence of periodontal disease among this group was above any average prevalence rate reported in the literature, such as the National Health and Nutrition Examination Survey (NHANES) which reports a periodontal disease prevalence rate of 47.2% among the general population in the USA, over the age of 30 [17].

Conclusion

This is the first study to shed the light on the prevalence and association of periodontal disease among rheumatoid arthritis patients and the general population in Qatar. Further investigation into the topic would be necessary conducting prospective longitudinal studies using a larger sample size with a more representative sample of the general population in order to clarify the temporal relationship between PD and RA. Environmental and other risk factors influencing the risk for the development of RA should also be examined in the future with regard to their relationship to PD and RA. It would also be necessary for rheumatologists and dentists to collaborate and maintain an ongoing relationship in order to monitor and manage any progression of symptoms.

Acknowledgments

This work has been supported by a grant (12186/12) from the Medical Research Center of Hamad Medical Corporation, Doha, Qatar.

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Citation: Hammoudeh M, Al-Momani A, Abdelrahman MH, Chandra P, Hammoudeh S (2014) Prevalence and Association of Periodontal Disease among Rheumatoid Arthritis Patients in Qatar: A Cross Sectional Study. Intern Med 4: 149. doi:10.4172/2165-8048.1000149

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