



Original Article

Cardiovascular comorbidities of rheumatoid arthritis in Taiwanese adults: A retrospective single-center study

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ABSTRACT

Objective: To evaluate the association between rheumatoid arthritis (RA) and cardiovascular comorbidities, including hyperlipidemia, hypertension, and diabetes, in Taiwanese patients based on the data from medical records. **Materials and Methods:** A retrospective study was performed using the computerized medical records from a regional hospital located in southern Taiwan. A total of 2293 patients (age range 30–79 years) with a diagnosis of RA (International Classification of Diseases, Ninth Revision, Clinical Modification code 714.0) treated since the opening of the study hospital in July 2000 until February 2013 were included. The RA cases were frequency matched for age and sex with 9172 patients without RA. The associations of RA with hyperlipidemia, hypertension, and diabetes were evaluated using multiple logistic regression analysis. **Results:** Significant associations between RA and hyperlipidemia (adjusted odds ratio [OR] = 2.05, 95% confidence interval [CI] = 1.77–2.38, $P < 0.001$) and hypertension (adjusted OR = 2.76, 95% CI = 2.43–3.14, $P < 0.001$) were observed. However, diabetes was not significantly associated with RA in either male or female patients. **Conclusion:** Findings from this retrospective medical record study indicated that hyperlipidemia and hypertension were significant cardiovascular comorbidities of RA.

KEYWORDS: *Hyperlipidemias, Hypertension, Medical records, Rheumatoid arthritis*

INTRODUCTION

Rheumatoid arthritis (RA), the most common type of inflammatory arthritis, is a debilitating disease characterized by joint pain and impaired functionality. An increased risk for cardiovascular disease in patients with RA has been well recognized, and cardiovascular events are important causes of mortality and morbidity in patients with RA [1]. Nevertheless, the association between cardiovascular comorbidities and RA remains elusive. Hypertension appears to be common in patients with RA [2]. However, a meta-analysis of seven studies revealed that the prevalence of hypertension was similar between patients with RA and controls. The prevalence of diabetes mellitus was increased in RA (odds ratio [OR] = 1.74, $P = 0.003$), but the prevalence of hypercholesterolemia was not significantly different between patients with RA and controls [3]. In fact, there is conflicting evidence on the prevalence of hyperlipidemia in patients with RA. Some studies demonstrated higher levels of cholesterol [4], whereas others found decreased levels of cholesterol in patients with RA [5]. Findings from the US Nurses' Health Study showed that, although there was a significant 2-fold increase in the risk of myocardial infarction in women with RA compared with those without, the proportion

of hypertension (34% vs. 30%), hypercholesterolemia (35% vs. 33%), and diabetes (4.7% vs. 4.9%) was similar between these two groups [6]. Other studies have indicated that traditional cardiovascular risk factors are important predictors of atherosclerosis in patients with RA [7]. These studies have mainly focused on the changes of disease risk in patients with RA. However, few studies have investigated the risk of RA in patients with cardiovascular comorbidities. In particular, relatively little is known about these associations in the Taiwanese population. Therefore, the aim of this study was to evaluate the association between RA and cardiovascular comorbidities, including hyperlipidemia, hypertension, and diabetes, in Taiwanese patients based on the data extracted from medical records.

MATERIALS AND METHODS

This study used a case-control study design based on data retrieved from computerized medical records in a regional


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hospital in southern Taiwan. A total of 2293 patients (age range 30–79 years) with a diagnosis of RA (International Classification of Diseases, Ninth Revision, Clinical Modification [ICD-9-CM] code 714.0) and 9172 patients without RA, frequency matched on 10-year age intervals and sex (a case–control ratio of 1:4), treated since the opening of the study hospital in July 2000 until February 2013, were included. Diagnoses of hypertension (ICD-9-CM codes 401.0, 401.1, 401.9), hyperlipidemia (ICD-9-CM codes 272.0, 272.2, 272.4, 272.9), and diabetes (ICD-9-CM code 250.x) in both the cases and controls were assessed. The associations of RA with hyperlipidemia, hypertension, and diabetes were evaluated using multiple logistic regression analysis adjusted for age. All statistical analyses were conducted using the IBM SPSS statistics software package, version 23.0 (IBM Corp., Armonk, NY, USA).

The study protocol was reviewed and approved by the institutional review board of the Dalin Tzu Chi Hospital, Buddhist Tzu Chi Medical Foundation (no. B10304017).

RESULTS

Significantly higher proportions of cardiovascular comorbidities, including hyperlipidemia, hypertension, and diabetes, were observed in the patients with RA compared with controls [Table 1]. Table 2 summarizes the results of the multiple logistic regression analyses of RA in patients with hyperlipidemia, hypertension, and diabetes. RA was significantly associated with hyperlipidemia (adjusted OR = 2.05, $P < 0.001$) and hypertension (adjusted OR = 2.76, $P < 0.001$). Both male and female patients showed a similar

pattern of association. While diabetes was significantly and inversely associated with RA when both sexes were analyzed together (adjusted OR = 0.83, $P = 0.027$), it was no longer an independent significant factor when males and females were analyzed separately.

DISCUSSION

In this retrospective study, RA was significantly associated with hyperlipidemia and hypertension. These findings are consistent with a recent secondary population-based cross-sectional study of a Japanese health insurance database in which the OR of RA for hyperlipidemia was 3.21 (95% confidence interval [CI] = 2.89–3.56) and for hypertension was 3.12 (95% CI = 2.83–3.44) [8]. Another study of a community-based cohort of patients with RA also reported that cardiovascular diseases, including hypertension, were a prevalent comorbid condition (16% of patients) among patients at RA diagnosis [9]. In addition, a study of 1460 recently diagnosed patients with RA in the United Kingdom showed that hypertension was the most common comorbidity at baseline (standardized incidence ratio = 1.61, 95% CI = 1.43–1.79) [10].

Although it is plausible that chronic low-grade inflammation in patients with diabetes may contribute to the development of RA [11,12], the results from two large cohort studies did not find evidence of an association between diabetes and RA [6,13]. Our study also did not find a significant association between diabetes and RA. Additional studies are required to elucidate the connection between diabetes and RA.

Findings from this study need to be weighed within the confines of the limitations of our data source. First, variables such as cigarette smoking and family history were not available in our data source. Nevertheless, when the data were analyzed with stratification by sex, similar associations were found in both male and female patients, even though the prevalence of smoking is generally below 5% in females, compared with over 45% in males, in Taiwan [14]. Therefore, the observed significant associations in RA should not be the result of the differences in smoking between male and female patients. In our study, based on the 1445 patients with available data on smoking status, the prevalence of current and ever smoking in males and females was 42.6% and 1.5%, respectively. Second, the data source of this study came from a single hospital, and loss to follow-up as a result of patients switching health-care providers is possible.

CONCLUSION

This medical record-based study indicated that hyperlipidemia and hypertension were two cardiovascular comorbidities that were significantly associated with RA. These findings support further evaluation of whether the use of more aggressive blood lipid management strategies can reduce the risk of developing RA.

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Table 1: Characteristics of patients with rheumatoid arthritis and frequency-matched controls (n=11,465)

Variable	n (%) [†]			P
	Total 11,465 (100.0)	Patients with rheumatoid arthritis 2293 (20.0)	Controls 9172 (80.0)	
Sex				
Male	2495 (21.8)	499 (21.8)	1996 (21.8)	>0.999
Female	8970 (78.2)	1794 (78.2)	7176 (78.2)	
Age category (years)				
30-39	660 (5.8)	132 (5.8)	528 (5.8)	0.993
40-49	1655 (14.4)	331 (14.4)	1324 (14.4)	
50-59	3055 (26.6)	611 (26.6)	2444 (26.6)	
60-69	3368 (29.4)	666 (29.0)	2702 (29.5)	
70-79	2727 (23.8)	553 (24.1)	2174 (23.7)	
Hyperlipidemia				
Yes	1106 (9.6)	417 (18.2)	689 (7.5)	<0.001
No	10,359 (90.4)	1876 (81.8)	8483 (92.5)	
Hypertension				
Yes	1694 (14.8)	636 (27.7)	1058 (11.5)	<0.001
No	9771 (85.2)	1657 (72.3)	8114 (88.5)	
Diabetes				
Yes	1079 (9.4)	283 (12.3)	796 (8.7)	<0.001
No	10,386 (90.6)	2010 (87.7)	8376 (91.3)	

[†]Percentages are column percentages except in the header row where they are row percentages

Table 2: Multiple logistic regression analyses of the association between cardiovascular comorbidities and rheumatoid arthritis (n=11,465)

Variable	Total		Male		Female	
	Adjusted OR (95% CI)	P	Adjusted OR (95% CI)	P	Adjusted OR (95% CI)	P
Hyperlipidemia	2.05 (1.77-2.38)	<0.001	1.77 (1.31-2.38)	<0.001	2.15 (1.82-2.55)	<0.001
Hypertension	2.76 (2.43-3.14)	<0.001	2.61 (2.02-3.36)	<0.001	2.81 (2.42-3.26)	<0.001
Diabetes	0.83 (0.70-0.98)	0.027	0.75 (0.54-1.04)	0.078	0.86 (0.71-1.04)	0.129

ORs were simultaneously adjusted for hypertension, diabetes, hyperlipidemia, and age. ORs: Odds ratios, CI: Confidence interval

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Conflicts of interest

There are no conflicts of interest.

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