Available online on 15.09.2023 at http://jddtonline.info

Journal of Drug Delivery and Therapeutics

Open Access to Pharmaceutical and Medical Research

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Research Article

Assessment of rheumatoid arthritis and associated risk factors among patients attending Kibungo level two teaching hospital

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Article Info:

Article History:

Received 09 July 2023
Reviewed 13 Aug 2023
Accepted 27 Aug 2023
Published 15 Sep 2023

Cite this article as:

Munezero PC, Mukiza P, Mutijima JB, Kankindi J, Nshimiyimana A, Ishimwe AP, Tuyishimire JD, Sinumvayo JP, Ndayambaje FX, Ndacyayisenga J, Assessment of rheumatoid arthritis and associated risk factors among patients attending Kibungo level two teaching hospital, Journal of Drug Delivery and Therapeutics. 2023; 13(9):119-124

DOI: http://dx.doi.org/10.22270/jddt.v13i9.5962

Abstract

Rheumatoid arthritis (RA) is a chronic autoimmune disease that primarily affects the joints, but can affect other parts of the body causing inflammation, pain, stiffness, and joint damage. It affects approximately 1% of the global population. The objectives of this study were to assess the prevalence of rheumatoid arthritis and risk factors associated with rheumatoid arthritis among patients attending Kibungo level two teaching hospital. The retrospective study extracted data from January, 2018 to January 2023 and the cross-sectional part assessed risk factors associated to rheumatoid arthritis using questionnaire by telephone calls. Data collected were analyzed statistically using SPSS version 25. In this study the prevalence of rheumatoid arthritis was 43.20%. Across sex, females were more affected than males (44.2% and 40.0%, respectively). Binary logistic regression was used to assess the association between RA and risk factors. Age groups, C-Reactive Protein, red meat consumption showed significant association with RA (OR = 1.566, p = 0.008; OR = 1.299, p = 0.013; OR = 2.599, p < 0.001). The study was limited since it only included the participants at Kibungo Level two Teaching hospital, hence not having large population. Carrying out country wide studies regarding to the rheumatoid arthritis and associated risk factors on large population in order to establish epidemiologic data in Rwanda is highly recommended.

Keywords: Rheumatoid arthritis, risk factors, C-Reactive Protein, Rheumatoid Factor

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BACKGROUND

Rheumatoid arthritis (RA) is a chronic autoimmune disease that primarily affects the joints, but can affect other parts of the body causing inflammation, pain, stiffness, and joint damage. Diagnosing and managing RA involves clinical evaluation by a rheumatologist, as well as several different laboratory tests that require blood work. It affects approximately 1% of the global population and is more common in women than men. The exact cause of RA is unknown, but it is believed to result from a combination of genetic and environmental factors [1].

An estimated 1.9 million people, about 0.6% of the US population, have RA. Women have a higher prevalence than men, with a female-to-male ratio of about 3:1. RA in women tends to initially be diagnosed between the ages of 30 and 60, while men tend to be diagnosed in their 60s or later. Overall, RA is present in about 1.3 million older adults (2% of people over 60 years of age), with most of those individuals being women over the age of 70. Disease activity and functional status tends to be worse among African Americans and Hispanics than in non-Hispanic whites [2].

Annual incidence of RA has been reported to be approximately 0.5 per 1000 people per year in United States. A prevalence of rheumatoid arthritis (RA) of 1-2% is reported and the epidemiology differs depending on ethnic and geographic distribution. Greater prevalence has been reported in certain indigenous population [3]. Epidemiologic variations in incidence and prevalence of RA have been observed with a general decreasing trend in incidence over the years reported by several investigators. Conversely, prevalence estimates of rheumatoid arthritis have been observed to be increasing by other researchers, with a suggestion that this phenomenon may be secondary to increased survival of RA patients [4].

In Rwanda, no studies regarding rheumatoid arthritis were carried out. Although different researches reported on this disease. RA is an emerging health concern, and there is a need to understand its prevalence and associated risk factors. Kibungo Level two Teaching Hospital serves as a major healthcare facility in the Eastern province, and therefore, it is

essential to assess the prevalence of RA and its associated risk factors among patients attending this hospital. This study aimed to assess the prevalence of RA and associated risk factors among patients attending Kibungo Level two Teaching Hospital.

MATERIAL AND METHODS

Study area

This study was conducted at Kibungo Level two Teaching Hospital (KLTH), in the laboratory and out patients (OPD) departments. This hospital is located in Kibungo sector, Ngoma district, Eastern Province, Rwanda.

Study design

This study was retrospective and cross-sectional which focused on assessment of rheumatoid arthritis and associated risk factors at KLTH. The study periods were from January 2018 to January 2023. Data were collected from patients' medical record files, OPD system and through phone calls.

Study population and inclusion criteria

Patients who attended KLTH and OPD during the study period constituted the study population. Only those who had more than two joints' pain and diagnosed for both rheumatoid arthritis and CRP at KLTH during the period of the study were included in this study regardless their age or sex.

Sample size

The total number of 199 patients diagnosed for Rheumatoid factor and CRP from 2018 to 2023 was considered for this study.

Ethical consideration

Approvals to conduct the study were obtained from KLTH and INES Ruhengeri ethical committees. Verbal consents were obtained from the study participants. The information of patients was kept with high confidentiality.

Data collection

Demographic and clinical characteristics data were collected retrospectively from patients' medical files and out patients' consultation service, other risk factors were collected from the same participants using a structured questionnaire through phone call.

Statistical analysis

Statistical package for the social sciences (SPSS) was used for data analysis. Frequencies were determined the prevalence of the rheumatoid arthritis. Binary logistic regression test was used to assess association between different variables and a p-value less than 0.05 was considered statistically significant.

RESULTS

Demographics and clinical characteristics of the study population

In this study, demographics and clinical characteristics of the study population were established in order to characterize the population. Table 1 summarizes demographics and clinical characteristics of the study participants. The mean age of the study participants was 53.58 (SD = ±17.5) years old. Females were dominant at a proportion of 77.4% of the participants, while males were 22.6%. Most of the study population were in range of 51-70 (32.30%) followed by 31-50 years (30.2%), >70 years (16.6%) and the least presented group was <31 years (11.1%). Regarding to body mass index, most participants were healthy weight (62.8%) followed by overweight (22.6%), obesity (10.1%) and underweight (4.5%). According to C-reactive protein, 104(52.3%) were positive, while 95(47.7%) were negative.

Table 1: Demographic and clinical characteristics of the study population (n = 199).

Characteristics	Frequency	Percentage (%)
Age at diagnosis	53.58(mean)	17.5(SD)
Age groups		
<31	22	11.1
[31-50]	60	30.2
[51-70]	84	42.2
>70	33	16.6
Sex		
Female	154	77.4
Male	45	22.6
Body Mass Index		
Underweight	9	4.5
Healthy weight	125	62.8
Overweight	45	22.6
Obesity	20	10.1
C-Reactive Protein		
Negative	95	47.7
Positive	104	52.3

SD: Standard Deviation

Prevalence of Rheumatoid Arthritis

The prevalence of rheumatoid arthritis was determined. Results showed that among 199 participants, the overall prevalence of rheumatoid arthritis was 43.2%. Across the sex, rheumatoid arthritis was more prevalent in females (44.2%) than in males (40%). More than half (60%) of participants aged above 70 years old had rheumatoid arthritis followed by the age groups of 51-70 and 31-50 years (45.2% and 36.7%, respectively). The lowest prevalence (27.3%) was found in the youngest age group (<31 years olds) (Table 2).

Table 2: Prevalence of Rheumatoid arthritis according to age and gender (n = 199).

Characteristics		n	Rheumatoid Arthritis prevalence	
			Negative	Positive
			n (%)	n (%)
Overall		199	113(56.80)	86(43.20)
Age groups				
	<31	22	16 (72.7)	6 (27.3)
	[31-50]	60	38(63.3)	22(36.7)
	[51-70]	84	46(54.8)	38(45.2)
	>70	33	13(39.4)	20(60.6)
Sex				
	Female	154	86(55.8)	68(44.2)
	Male	45	27(60.0)	18(40.0)

Risk factors associated with rheumatoid arthritis among study participants

The risk factors associated with rheumatoid arthritis among patients attending KLTH during the study period were assessed. According to demographic and clinical characteristics, results showed that the age groups and CRP were significant predictors of RA (OR = 1.566, p = 0.008 and OR = 1.299, p = 0.013), while the body mass index was a non-significant predictor of RA (OR = 0.921, p = 0.684). Sex was not significantly associated with RA (OR = 1.176, p=0.645) (Table 3).

Table 3:Association of RA with demographic and clinical characteristics (n = 199).

Characteristics	OR	p-value	95% C.I.	
			Lower	Upper
Sex	1.176	0.645	0.589	2.346
Age groups	1.566	0.008	1.122	2.188
Body Mass Index	0.921	0.684	0.619	1.370
C-Reactive Protein	1.299	0.013	0.545	1.722

OR: Odds ratio; **C.I:** Confidence Interval

Binary logistic regression was used to assess the relation between risk factors and RA. Results showed that red meat was positive significant predictor of RA (OR = 2.599, p < 0.001), while alcohol consumption, dairy product, sugar consumption were non-significant predictor of RA (OR = 1.713, p = 0.217; OR = 1.530, p = 0.654; OR = 1.546, p = 0.239). Smoking, hepatitis C infection, family history and stress were negative predictors of RA (OR < 1) (Table 4).

Table 4: Association between RA and other risk factors among study participants (n = 186).

Characteristics		n	OR	p-value	95% C.I.	
					Lower	Upper
Smoking						
	Yes	39	0.364	0.077	0.119	1.115
	No	147				
Alcohol consumption						
	Yes	83	1.713	0.217	0.729	4.025
	No	103				
Red meat						
	Yes	169	2.599	0.000	1.703	3.966
	No	17				
Hepatitis C infection						
	Yes	57	0.324	0.011	0.137	0.769
	No	129				
Dairy product						
	Yes	11	1.53	0.654	0.238	9.853
	No	175				
Sugar consumption						
	Yes	102	1.546	0.239	0.749	3.191
	No	84				
Family history						
	Yes	9	0.306	0.200	0.05	1.874
	No	177				
Stress						
	Yes	21	0.134	0.026	0.023	0.788
	No	165				

***OR:** Odd Ratio; **C.I**: Confidence Interval*

DISCUSSION

In this study, the prevalence of the rheumatoid arthritis was 43.2% among patients attending KLTH. This is a diagnosis confirmed by considering the results from rheumatoid factor, one of the marker of RA, from patients having pain in more than 2 joints. Those 2 criteria affect the overall prevalence of RA which was seen too higher compared to the global prevalence ranging between 0.1-2.0% of the global population [5-7]. A study conducted by Ghamdi [8] showed a RA prevalence of 54% when assessing the mortality rate in patients diagnosed with RA.

In this study the prevalence of rheumatoid arthritis was high in female than male. Similarly, Albishri et al. [9] reported a predominance of RA in female with a female-to-male ratio of 1.1:1. Studies reported important role of estrogen in RA [10-12]. The fact of having higher level of estrogen, may explain the higher prevalence of RA in females than in males [13]. A study conducted by Rudan et al. also showed a higher prevalence of RA in females (20%) than males (9%).

The association of RA with demographic and clinical characteristics showed that there is significant association between RA and age groups. Similarly, Otón and Carmona [14] also reported a significant association between age groups and RA. Results showed that the prevalence of RA increased by age. This is probably due to many reasons including increase in weight. In assessing the association between being obese or overweight and developing RA, Lu et al. [15] reported an increased risk of RA in obese and overweight women. This study showed that the BMI was a negative predictor of RA. Previous studies conducted to assess the relationship between BMI and RA were controversial; some studies reported significant relationship [16, 17], while others not [18, 19].

CRP was significantly associated with increasing risk of developing RA. These results are supported by study conducted by Shrivastava *et al.* [20] which revealed that RA patients had significant higher level of CRP ($p < 0.001$). Similarly, a study conducted by Pope *et al*. [21] reported that elevated level of CRP was associated with RA.

In this study, there was no significant association between smoking and RA. In contrast, the study conducted by Sugiyama *et al*. [22] showed an association between rheumatoid arthritis and smoking. Smoking is a highly significant risk factor for RA [17] but not everyone who smokes will develop the disease. Additionally, non-smokers can also develop rheumatoid arthritis, as it is a complex condition influenced by a combination of genetic, environmental, and lifestyle factors [23]. This may be due to the fact that smoking is believed to trigger or exacerbate the autoimmune response. The activation of endogenous source of free radicals by cigarette smoke [24] which in turn impaired antioxidant system, causing abnormal immune reaction and inflammation in the joints, are known to play critical role in developing RA [25]. The opposite results of this study may be due to a small sample of participants. Alcohol consumption, on the other hand was found as predictor of RA, although results were not statistically significant. In contrast, some studies suggest that moderate alcohol intake, especially in the form of wine, may have a protective effect against the development of RA. A study assessing the relationship between alcohol intake and the incidence of RA in women, showed a statistically significant decrease of 37% in developing RA when taking more than 4 glasses of alcohol per week [26]. However, excessive alcohol consumption is generally discouraged for individuals with RA, as it can interact with medications and may increase the risk of gout attacks. Alcohol should be consumed in moderation, and potential interactions with medications should be discussed with a healthcare provider to ensure optimal management of RA and overall health [26].

Red meat was found as a significant predictor of RA. This is supported by research conducted by Grant [27] in England suggesting that certain types of meat, particularly red and processed meats may be associated with an increased risk of developing RA or worsening its symptoms. Red and processed meats contain high levels of saturated fats, which are known to promote inflammation in the body [28]. Moreover, cooking meats at high temperatures, such as grilling or frying, can produce harmful compounds known as advanced glycation end products (AGEs), which may also contribute to inflammation [29].

The association between rheumatoid arthritis (RA) and hepatitis C infection has been the subject of research, and some studies have indicated a potential link between the two conditions. Hepatitis C is a viral infection that primarily affects the liver, but it can also cause extrahepatic manifestations, including various autoimmune disorders [30]. Although this study showed hepatitis C infection as a negative predictor of RA, Zampeli *et al.* [31] suggested that hepatitis C infection may be a trigger for the development of RA or that it could exacerbate existing RA symptoms in certain individuals. However, the exact mechanisms of how hepatitis C might contribute to RA are not fully understood, and more studies are needed to establish a clear link between the two conditions. It's important to note that while there may be an association, not everyone with hepatitis C will develop RA [30].

Dairy product and sugar intake were found as positive predictors of RA although the results were not statistically significant. This study has been carried out in a rural where these products are not often consumed. Although it is believed that certain proteins in dairy, like casein, may trigger an immune response that contributes to inflammation in susceptible individuals, many studies faired to find an association between dairy products and RA. Study conducted by Lindegren et al. [32], on one hand, showed a significant association of regular milk and RA, and on the other hand, an inverted association between cheese intake and RA. Processed sugar causes the body to release pro-inflammatory cytokines that are found elevated in inflammatory arthritis [33]. A study by Cerhan *et al.* (2014) in US revealed no significant association between rheumatoid arthritis and sugar consumption. These findings are in contradiction to the study conducted by Athanassiou *et al.* [34] reported strongest association between rheumatoid arthritis and sugar consumption (OR = 2.80; 95% CI 1.74–4.67; $P < 0.001$).

Research conducted by Matcham *et al.* [35] revealed the significant association between rheumatoid arthritis (RA) and stress (P=0.001). Stress triggers the release of stress hormones, such as cortisol, which can impact the immune system and inflammation in the body. In individuals with a genetic predisposition to RA, chronic stress may contribute to the activation of the autoimmune response and increase the risk of developing the disease or worsening its symptoms [36]. However, stress is not a direct cause of RA, it can be a contributing factor in disease management and symptom exacerbation. Taking steps to manage stress effectively, along with appropriate medical treatment, may help improve the overall quality of life for individuals living with rheumatoid arthritis [37]. The present study found that the family history was not significantly associated with rheumatoid arthritis. These findings are in contrast to the results reported by Kronzer *et al.* [38] where RA was significantly associated with family history (OR= 1.89, $p<0.05$).

CONCLUSION AND RECOMMENDATIONS

The study focused on assessment of rheumatoid arthritis and associated risk factors among patients attending KLTH. The prevalence of rheumatoid arthritis among patients was high (43.2%). Risk factors such as gender, age groups, body mass index, CRP, smoking, alcohol consumption, red meats, hepatitis C infection, dairy products, sugar consumption, family history and stress were assessed. Among these risk factors, only age group, red meat consumption, and CRP were significantly associated with RA. The study was limited since it only included the participants at KLTH, thus, the countrywide study on large population is suggested for big data analysis on RA. The study recommended the frequent screening for rheumatoid arthritis, staying informed about the early signs and risk factors of the rheumatoid arthritis, staying physically active, eating a balanced diet, avoiding smoking and establishing education program to the patients.

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