Cardiovascular Risk Factors in Patients with Knee Osteoarthritis: A Teaching Center in Guilan Province, Iran

Abstract

Introduction: According to the literature, cardiovascular diseases are highly prevalent globally, while there is an increased risk of cardiovascular-related death in osteoarthritic patients. Therefore, the present study intended to investigate the cardiovascular risk factor prevalence in osteoarthritic patients.

Methods: This cross-sectional, descriptive study was performed at the orthopedics clinics of the Guilan University of Medical Sciences in 2017. The inclusion criteria were the 40-75-year-old patients who were selected using the convenience sampling method. They were diagnosed with osteoarthritis, and gave informed consent for participation. The study data included demographics, cardiovascular risk factors, medical history, and anthropometric measurements. After a qualitative analysis, the data were analyzed using the SPSS software version 16.

Results: A total of 100 patients with knee osteoarthritis, including 79 female and 21 male patients with the mean age of 53.9±11.9 years, were included in the study. The prevalence of diabetes, hypertension, obesity, metabolic syndrome, and smoking in the participants was 31%, 33%, 45%, 51%, and 9%, respectively. 12% reported a history of previous heart attacks. Moreover, the prevalence of diabetes, obesity, hypertension, and metabolic syndrome was higher in women than men. Also, the mean age of the male patients was significantly higher than women (P = 0.03).

Conclusion: Given the high prevalence of cardiovascular risk factors in osteoarthritis patients, it is essential to notice the early cardiovascular disease detection in patients with knee osteoarthritis, especially in female patients.

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Introduction

Cardiovascular Diseases (CVDs) are a global health issue [1] and the most common cause of death in most countries, including Iran. Moreover, they are among the most important causes of disability [2] and impose huge costs on the healthcare systems globally [3, 4]. In recent years, cardiovascular-related deaths have been declining in developed countries due to preventive measures, while related mortality is still growing in developing countries. Economic and industrial developments, along with the expansion of communication, have led to the mechanization of daily life, resulting in altered lifestyles and increased incidence of CVDs. However, these diseases are highly preventable. The prevalence of related risk factors can be reduced by effective measures, thereby decreasing premature death from CVDs, stroke, and diabetes [5].

It has been reported that 23% of the patients with Coronary Heart Disease (CHD) are also concomitantly affected by Osteoarthritis (OA). The relationship between OA and CVDs is not fully understood yet [6]. However, since systemic inflammation, which can be OA-induced, is a risk factor for CVD, it is important to investigate this potential relationship [7, 8]. On the other hand, OA is an important public health issue that significantly impacts daily activities, decreasing the quality of life of the affected individuals (9). With about 250 million affected patients globally, it is one of the most common articular diseases [10]. The related prevalence is estimated to increase to 67 million in the United States by 2030 [11].

According to global health statistics, the estimated global prevalence of systemic osteoarthritis is 9.6% and 18% in men and women older than 60 [12]. Due to the OA-induced inflammatory processes and cytokine releases, the disease can contribute to vascular inflammation and subsequent atherosclerosis development, leading to different manifestations of CVDs, including hypertension, myocardial infarction, heart failure, and cerebral vascular diseases [13]. According to previous studies, patients with osteoarthritis have a higher probability of death than the general population. This increased mortality risk can be attributed to several diseases, especially cardiovascular diseases [14]. Moreover, osteoarthritis is particularly debilitating when it affects the knees. Knee osteoarthritis, which is more common in women than men, is the most common form of arthritis in the elderly [6, 15]. Also, it should be noted that the risk of death in patients undergoing surgical procedures for OA will increase in case of cardiovascular involvements.

Given the medical importance of OA-related complications and disability and the potential relationship between OA and CVDs, the present study intended to investigate the prevalence of cardiovascular risk factors in patients with knee osteoarthritis, as well as comparing these risk factors between the genders.

Methods

The present cross-sectional, descriptive study included the patients diagnosed with knee osteoarthritis who presented to the orthopedic clinics of the Guilan University of Medical Sciences in 2017. The participant selection was performed using the convenience sampling method. The inclusion criteria were the patients diagnosed with osteoarthritis who were in the age range of 40-75 years old, while the exclusion criteria included the patients with a history of rheumatic diseases. The participants gave informed consent for participation. All patients were evaluated for OA symptoms. A diagnosis of osteoarthritis was made based on

a history of articular pain or disability according to the criteria by the American Rheumatology Association (ACR) 20 and the radiographic findings suggestive of OA (Colgren-Lawrence degree ≥ 2). The final diagnosis was made by an orthopedist.

The study data included the demographic characteristics of age and gender; the status of cardiovascular risk factors, including a history of diabetes, hypertension, obesity, and hyperlipidemia; history of smoking; history of cardiovascular events, such as previous heart attacks, cardiac surgeries, and angioplasties; and the history of strokes. In order to find the medical and drug history, the patients or their companions were asked to mention their medications. Moreover, the anthropometric measurements for height, weight, and waist circumference were performed by a trained nurse using a lever scale with an accuracy of 0.1 kg that was connected to a calibrated gauge with an accuracy of 0.1 cm. the waist circumferences were measured using an elastic tape measure at the lowest lumbar point in the middle of the distance between the lowest rib edge and the upper edge of the iliac spine on both sides. In case of a more than 2 cm difference between the two measurements, a third measurement was made, and the mean of the two values closer to each other was recorded as the waist circumference. The patients had their shoes on and minimal clothing for anthropometric measurements. Body Mass Index (BMI) was calculated for all the participants by dividing the weight (kg) by height squared (m2). The Participants were divided into 3 groups in terms of BMI as follows: those with normal weight (BMI<25), overweight participants (BMI = 25-29.9), and obese participants (BMI≥30).

If the patients had undergone biochemical tests within the last 3 months, including Triglyceride (TG), Fasting Blood Sugar (FBS), cholesterol, LDL, and HDL, the results were recorded. If not, the participants underwent venous blood sampling after 12 hours of fasting to obtain the biochemical test results. All samples were tested using the same kits in a specific laboratory of a hospital of the Guilan University of Medical Sciences.

The metabolic syndrome status was determined by a research assistant according to the Lipid Study - Iranian modified National Cholesterol Education Program/Adult Treatment Panel III. If an individual fulfilled 3 or more of the following criteria, he/she would be considered as being affected by metabolic syndrome:

1. An HDL<50 and 40 Hin women and men, respectively, or being on hyperlipidemic medications
2. A TG >150 or being on hyperlipidemic medications
3. An FBS >110 or being on hypoglycemic medications
4. Blood pressure >130/85 or being on hypotensive medications
5. A waist circumference >95 cm [16]

The present study was approved by the Ethics Committee of the Guilan University of Medical Sciences with the approval code of IR.GUMS.REC.1396.541. As mentioned before, a diagnosis of osteoarthritis was made based on the clinical examinations and radiographic findings suggestive of OA based on the Colgren-Lawrence criteria. The final diagnosis was made by an orthopedist.

After qualitative analysis, the data were analyzed using the SPSS software version 16. The prevalence of age groups and cardiovascular risk factors were reported in the frequency and percentage. Cardiovascular risk factors were compared between men and women using the Chi-square test. The significance level was considered at 0.05.

Results

Out A total of 100 patients with knee osteoarthritis, including 79 female and 21 male patients with the mean age of 53.9±11.9 years, were included in the study. About 45% of the participants were obese based on the calculated BMI, while 9% were smokers. Moreover, 51% were affected by metabolic syndrome based on the mentioned criteria. The prevalence of diabetes and hypertension was 31% and 33%, respectively. Also, about 12% of the participants reported a history of cardiac events (Table 1). The cardiovascular risk factors of the participants by gender are presented in Table 2. As can be seen, the mean age of the male participants was significantly higher than the female ones (P = 0.03), while men were significantly more likely to be smokers than women (P = 0.001). Moreover, the mean weight and waist circumference of the male participants were higher than the female ones, which were not significant (P> 0.05). Also, the BMI of the female participants was higher than the males (P = 0.04). The prevalence of overweight (BMI = 25-30) and obese (BMI>30) patients was higher in women than men as well. More than half of the female patients (57%) and 28.6% of the male patients (6 out of 21) were affected by metabolic syndrome, and the related difference between the genders was found to be significant (P = 0.019) using the Chi-square test. Given diabetes and hypertension, the related prevalence was higher in women than men; however, the difference was not significant (P> 0.05).

Table 1. Distribution of demographic characteristics and cardiovascular risk factors in people with osteoarthritis of the knee by gender				
Variable	Percentage	Female	Male	p.value
		N=79	N=21	
Age (year) (mean± SD)	53.9 (11.9)	52.5±10.6	58.9±15.05	*0.03
Smoking (%)	9 %	3(3.8%)	6(28.6%)	**0.001
Mean (SD) Weight (Kg)	78. 86 ± 14.27	78.2±13.5	77.6±17.1	*0.8
(BMI)kg/m^2				**0.04
Natural (< 25)	20%	12(15.2%)	8(38.1%)	
Overweight (25-30)	35%	29(36.7%)	6(28.6%)	
Obesity (≥ 30)	45%	38(48.1%)	7(33.7%)	
Diabetes (%)	31%	19(24.1%)	2(9.5%)	**0.1
High blood pressure (%)	33%	27(34.2%)	6(28.6%)	**0.4
High cholesterol (%)	51%	45(57%)	6(28.6%)	**0.019
Metabolic syndrome (%)	51%	45(57%)	6(28.6%)	**0.019

*Independent T-Test, ** Chi-Square Test

Discussion

Distal Given the increasing prevalence of cardiovascular diseases globally, identifying the gender-related differences in the related risk factors is important. Since the effect of inflammatory factors induced by the diseases like knee osteoarthritis on the incidence of CVDs has not been fully understood, it is essential to conduct further studies in this field that may help improve the quality of life. Therefore, the present study investigated the prevalence of cardiovascular risk factors in patients with knee osteoarthritis in Guilan province.

In the present study, more than half of the participants were older than 50 years, with the mean age of women being higher than men. A recent study investigated the global prevalence of osteoarthritis and found that the disease was more prevalent in women, especially older women [17]. Another study by Srikanth et al. reported that women older than 55 had a more severe OA than men of the same age [18]. A study on the burden of osteoarthritis, which was conducted during 1990-2017, showed that the Disability-Adjusted Life Years (DALY) due to osteoarthritis was increased with increasing age [19].

In our study, the number of female participants with OA was higher than male participants, which was compatible with the meta-analysis by Srikanth et al., who reported that the prevalence of knee and hand osteoarthritis was higher in women than men; however, the prevalence of osteoarthritis affecting other places of the body was similar in both genders [18]. It is worth mentioning that the mentioned study reported more radiographic severity of osteoarthritis in women than men.

More than 2.3% of osteoarthritis patients in our study were overweight or obese, which is a known and modifiable risk factor for osteoarthritis. According to previous studies, obesity is a mechanical risk factor for OA. Therefore, weight loss and obesity control are important in the prevention and treatment of OA [20]. Previous studies have reported a positive correlation between the severity of knee OA and BMI [21].

A meta-analysis showed that each 5 unit increase in BMI could increase the risk of knee OA by 35% [22]. Regardless of osteoarthritis, overweight and obesity are important risk factors for disability and premature death due to cardiovascular diseases [23]. Modifying these risk factors requires population-based prevention and control programs.

A significant number of participants in the present study were affected by diabetes, hypertension, and metabolic syndrome, with women being more likely to be affected by these cardiometabolic risk factors. Our findings were compatible with those of the Gilan cohort study that reported a 24% and 43% prevalence of diabetes and hypertension in the general population [24]. Several studies have reported a relationship between the cardiometabolic risk factors and the OA development and progression. There is a relationship between obesity and osteoarthritis of the weight-bearing joints, which is beyond the mechanical and inflammatory effects of obesity on joints [25]. Also, there is an increased prevalence of metabolic syndrome and hypertension in osteoarthritis patients [26].

According to a study by Williams et al., radiographic osteoarthritis was more prevalent in diabetic patients compared to the non-diabetic participants [27]. Moreover, our study reported that the prevalence of diabetes and hypertension was higher in women than men. These findings are compatible with those of the Guilan cohort study on 10,520 participants, including 5,633 females and 4,887 males, which reported a higher prevalence of these risk factors in women than men [24].

In our study, about 9% of the participants were smokers, while smoking prevalence was higher in men than women. These findings were compatible with those of the previous studies indicating a lower prevalence of smoking in women than men [28, 29]. A recent population-based study in 2020 found a negative correlation between smoking and knee osteoarthritis [17, 30]. According to some studies, smokers, on average, have a lower

BMI, which can lower the prevalence of osteoarthritis in these individuals by controlling the mechanical effect of obesity [28, 31].

Limitations and suggestions

The present study was a single-centered study, which can reduce the generalizability of the study. However, the participants were recruited from an academic tertiary hospital that admits the patients referred from all over the province. Therefore, the patients were of different ethnicities. Moreover, the prevalence of women in the present study was higher than men, which can affect the inter-gender comparison results. Previous studies have reported a higher prevalence of knee osteoarthritis in women than men. Therefore, this higher prevalence of females than males can be explained by the convenience sampling method used in the present study, which was selected because the primary objective of the study was investigating the prevalence of cardiovascular factors in patients with OA. However, the study made inter-gender comparisons as the secondary objective as well.

The duration of osteoarthritis can affect the prevalence of cardiovascular risk factors in OA patients. However, this factor was not investigated in the present study. Therefore, it is recommended to conduct further studies on recently diagnosed patients or those with symptomatic OA. Given the lower mean age of the female OA patients than male ones, the fertility-related factors, including the age of first menstruation, the age of menopause, and other factors, should also be investigated. Also, it is recommended to closely monitor the cardiovascular condition of the OA patients undergoing surgery and conduct further studies to investigate the cardiovascular factors and symptom severity in the OA patients indicated for surgery.

Conclusion

According to our findings, osteoarthritis affects women more than men, and it is more prevalent in those older than 50. There are significant relationships between cardiovascular risk factors and osteoarthritis, especially diabetes, hypertension, and high BMI. Since the disease causes disability, it disrupts everyday activities. The subsequent inactivity increases the risk of cardiovascular disease. Therefore, it is necessary for osteoarthritis patients, especially women, to be monitored in terms of cardiovascular risk factors for early diagnosis and prevention.

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