Correlation of osteoarthritis with BMI, age and gender differences in a tertiary care hospital in Pakistan

Khurram Irshad, Riffat Shafi, M. Nasir Afzal

Department of Physiology, Shifa College of Medicine, Islamabad, Pakistan

Objective: To correlate osteoarthritis (OA) with BMI, age and gender.

Methodology: This case control study was carried out at Shifa College of medicine/Shifa International Hospital, Islamabad, Pakistan for the duration of one year. The non-probability sampling technique was used. After getting informed consent, subjects were divided in two groups. Group A included 50 patients of OA, who were diagnosed on the basis of radiographs by using Kellgren-Lawrence grading system and Group B included 50 controls. Height and weight of patients and controls were recorded. Body mass index (BMI) was calculated. Patients were divided in different age groups on the basis of gender, number of joints involved and severity of disease.

Results: BMI was significantly associated with OA as compared with controls (p= 0.000). It was a progressive disorder and was more common in females especially in old age. 86 % of the cases in younger age group (40-50 yrs) had unilateral joint involvement, however, in older age group (71-80 yrs) 100% of patients had bilateral joint involvements. Similarly, 57% of the patients had moderate disease in a younger age group as compared to 70% of patients having severe (grade 4) disease in older age group.

Conclusion: Over weight and obesity were strongly associated with OA in our population. Therefore, weight reduction can decrease the disease burden and will help in minimizing morbidity associated with OA. (Rawal Med J 2014;39: 10-14).

Key words: Osteoarthritis, obesity, Body mass index (BMI).

INTRODUCTION

Osteoarthritis (OA) is a degenerative disease of the joints with major clinical features as joint pains and stiffness, leading to decline in physical activities.It is known to be a complex disease that has a multifactorial etiology bridging biomechanics and biochemistry and has been reported to be the most common self reported cause of disability with a remarkable impact on functional ability of the patients.[1]It has become one of the most common musculoskeletal disorder and affects millions of people all over the world.[2,3]It is a progressive disorder and its frequency increases with the progression of age.[4] It is a disease in which sex specific differences in prevalence are evidentbeing more common in women than in men.[5] Before 50 years of age, the prevalence of osteoarthritis is higher in men than in women but after the age of 50, women are more often affected than men.[6]

Obesity is one of the most important and modifiable risk factor for the osteoarthritis.[7]According to recent NIH guidelines, approximately 25% of women and 20% of men in the United states are obese[8] with BMI of $30 kg/m^2$ or more[9] and the figure has increased more than 50% in the past 10-15 years.[8] However, for many years, it was not clear whether being overweight and obese preceded or was a consequence of immobility and disability caused by OA. Recent studies have shown that overweight and obesity can lead to the development of OA.[10]Furthermore, overweight and obesity have an increased risk of progression of this disease.[11]Results of the Framingham study showed that women who lost on an average 11 lbs of their weight had 50% decreased risk of developing OA.[12] Al-Arfajet alhave found a significant correlation between obesity and OA.[13]

A study indicated the prevalence of OA of 13.5 % in the rural population of North China and they regarded obesity as one of the modifiable risk factor

along with age, gender, diet, occupation and cardiovascular diseases.[14] A systematic review with meta analysis carried out by Richmond et al also suggested obesity as one of the well established risk factor for OA, however evidence regarding physical activity and sports specificity remains inconclusive.[15] Intervention to prevent overweight early in adulthood may limit the magnitude and prevalence of OA and its related disability with progression of age.[16,17]Weight management, therefore, becomes very crucial in the prevention and management of OA.[18,19]The aim of this study was to correlate osteoarthritis (OA) with BMI, age and gender.

METHODOLOGY
This case control study was carried out at Shifa College of Medicine/Shifa International Hospital, Islamabad, Pakistan for the duration of one year in 2008. Formal approval from the Institutional Review Board and Ethics Committee of Shifa College of Medicine/Shifa International Hospital was taken. The non-probability sampling technique was used. After getting informed consent, subjects were divided in two groups. Group A included 50 patients of OA, who were diagnosed on the basis of radiographs by using Kellgren-Lawrence grading system. The radiographs were reported by the radiologist and orthopedic surgeon. Group B included 50 age and gender matched controls.Height and weight of all subjects were recorded. Body mass index was calculated by applying formula BMI = Weight in kilograms/ (Height in meters).[2] Patients were divided in different age groups on the basis of gender, number of joints involved and severity of disease. Student t-test was used for continuous variables and number and percentages for categorical variables.

RESULTS
Table1 shows the comparison of various parameters of general physical examination between the cases and controls. BMI was seen significantly higher among the cases while the relationship of systolic blood pressure and diastolic blood pressure is not significant.

Table1. Findings of general physical examination.

	Cases (n = 50)	Controls (n = 50)	p - value
Body mass index BMI (kg/m^2)	27.5 ± 0.4*	23.7 ± 0.4	0.000
Systolic blood pressure (mmof Hg)	152.2 ± 2	149.2 ± 2	0.282
Diastolic blood pressure (mmof Hg)	86.3 ± 1.2	84.2 ± 1.2	0.221

Values are expressed as Mean ± SEM. *p value < 0.05 is taken as significant as compared to controls.

Table 2 shows the distribution of cases on the basis of gender, number of joints involved and severity of disease into different age groups. Males are predominantly affected in the younger age groups, as 43% of the cases in age group 40-50 years were male and 57% were females and in the older age group (71-80 years). 80% of all the cases are females and 20% are males, suggesting females are commonly affected in the older age group.

Table 2. Gender, number of joints involved and severity of disease into various age groups.

		Age group (40–50 yrs)	Age group (51– 60 yrs)	Age group (61–70 yrs)	Age group (71–80 yrs)
Gender	Male	3(42.9 %)	3(20 %)	4(22.2 %)	2(20 %)
	Female	4(57.1 %)	12(80 %)	14(77.8 %)	8(80 %)
Joints involved	Unilateral	6(85.7 %)	6(40 %)	5(27.8 %)	0(0 %)
	Bilateral	0(0 %)	9(60 %)	13(72.2 %)	10(100 %)
	Generalized	1(14.3 %)	0(0 %)	0(0 %)	0(0 %)
Severity of disease	Moderate (Grade 3)	4(57.1 %)	7(46.7 %)	8(44.4 %)	3(30 %)
	Severe (Grade 4)	3(42.9 %)	8(53.3 %)	10(55.6 %)	7(70 %)

85.7% of cases of age group (40-50 years) had unilateral joint involvement while in this group no one has bilateral joint disease. As the age progresses, percentage of bilateral joint disease rises and in age group of 71-80 years, all of the cases had bilateral joint involvement. Similarly, cases of moderate

(grade 3) disease were more common in younger age group and those suffering from severe (grade 4) are more common in older age group.

DISCUSSION

The results of our study showed a strong significant association of OA with increased BMI and obesity. In the current study, the mean BMI of thepatients with OAwas significantly higher as compared to the controls (P=0.000). This indicates that body weight and obesity had a strong correlation with the disease. This relationship remained significant even after adjusting for confounding variables. These results are consistent with the study by Al-Arfaj, who found a strong correlation between obesity and OA. According to his results, OA of the knee in general and generalized OA in females was associated with obesity in this sample of Saudi population.[9] Widmyer etal also found strong association between obesity and OA, indicating that inflammatory and biochemical changes in the joint environment supposed to play a role in the pathogenesis of OA.[20] Findings of a study by Martin et al are also in agreement with the present study as they elaborated that occupational mechanical stress increases odds of developing OA and by adapting more active life style thus reducing BMI may lead to reduction in OA.[21]

However, another study has found inconclusive evidence of physical activity and sports specificity with OA.[6] Yet another study had suggested that obese children had a greater tendency of developing OA in the adulthood.[22] Recent evidence has also suggested that disease burden of OA can be tackled by controlling body weight and decreasing obesity.[23] The present study also demonstrates that OA is a disease of old age and being more common in older age groups. It is aprogressive disorder, among all the cases, 14 % were in age group between 40 – 50 years, 30 % between 51 – 60 years and 36 % between the 61 – 70 years of age. Several other studies have reported similar results. Hart et al. found that 13.5 % of the women between the ages of 45 – 65 years have developed osteoarthritis in a four year follow up time.[24] Similarly, Felsonet al. have shown that old age is one of the major and most important risk factor for the development and progression of the disease.[25] Tenant and his colleagues, who carried out a survey of general population in North England found that osteoarthritis was more prevalent among the people aged 55 years and over as compared to the younger age groups.[26] These findings are comparable with the study of Roland and Jamoulle who have found high prevalence of the disease among the older age groups in the Dutch population.[27]Guccione and colleagues have regarded osteoarthritis as a disease of old age and one of the most common disease leading to disability and loss of normal functioning of the musculoskeletal system especially in the elderly population.[28]

The current study reveals that unilateral joint involvement is more common in the younger age group as 85.7 % of all the cases in the age group of 40 – 50 years have unilateral joint involvement, while no one in this age group has bilateral involvement of joints. With the progression of age the percentage of bilateral joint disease progressively increases and in the age group of 71 – 80 years, all the cases have bilateral joint disease. Similar findings have been reported by Lethbridge and his colleagues, they estimated the prevalence and pattern of radiographic osteoarthritis with age and gender. Their results revealed that men aged 59 and below were more likely to have unilateral impairment of joints as compared to those aged 60 years and above.[29] Similarly, Mazzuca and coworkers have suggested that contralateral knee (which they have labeled as "Chjingford Knee" of a middle aged female patient with unilateral knee osteoarthritis has high risk of developing osteoarthritis in a two years follow up.[30]

Although this study has found the significant association between OA and obesity but cause effect relationship between obesity and osteoarthritis cannot be ascertained. A longitudinal prospective study with a follow up and more sample size may help in better understanding and prevention of this disease.

CONCLUSION

Over weight and obesity is strongly associated with

OA in our population, therefore weight reduction can decrease the disease burden and will help in minimizing morbidity associated with OA.

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