

Association of Obesity and Knee Osteoarthritis

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ABSTRACT

Objective: To determine the association between obesity and severity of knee osteoarthritis.

Methodology: It was a cross-sectional descriptive study conducted in the Department of Orthopaedics Surgery, Sharif Medical City Hospital, Lahore. Study duration was twelve weeks. Fifty (50) patients fulfilling the inclusion criteria were included in this study. Non-probability, purposive sampling technique was used. Anthropometric assessment was performed and radiographs in orthogonal views were taken. Body mass index (BMI) was calculated and knee osteoarthritis grading according to Kellgren and Lawrence (K & L) was done on radiographs. The clinical complaints, radiological assessment and BMI were compared.

Results: Out of 50 patients, 29 were females (58%). Seven (14%) patients presented with mild OA knee, 19 (38%) with moderate OA and 24 (48%) had severe OA. There was a strong correlation between increased body mass index ($BMI > 30 \text{ kg/m}^2$) with the severity of OA knee. Moreover, BMI tends to increase with age as well.

Conclusion: Obesity has a strong association with knee osteoarthritis. Obesity increases the incidence and progression of knee osteoarthritis.

Keywords: Osteoarthritis knee. Body mass index. Obesity.

INTRODUCTION

Obesity is very common worldwide. According to World Health Organization (WHO), the prevalence of obesity in South East Asia is on a rise and approximately 7 % of adult population has a BMI more than 30 kg/m^2 . Although both genders are involved but female gender is relatively at a higher risk.¹ The incidence has become twice globally in the past 30 years. About half a billion people in the world are obese. The obesity is prevalent in both developed as well as developing countries.² It is associated with increased morbidity and mortality.³ Both genetic and environmental factors play a role in causing obesity.⁴ Obesity is a risk factor for chronic diseases such as hypertension, dyslipidemia, type 2 diabetes, cardiovascular disease, sleep apnoea, musculoskeletal disorders and some cancers. The risk of death from all causes increases due to obesity in both males and females of all age groups.⁵ The obesity causes degenerative and inflammatory diseases of the musculoskeletal system, with the greatest burden resulting from osteoarthritis (OA).⁶

Osteoarthritis (OA) of the knee is the most significant musculoskeletal condition associated with obesity. It is signified by joint pain, stiffness and impaired movement. It is caused by thinning of joint cartilage, which results in reduced joint space and rubbing of bone together. This results in localized inflammatory

reaction and eventually stiffness in the surrounding tissue.⁷ Currently, 10% population is suffering from OA and its prevalence increases with age.⁸ Obesity has a strong relationship with OA and is considered as the greatest modifiable risk factor.⁹ Coggon et al. reported that subjects with a $BMI > 30 \text{ kg/m}^2$ were 6.8 times more likely to develop knee OA than normal-weight controls.¹⁰ Osteoarthritis affects all aspects of life through pain and limitation of mobility. It was estimated that the economic burden of OA in the USA was second only to diabetes in obesity-associated conditions.¹¹ The burden of this disease is expected to increase, due to the prevalence of obesity and increased longevity. The rationale of this study was to determine the association of knee osteoarthritis with obesity. So that weight reduction and lifestyle modification can lead to decrease mortality and morbidity related to the disease.

METHODOLOGY

It was a cross-sectional descriptive study carried out in the outdoor patient department (OPD) of Orthopaedics Surgery Department, Sharif Medical City Hospital, Lahore. Fifty patients of both genders and age between 25-65 years with primary osteoarthritis of one or both knees were included in the study. Probability sampling technique was used.

Patients with the history of trauma to knees, infection of bone or joint (clinical and radiological), pathological fracture (clinical and radiological) and previous history of any procedure performed on the knee were excluded. The study was approval from the ethical committee of the hospital. Informed consent was taken and history proforma was filled. Anthropometric assessment was performed and radiographs in orthogonal views were taken. Body mass index (BMI) was calculated and knee

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osteoarthritis grading according to Kellgren and Lawrence (K & L) was done on radiographs. The clinical complaints, radiological assessment and BMI were compared.

STATISTICAL ANALYSIS

The collected data was entered and analyzed by SPSS version 23. Descriptive statistics were used to calculate mean and standard deviation for age. Frequency and percentages were calculated. A p-value of <5 was considered statistically significant.

RESULTS

Fifty patients were included in this study. Out of 50 patients, 29 were females (58%) and 21 were males (42%). Mean age of the patients was 48 ± 18 years. Twenty four patients presented with severe OA knee (48%). The grade of OA knee in the patients is shown in figure 1.

Our results showed that there is a strong association between the advancing age and BMI of the patients. In patients of age group 45-65 years, mean BMI was 35 kg/m^2 whereas in patients of age 25-45 years BMI is comparatively low with mean value 31 kg/m^2 .

Out of 50 patients, 7 (14%) presented with mild OA knee, 19 (38%) with moderate OA and 24 (48%) had severe OA. Patients with mild and moderate OA had BMI 28 kg/m^2 and 30 kg/m^2 respectively whereas BMI of the patients having severe OA was 34 kg/m^2 . There is a strong relationship of BMI with the grade of OA knee. The severity of OA knee increased with higher BMI.

DISCUSSION

This study showed that osteoarthritis knee affects female patients more than the male patients. Similar results were also shown in the studies carried out by Hame et al.¹¹ Another study done by Cho et al. showed similar results.¹²

Our study showed that the BMI of the patients tends to

increase with age. The work carried out by Holliday et al. showed similar finding. This occurs due to various factors like lack of exercise, unhealthy eating habits and the slowing of basal metabolic rate.¹³

Our study showed a strong association between BMI and severity of OA knee. The patients with BMI $> 30 \text{ kg/m}^2$ presented with severe OA knee. The impact of body mass index (BMI) on incidence and severity of knee was assessed by Jiang et al. They also reported a significant relationship between BMI and risk of OA at both the hip and the knee joint after both clinical and radiological examination. They found a significant association of BMI and knee OA in females as compared to males which was also observed in our study.¹⁴

In a large population-based cohort study, Reijman et al. investigated the relationship between BMI and incidence and progression of both knee and hip OA. According to them, the mean follow up time was 6.6 years and incidence of knee OA was high in overweight patients. Progression of knee OA was evaluated by decreased joint-space on x-ray and it was found strongly associated with high BMI. No significant relationship was observed between BMI and hip OA.¹⁵

The severity of structural damage to the joint is directly related to the increased BMI.²² The multiple factors are involved in the pathogenesis of OA due to obesity. The joint damage occurs due to mechanical factors and metabolic factors. The mechanical factors are decreased muscle strength and increased force on the joints.¹⁶⁻¹⁸

Obesity is a chronic inflammatory condition that affects multiorgan systems. The metabolic pathways through which obesity leads to joint damage are still unknown. It was supposed that aberrant adipokine expression leads to the destruction and remodeling of joint tissue. Adipokines affect cartilage, synovium and bone. The most abundantly produced adipokines are leptin and adiponectin. Receptors of these adipokines are expressed on the surface of chondrocytes, synoviocytes

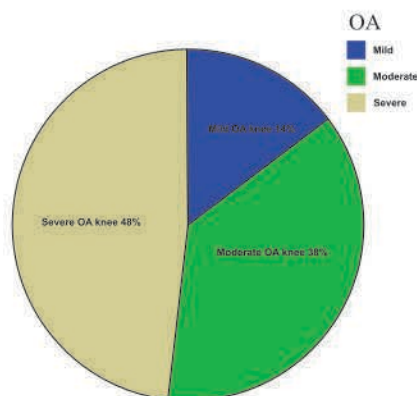


Figure 1: Showing grade of osteoarthritis in patients

and subchondral osteoblasts. Leptin increases the levels of proinflammatory cytokines and various degradative enzymes like nitric oxide and matrix metalloproteinases (MMPs).¹⁹⁻²¹ According to a study, leptin and adiponectin levels were significantly high in OA patients as compared to controls.²⁰

A study conducted by Richette et al. showed that weight reduction in obese knee OA patients resulted in decreased levels of leptin.²² Various studies have shown that OA is not just a disease related to aging but also occurs due to metabolic derangement. The metabolic, lipid and humoral mediators contribute to initiation and progression of the disease.²³

Articular cartilage may not be able to maintain absolute knee adduction movement during walking in obese patients as compared to normal weight individuals. A study done in Japan revealed that obesity related metabolic disorders increased the incidence and progression of knee OA.²⁵

CONCLUSION

There is a strong association of increased body mass index (BMI > 30 kg/m²) with the severity of OA knee. Obesity increases the incidence and progression of knee osteoarthritis. So, weight reduction and lifestyle modification can lead to decreased mortality and morbidity related to the disease.

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