Original Research Article

Incidence of Osteoarthritis of Knee Joint among Obese Female Patients: A Cross-Sectional Study

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Abstract: Osteoarthritis (OA), a common joint disorder, is due to aging and wear and tear on a joint. Being overweight increases the risk of OA in different joints. Knee osteoarthritis is the most common type. Obesity is a risk factor for the onset, progression, and symptoms of knee osteoarthritis. Other risk factors are aging, family history, menopause and female gender. Current study was aimed at investigating the relationship between obesity with the increased incidence of osteoarthritis of knee in females.This cross sectional study was done including females of age group 40 to 64 years of age. The study was done over a period of 6 months. A total of 250 patients were included in this study. The patients were selected on a basis of convenience sampling method. In detail history of the patient were taken. As well as physical examination and imaging studies were done. Statistical analysis was done with the help of IBM SPSS statistics version 20 using pearsons chi square test.In each of the participants, individual demographic characteristics and clinical features of osteoarthritis were evaluated. 78% of the participants were diagnosed with the osteoarthritis of the knee. Highest percentage of the knee affected were shown bilateral (51%), followed by right knee (39%) and left knee were affected in 10 % of the cases. Significant association (p=0.001) was found with increased BMI and osteoarthritis of the knee (Table 2). Obesity is strongly associated with the development of secondary osteoarthritis of knee in both pre and post-menopausal females.
Keywords: Obesity, Osteoarthritis of knee, BMI

INTRODUCTION

Osteoarthritis is caused by the breakdown of cartilage, which can lead to pain and stiffness in the knees, hips, and other joints. It is a different disease than rheumatoid arthritis, an autoimmune condition in which the body attacks the lining of the joints [1].

Osteoarthritis (OA) of the knee is the most common type of arthritis and the major cause of chronic musculoskeletal pain and mobility disability in the elderly, and therefore represents a significant burden on healthcare provision. It is being encountered with increasing frequency as the population continues to age. Risk factors of OA of the knee include older age, female sex, obesity, osteoporosis, occupation, sports activities, previous trauma, muscle weakness or dysfunction, proprioceptive deficit and genetic factors [2].

Approximately 25 percent of persons with 55 years of age or older have had knee pain on most days

in a month in the past year, and about half of them have radiographic osteoarthritis in the knee, a group considered to have symptomatic osteoarthritis. Many without radiographic osteoarthritis of the knee probably have osteoarthritis that is not yet visible on radiography, an imaging procedure insensitive to early disease [3].

Osteoarthritis is a progressive disease of the synovial joints commonly affecting the hip and knee [4], and is characterized by hyaline cartilage degeneration, subchondral bone thickening, and novel bone formation[5]. Symptoms of OA typically include insidious onset of joint pain, swelling, stiffness, limited range of movement and muscle weakness [6]. Ten percent of people over 55 who have OA of the knee in particular will be significantly disabled by these symptoms [7].

MATERIALS AND METHODS

This cross sectional study was done including females of age group 40 to 64 years of age. The study

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Inclusion criteria
Females; 45-65 years of age

Exclusion criteria
All other persons who were not fulfilling the above mentioned criteria were excluded. Participants were excluded if they had any specific medical condition affecting the knee joint (such as, tumors, septic arthritis, or rheumatoid arthritis).

RESULTS
In each of the participants, individual demographic characteristics and clinical features of osteoarthritis were evaluated.

Mean age of the participants females were 54.19 and mean weight of the participants were 83.28. Among 250 females 54% were obese, 28% were overweight and 18% were of normal BMI.

77.2% of the participants were diagnosed with the osteoarthritis of the knee. Highest percentage of the knee affected were shown bilateral (51%), followed by right knee (39%) and left knee were affected in 10 % of the cases. The most common sign and symptoms were pain in knee joint, morning stiffness, swelling, crepitation, difficulty in climbing stairs and weak quadriceps. Frequencies of variables in all subjects showed that 68% of all the subjects were postmenopausal, 62% had a positive family history and 76% had pain in knee joint (Table 1).

Significant association (p=0.001) was found with increased BMI and osteoarthritis of the knee (Table 2).

Table 1: Distribution of the participants according to the BMI

BMI	DIAGNOSTIC RESULT		TOTAL
	YES	NO	
NORMAL	21	24	45
OVERWEIGHT	42	28	70
OBESE	130	5	135
TOTAL	193	57	250

Table 2: Analysis of the BMI with the incidence of the osteoarthritis of knee

	Value	Df	Significance (2 sided)
Pearson chi-square	12.3425	2	0.001

DISCUSSION
The OA disease process involves the whole joint including cartilage, bone, ligament and muscle with changes such as joint space narrowing, bony osteophytes and sclerosis seen on X-ray. Risk factors are multifactorial and include older age, female gender, obesity (particularly in knee OA), previous joint injury, genetics and muscle weakness. Pain is the dominant symptom although it is important to note that the severity of pain and the extent of changes on X-ray are not well correlated. Pain together with joint stiffness, instability, swelling and muscle weakness leads to physical and psychological disability and impaired quality of life. Individuals with hip or knee OA have difficulty with activities of daily living, such as walking, stair-climbing and housekeeping [8, 9].

Furthermore people with OA commonly have a number of co-existing obesity-related disorders such as heart disease, hypertension and diabetes and the

majority of people with OA do not achieve recommended levels of moderate physical activity [9].

Cartilage and other biological tissues were not constructed to effectively cushion the joints of obese and morbidly obese individuals during locomotion. The high-magnitude, repetitive loads that the knee sustains can lead to knee osteoarthritis. The ability of cartilage to self-repair is poor and, over time, the degenerative process of cartilage deterioration exposes the subchondral bone and can lead to joint pain and osteoarthritis. The pain and discomfort associated with knee OA brings the problem full-circle as these issues further limit mobility and the ability to exercise for weight loss, which further exacerbates the problem of obesity [10].

Pathophysiology of Knee OA is characterized by a no inflammatory deterioration of the particular cartilage with reactive new bone formation at the joint's surface and margins. Whether this new bone formation

originates from the cartilage or from the subchondral bone is still uncertain. Many authors have considered that the primary lesion of OA is in the articular cartilage, in which the earliest change is diminution of mucopolysaccharide chondroitin sulphate relative to the collagen in the matrix. This depletes the ground substance and unmasks the collagen. Normally, the matrix dissipates stresses hydrostatically. However, when the collagen is unmasked, its fibers are subjected to excessive flexural and torsional stresses, leading to their rupture. This produces the characteristic lesions of early OA. Much like bone, the health of cartilage depends on the mechanical loading it experiences. Cartilage is an avascular tissue, and the chondrocytes within it depend on diffusion and convection for nutrition. The cyclic loading induced by everyday activities produces deformations, pressure gradients, and fluid flows within the tissues that enhance this process. Laboratory and animal investigations have shown that mechanical stress has a direct effect on the synthetic and catabolic activities of chondrocytes. Moderate to strenuous articular loading, such as that associated with regular distance running, seems to have no adverse effects on the health of normally congruent joints [2].

The conventional concept of osteoarthritis is that it occurs as an aging and degenerative process resulting in reduction of the surface cartilage, narrowing of the joint space and reduction of the synovial fluid. The cartilage protects the underlying sub-chondral bone by distributing large, loads, maintaining low contact stresses, and reducing friction at the joint. So it is postulated that reduction of these protective functions cause pain in the joint, although primary osteoarthritis is related to the aging [11].

Obesity is associated with an elevated risk of an array of chronic diseases. The implications for the musculoskeletal system include both degenerative and inflammatory conditions, with the greatest burden resulting from osteoarthritis. OA is a clinical syndrome of joint pain and dysfunction caused by joint degeneration, and affects more people than any other joint disease3. Currently, nearly 10 per cent of the population is affected and the prevalence increases with age. Obesity is the greatest modifiable risk factor for OA [12].

The high prevalence of osteoarthritis entails significant costs to society. Direct costs of osteoarthritis include clinician visits, medications, and surgical intervention. Indirect costs include time lost from work. Costs associated with osteoarthritis can be particularly significant for elderly persons, who face potential loss of independence and who may need help with daily living activities. As the populations of developed nation's age over the coming decades, the need for better understanding of osteoarthritis and for improved therapeutic alternatives continues to grow [11].

Knowledge of the genetic influence contributing to OA of the knee has important clinical repercussions. Potentially if the genes associated with OA of knee were known this would give us a better understanding of the molecular pathogenesis, which may enable therapeutic intervention before the osteoarthritis results in disability [13, 14].

Pathophysiology

The pathophysiology of obesity-related OA is likely to be multi-factorial. Structural joint damage is thought to result from both mechanical factors, including increased forces about the joint, decreased muscle strength and altered biomechanics during everyday activities, and metabolic factors, as being obese also increases the risk of OA in non-weight-bearing joints such as the hands [12].

Obesity leads to increased loading of the weight-bearing joint, which may be the most important mechanical contribution. Knee adduction moment may be an important mechanical variable associated with the development of knee OA. People with obesity have greater absolute knee adduction moments due to increased body mass, and engage in compensatory gait patterns such as slower walking velocity and increased toe-out angle [12].

There is some evidence that impaired proprioceptive acuity may be involved in the pathogenesis of osteoarthritis. Proprioceptive acuity relies on joint position sense, which we assessed using a protocol developed by Hurley. The protocol instructs a subject to attempt to reproduce a randomly chosen angle of knee flexion [15].

Osteoarthritis affects all structures within a joint. Not only is hyaline articular cartilage lost, but bony remodeling occurs, with capsular stretching and weakness of periarticular muscles. In some patients, synovitis is present, laxity of the ligaments occurs, and lesions in the bone marrow develop that may represent trauma to bone. Osteoarthritis involves the joint in a non-uniform and focal manner. Localized areas of loss of cartilage can increase focal stress across the joint, leading to further cartilage loss. With a large enough area of cartilage loss or with bony remodeling, the joint becomes tilted, and malalignment develops. Malalignment is the most potent risk factor for structural deterioration of the joint, since it increases further the degree of focal loading, creating a vicious cycle of joint damage that ultimately can lead to joint failure. Local inflammation in the synovial and the cartilage may contribute to pain and joint damage [3].

One type of conservative non-pharmacological treatment is physiotherapy. Interventions such as supervised exercise programmes, acupuncture, bracing, taping, manual therapy, hydrotherapy and patient education have all been proven to be effective in the management of knee OA. A recent randomized controlled trial by Abbott *et al* demonstrated that manual therapy and exercise are effective at improving pain and physical function in people with OA of the hip or knee and are more effective than usual care from a GP or other health care providers, with benefits lasting for at least one year. Anti-inflammatory drugs used to treat the symptoms of this disorder are associated with various side-effects. Furthermore, for patients for whom these drugs do not lead to an adequate response, replacement surgery is often recommended.3 Patients with chronic pain is increasingly using acupuncture for pain relief [16].

CONCLUSION

The present study concludes that obesity is strongly associated with the development of secondary OA of knee in both pre and post-menopausal females. In that, chances of development of bilateral knee osteoarthritis are the maximum, followed by right unilateral disease. Also, being overweight increases the risk of developing knee osteoarthritis.

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