

**Original article:**

## **Study of Association of Obesity with Knee Joint Osteoarthritis in Females at a Tertiary Care Teaching Hospital**

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### **ABSTRACT:**

**Introduction:** Osteoarthritis (OA) is one of the commonest causes of disability and knee disease is the commonest site leading to loss of function and pain. The present study was conducted to assess whether obesity explains the trend in knee pain and osteoarthritis in females.

**Methodology:** An Observational, Cross sectional study was conducted in Department of Orthopaedics, Santosh Medical College and Hospital, Ghaziabad, UP (India). 120 female patients (age ranges between 45-70 years) visiting to department of orthopaedics during (Oct 2010-Sept 2011) were included to participate in study. Patients with any evidence of secondary OA, inflammatory arthritis, and those with neurological conditions were excluded.

**Results:** In present study, among 120 females, 61.67% females were obese, 24.17% females were overweight, 14.17% females had normal BMI. 78.33% of subjects were diagnosed as OA of knee. Frequency of variables showed that 88.3% had a positive family history, 81.9% females were post-menopausal and almost everyone had pain, crepitus and morning stiffness. 87.2 % patients has joint swelling.

**Conclusion:** Present study was conducted to assess whether obesity (described in terms of increased BMI) explains the trend in knee pain and osteoarthritis in females. Study showed that 93.2% of the obese females developed symptomatic OA of knee and obesity is strongly associated with OA.

**Key Words:** Body Mass Index, Knee, Obesity, Osteoarthritis.

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### **INTRODUCTION**

Osteoarthritis (OA) is one of the commonest causes of disability and knee disease is the commonest site leading to loss of function and pain.<sup>1</sup> Osteoarthritis is a degenerative joint disease of multifactorial origin. It is estimated that prevalence range from 4 -30% depending on the age, sex and disease definition.<sup>2,3</sup>

Obesity, defined by either increased weight (kg) or BMI, is a powerful risk factor for development of knee OA.<sup>4</sup>

Weight loss reduces the risk of symptomatic knee OA,<sup>5</sup> and for obese patients with knee OA, weight loss and exercise are recommended by both the American College of Rheumatology and the European League Against Rheumatism. However, this recommendation is primarily supported by expert opinion; meta-analysis of randomised controlled trials (RCTs; ie, category 1a evidence) is yet to be undertaken.<sup>6,7</sup>

Two major theories have been proposed to

explain this association (systemic/metabolic mechanisms).<sup>8</sup> The biochemical theory suggests that obesity increases axial loading with consequence degeneration of articular cartilage and sclerosis of subchondral bone, whereas metabolic theory proposes that some metabolic factors adversely affect cartilage.<sup>9</sup>

Many population studies to date have found a cross-sectional association between obesity and OA of the tibiofemoral joint of the knee.<sup>10-14</sup> Radiographic knee OA is increased 4-fold in obese women, with a range of odds ratios (ORs) between 2 and 9 in different studies.

There is a dose-response relationship between excess weight or obesity and knee OA.<sup>11</sup> These cross-sectional data have been confirmed by longitudinal data from the Framingham Study,<sup>4,15</sup> the Chingford study,<sup>16</sup> as well as the Baltimore Longitudinal Study of Aging.<sup>17</sup>

The present study was conducted to assess whether obesity explains the trend in knee pain and osteoarthritis in females.

### METHODOLOGY

An Observational, Cross sectional study was conducted in Department of Orthopaedics, Santosh

Medical College and Hospital, Ghaziabad, UP (India). 120 female patients (age ranges between 45-70 years) visiting to department of orthopaedics during (Oct 2010-Sept 2011) were included to participate in study. Patients with any evidence of secondary OA, inflammatory arthritis, and those with neurological conditions were excluded.

Detailed history was taken from all patients regarding onset of pain, aggravating and relieving factor, other joints affected by OA, family history, physical activities, history of menopause etc.

Complete physical examination for OA of the knee joint was done to assess any swelling and note any various movements which may bring on pain.

### Criteria Used to Diagnose OA of Knee Joint

- 1) Knee pain for most days of the month
- 2) Crepitus on active joint motion
- 3) Morning stiffness more
- 4) Bony enlargement of the knee on examination.

Ethical approval for the study was granted by the institutional ethical committee. The written consent was taken from all the subjects for participation in the study.

### RESULTS AND DISCUSSION

Table 1: Patients statistics.

Parameters	Mean ± SD
Age	51.9 ± 7.8
Height	1.56 ± 0.74
Weight	84.97 ± 16.26

Table 2: Association Between BMI And OA

BMI	Osteoarthritis		
	Yes	No	Total
Normal	4	13	17
Overweight	21	8	29
Obese	69	5	74
Total	94	26	120

Table 3: Frequency of variables in diseased patients

Variables	Frequency		Percentage	
	Yes	No	Yes	No
Family h/o OA	83	11	88.3	11.7
Menopause	77	17	81.9	18.1
Pain in knee joint, Morning Stiffness, Crepitus	94	00	100	00
Joint Swelling	82	12	87.2	12.8
Radiating Pain	71	23	75.5	24.5
Difficulty in climbing stairs	94	00	100	00
Weak quadriceps	69	25	73.4	26.6
Deformity in knee joint	41	53	43.6	56.4

In present study, among 120 females, 61.67% females were obese, 24.17% females were overweight, 14.17% females had normal BMI. 78.33% of subjects were diagnosed as OA of knee. Frequency of variables showed that 88.3% had a positive family history, 81.9% females were post-menopausal and almost everyone had pain, crepitus and morning stiffness. 87.2 % patients has joint swelling.

Present study was conducted to assess whether obesity (described in terms of increased BMI) explains the trend in knee pain and osteoarthritis in females. Study showed that 93.2% of the obese females developed symptomatic OA of knee and obesity is strongly associated with OA.

Several studies have identified a genetic predisposition towards OA.<sup>18,19</sup> Only one study

showed that the offsprings of people with medial tibio-femoral OA walked with a less than normal degree of foot rotation, which may ultimately predate disease.

OA has a substantial disease burden and affects quality of life on many levels. “People with OA have more difficulty and take longer to perform activities of daily living, having less time available for leisure activities, depend significantly more on family and friends for assistance, and spend more money on healthcare than age-matched and sex-matched peers in the general population.”<sup>20</sup>

Knee-joint moments contribute to the stress placed on the knee during walking. Specifically, higher external adduction moments (or internal abduction moment) are related to increased compressive loads transmitted to the medial compartment of the

knee.<sup>21</sup> Schipplein and Andriacchi proposed that increased compressive forces at the knee represent an adaptive gait strategy to increase dynamic stability in the presence of a high external adduction moment.<sup>22</sup>

During the single-leg stance in the gait cycle, a force of 3 to 6 times that of body weight is transmitted across the knee joint. Likewise, the force exerted across the hip is 3 times that of body weight. These forces are increased several times over during high-impact activities. "Therefore, any increase in weight may be roughly multiplied by these factors to reveal the excess force across the knee when an overweight person walks."<sup>23</sup>This increase in force elevates stress on articular cartilage and causes its eventual breakdown, which in turn causes proliferation of periarticular bone (to

distribute the increased forces) and culminates in decreased joint space. If unchecked, this vicious cycle continues until the joint space is obliterated.

Given that obesity is associated with the onset and progression of OA, weight loss represents an important preventive strategy. The Framingham Study showed that weight control significantly affected the risk of developing knee OA. The women who reduced their BMI by 2 units or more, reduced the odds for developing OA by >50%. It can be concluded that obesity is strongly associated with the development of secondary OA of knee in females. Primary and secondary prevention programs aimed at reducing obesity, preventing injury, and improving rehabilitation and physical activity are urgently needed.

## REFERENCES

1. Spector T D, Hart D J. How " serious is knee osteoarthritis? *Annyi Rhelio Dis* 1992; 51: 1105-6.
2. Felson DT, Lawrence RC, Dieppe PA, Helmick CG, Jordan JM, Kington RS, et al. Osteoarthritis: new insights. Part 1: the disease and its risk factors. *Ann Intern Med.* 2000; 133:635-46.
3. Lanyon P, O'Reilly S, Jones A, Doherty M. Radiographic assessment of symptomatic knee osteoarthritis in the community: definitions and normal joint space. *Ann Rheum Dis.* 1998;57:595-601, doi: 10.1136/ard. 57.10.595.
4. Felson DT, Anderson JJ, Naimark A, et al. Obesity and knee osteoarthritis. The Framingham Study. *Ann Intern Med* 1988;109:18-24.
5. Felson DT, Zhang Y, Anthony JM, Naimark A, Anderson JJ. Weight loss reduces the risk for symptomatic knee osteoarthritis in women: The Framingham Study. *Ann Intern Med* 1992;116:535-9.
6. American College of Rheumatology Subcommittee on Osteoarthritis Guidelines. Recommendations for the medical management of osteoarthritis of the hip and knee: 2000 update. *Arthritis Rheum* 2000;43:1905-15.
7. Jordan KM, Arden NK, Doherty M, Bannwarth B, Bijlsma JW, Dieppe P, et al. EULAR recommendations 2003: an evidence based approach to the management of knee osteoarthritis. Report of a Task Force of the Standing Committee for International Clinical Studies Including Therapeutic Trials (ESCISIT). *Ann Rheum Dis* 2003;62:1145-55.
8. Van Saase JL, Vandenbroucke JP, van Romunde LK, Valkenburg HA. Osteoarthritis and obesity in the general population: a relationship calling for an explanation. *J Rheumatol.* 1988; 15:1152-8.

9. Hartz AJ, Fischer ME, Bril G, Kelber S, Rupley D Jr, Oken B, et al. The association of obesity with joint pain and osteoarthritis in the HANES data. *J Chronic Dis.* 1986; 39:311–9, doi: 10.1016/0021-9681(86)90053-6.
10. Hochberg MC, Lethbridge-Cejku M, Scott WW Jr, Reichle R, Plato CC, Tobin JD. The association of body weight, body fatness and body fat distribution with osteoarthritis of the knee: data from the Baltimore Longitudinal Study of Aging. *J Rheumatol* 1995;22: 488–93.
11. Anderson JJ, Felson DT. Factors associated with osteoarthritis of the knee in the First National Health and Nutrition Examination Survey (HANES I): evidence for an association with overweight, race, and physical demands of work. *Am J Epidemiol* 1988;128: 179–89.
12. Davis MA, Ettinger WH, Neuhaus JM, Hauck WW. Sex differences in osteoarthritis of the knee: the role of obesity. *Am J Epidemiol* 1988;127:1019–30.
13. Hart DJ, Spector TD. The relationship of obesity, fat distribution and osteoarthritis in women in the general population: the Chingford Study. *J Rheumatol* 1993;20:331–5.
14. Cicuttini FM, Baker JR, Spector TD. The association of obesity with osteoarthritis of the hand and knee in women: a twin study. *J Rheumatol* 1996;23:1221–6.
15. Felson DT, Zhang Y, Hannan MT, Naimark A, Weissman B, Aliabadi P, et al. Risk factors for incident radiographic knee osteoarthritis in the elderly: the Framingham Study. *Arthritis Rheum* 1997;40:728–33.
16. Spector TD, Hart DJ, Doyle DV. Incidence and progression of osteoarthritis in women with unilateral knee disease in the general population: the effect of obesity. *Ann Rheum Dis* 1994;53:565–8.
17. Lethbridge-Cejku M, Creamer P, Wilson M. Risk factors for incident knee osteoarthritis: data from the Baltimore Longitudinal Study on Aging [abstract]. *Arthritis Rheum* 1998;41 Suppl 9:S182.
18. Spector TD, Cicuttini F, Baker J, et al. Genetic influences on osteoarthritis in women: a twin study. *BMJ* 1996; 312(7036):940–3.
19. Keen RW, Hart DJ, Lanchbury JS, et al. Association of early osteoarthritis of the knee with a Taq I polymorphism of the vitamin D receptor gene. *Arthritis Rheum* 1997;40:1444–9.
20. March LM, Bagga H. Epidemiology of osteoarthritis in Australia. *Med JAust.* 2004;180(5 suppl):S6-S10.
21. Andriacchi TP. Dynamics of knee malalignment. *Orthop Clin North Am* 1994;25:395–403.
22. Schipplein OD, Andriacchi TP. Interaction between active and passive knee stabilizers during level walking. *J Orthop Res* 1991; 9:113–9.
23. Felson DT. Weight and osteoarthritis. *Am J Clin Nutr.* 1996;63(3 suppl):430S- 432S

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