

Osteoarthritis & Obesity Grading: Is There an Association?

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ABSTRACT

Objective: To find an association between knee osteoarthritis and obesity grading.

Methods: A cross sectional study was conducted in 2016 in the OPD of a tertiary care hospital of Karachi, Pakistan. A total of n=140 patients were recruited through consecutive sampling technique after taking informed consent. Data was collected through a Proforma, which had the variables of age, gender, duration of disease, age at onset of disease and BMI. BMI was categorized according to World Health Organization Criteria for obesity. Data was entered on Microsoft excel 7 and exported to SPSS version 21 for analysis. Mean and standard deviation was taken out for numerical variables. Frequencies and percentages were taken out for categorical variables. Chi Square as test of significance was applied for finding association between BMI and X-ray findings. Pooled t test was applied for finding difference in mean age based on X-ray findings.

Results: A total of n=140 diagnosed cases of osteoarthritis was recruited in the study. Females were 73% (n=102) while males were 27% (n=38). The mean age of the sample was 52+/- 7.8. The mean age at onset of disease was 49+/- 7.6. The mean for the duration of disease at the time of data collection was 3.3+/-1.7. Significant association was observed when obesity grades were associated with X-ray findings of Osteoarthritis. Grade II and Grade III obesity patients both were significantly more in number with both joint space narrowing and Osteophytes (P value 0.013)

Conclusion: Our study found significant association between obesity grading and knee osteoarthritis.

Keywords: Obesity, BMI, knee osteoarthritis

INTRODUCTION

Osteoarthritis is considered one out of the ten most crippling diseases in the developed world & an important cause of pain & disability [1]. It is estimated that by the year 2040 a whopping 78 million US adults ages 18 years or older will have been diagnosed with arthritis [2]. It is also the most common rheumatologic disorder in the Asia Pacific region [3]. The prevalence of osteoarthritis in Pakistan is 28% in urban areas and 25% in the rural areas [4]. Weight bearing joints like knee and hips are the most commonly affected by osteoarthritis [5]. Out of both these joints the most common type of lower extremity osteoarthritis is knee osteoarthritis. Women, older adults, obese people & those having a knee injury are more at risk of developing symptomatic osteoarthritis [6, 7, 8].

Clearly defined risk factors for osteoarthritis are advancing age, increased weight, female gender, genetic predisposition and mechanical stress [9]. Several studies have also shown that a number of biochemical factors also play a role in the destructive cascade of this disorder [10, 11]. Out of all the established risk factors for knee osteoarthritis obesity is one of the most important. The burden of knee osteoarthritis is expected to rise in proportion to the worldwide obesity epidemic [12]. Obesity defined as an increased body mass index (BMI) & has been seen to be associated with knee pain in a number of studies [13, 14, 15, 16]. Obesity has been shown to increase the risk of developing knee osteoarthritis by three-folds & has also been shown to accelerate the progression of disease [17, 18, 19]. Central fat in obesity is especially associated with an increased production of inflammatory mediators like interleukin-6 [20] that may be important as these mediators also have an important association with knee osteoarthritis [21, 22]. Additionally, increased central fat deposition may also have mechanical effects by affecting gait & balance [23, 24] & has been seen to have an association with knee

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osteoarthritis [25, 26]. A number of studies also confirm that BMI and weight are strongly associated with knee osteoarthritis especially in women [27]. Although a lot of importance has been placed on linking obesity with coronary heart disease & diabetes the health consequences of obesity with crippling knee pain has not been highlighted adequately, mainly due to the non-fatal nature of the disease. This has led to osteoarthritis becoming a public health concern mainly due to the magnitude of the problem & the reduced quality of life associated with it [28, 29, 30, 31, 32]. Pakistan is also witnessing a rise in the levels of obesity at an alarming rate. Since, scientific evidence has already linked obesity to knee osteoarthritis worldwide, we speculate that the same association will be seen in our population & an additional burden to our already burgeoning health problems will the disability & decreased quality of life associated with knee osteoarthritis [34]. Therefore the objective of our study is to find an association between obesity grading & knee osteoarthritis in the Pakistani population.

METHODS

This was a cross sectional study conducted in the OPD of Liaquat National Hospital. The data was collected for a period of six months from May 2015 to October 2015. The calculated sample size was n=309 based on the prevalence of osteoarthritis of 28% in the urban areas of Pakistan. The bound of error was taken at 5% and confidence level of 95%. The actual sample collected after six months was n=140. Sample was selected through consecutive sampling technique based on the inclusion criteria.

After informed consent from each patient where they were duly informed about the objectives of the study, data was collected on a Proforma by the principal investigator. The Proforma included the age, gender, duration of disease, age at onset of disease and BMI variables. BMI was categorized according to WHO Criteria for obesity with the following cutoffs:

- Pre obesity----- 25-29.99
- Grade I Obesity----- 30-34.99
- Grade II Obesity----- 35-39.99
- Grade III Obesity----- > 40

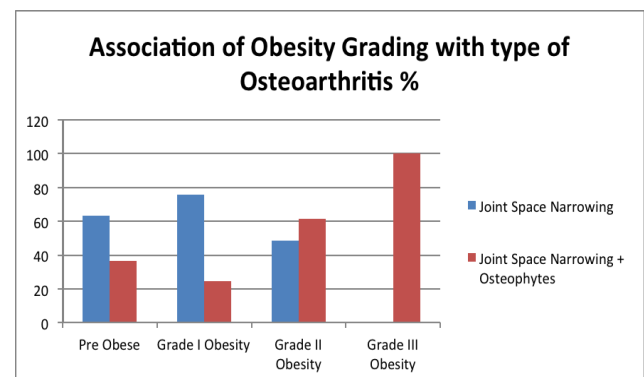
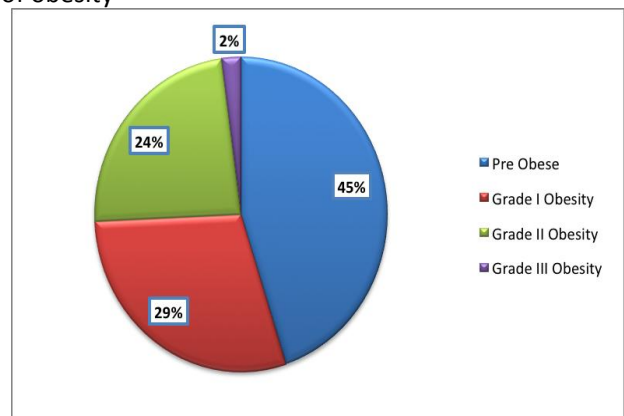
Data was entered on Microsoft excel 7 and exported to SPSS version 21 for analysis. Mean and standard deviation was taken out for numerical variables. Frequencies and percentages were taken out for categorical variables. Chi Square as test of

significance was applied for finding association between BMI and X-ray findings. Pooled t test was applied for finding difference in mean age based on X-ray findings. P value less than 0.05 was taken as significant. Ethical consent was taken from the LNH ERC.

RESULTS

A total of n=140 diagnosed cases of osteoarthritis was recruited in the study. Females were 73% (n=102) while males were 27% (n=38). The mean age of the sample was 52 years (±7.8). The mean age at onset of disease was 49 years (±7.6). The mean for the duration of disease at the time of data collection was 3.3 years (±1.7). Categorization of age at disease onset revealed 39% (n=55) had the disease diagnosed when they were less than 45 years while remaining 61% (n=85) had the disease after 45 years. When duration of disease was categorized 89% (n=125) had osteoarthritis for less than 5 years while remaining 11% (n=15) had the disease for more than 5 years.

Graph 1: Percentage of Patients with different grades of obesity



X-ray findings revealed that joint space narrowing was present in 63% (n=88) patients, while 37% (n=52) had joint space narrowing as well as Osteophytes formation. When treatment already taken was asked from the participants, 71% (n=99) were taking treatment from allopathic doctor, 16% (n=22) were consulting homeopaths and remaining 13% (n=19) were taking treatment from Hakeems.

Significant association was observed when obesity grades were associated with X-ray findings of Osteoarthritis. Grade II and Grade III obesity patients

both had more number of patients with both joint space narrowing and Osteophytes (P value 0.013) **Table 1**. No significant association was observed when gender, duration of disease and age of disease onset were associated with findings on X-rays **Table 2**. There was no difference in the mean age of patients when categorized into two groups of joint space narrowing and joint space narrowing with Osteophytes (P value 0.093).

Table 1: Association of Obesity Grades with type of Osteoarthritis

	Joint Space Narrowing		Joint Space Narrowing + Osteophytes		P Value
	N	%	N	%	
Pre Obese	40	63.5	23	36.5	0.013
Grade I Obesity	31	75.6	10	24.4	
Grade II Obesity	16	48.5	17	61.5	
Grade III Obesity	0	0	3	100	

Table 2: Association of gender, disease duration and age of onset of disease with type of Osteoarthritis

		Joint Space Narrowing		Joint Space Narrowing + Osteophytes		P Value
		n	%	N	%	
Gender	Males	22	58	16	42	0.329
	Females	65	64	37	36	
Age at disease Onset	< 45 Years	30	54.5	25	45.5	0.095
	≥45 Years	57	67	28	33	
Disease Duration	< 5 Years	77	61.6	48	38.4	0.467
	≥5 Years	10	66.7	5	33.3	

DISCUSSION

Obesity is an important modifiable risk factor for developing knee osteoarthritis as it can cause altered knee joint loading patterns & knee joint mal alignment [35, 36, 37]. In addition, adipose tissue is a rich source of adipokines that mediate synovial tissue inflammation & increase in cartilage matrix synthesis & degradation [38, 39]. A number of studies have shown a strong correlation between increased BMI and knee osteoarthritis in all populations [40]. Osteoarthritis tends to be more progressive in the obese [41]. Statistically significant relationships have been found even between small increases in BMI and the prevalence of osteoarthritis [[42]. An increased BMI has been shown to have a strong association with osteoarthritis of weight bearing joints (hip and knee),

as well as the non-weight bearing joints (hands) [43]. A study done in 2012 by Patil on 102 patients with osteoarthritis reported that 55.9% people out of these were obese [44].

A similar study done in Jordan in 2013 showed an association of increased BMI with knee osteoarthritis. The mean BMI in these patients who had radiographic knee osteoarthritis was 29.5(±5.6) [45]. Studies indicate that a BMI>30 at the baseline of the follow-up had a 7-fold risk of developing knee osteoarthritis as compared to those with a BMI<25. In addition, women were more prone to develop osteoarthritis as compared to men [46]. In our study a majority of the patients were females 73% (n=102) while males were 27% (n=38) & a majority of patients with radiographic findings on X-ray were from grade II & III obesity as

defined by a BMI ranging from 35-40 (WHO). A study conducted by Sharma on the elderly population showed that the prevalence of osteoarthritis was 51.4% in patients with BMI < 25, whereas it increased to 100% in patients with BMI > 40 [47]. By contrast the mean age of the sample was 52 years (± 7.8) & the mean age at onset of disease was 49 years (± 7.6) in our study.

A study conducted by Umair Khalid in Bahawalpur Pakistan showed that obesity was a significant risk factor for osteoarthritis in our population also with 93.3% of the obese patients having knee osteoarthritis [48]. As obesity precedes knee osteoarthritis weight loss regimens may help in delaying the development of disease [49] and weight reduction was shown to be an effective primary and secondary strategy of disease prevention [50].

CONCLUSION

Our study found a significant association between obesity grading & knee osteoarthritis.

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