



Original Article

Obesity and Overweight in Women with Knee Osteoarthritis Secondary to Menopause

Gulraiz Enderyas^{1*}, Sania Rasool¹, Farooq Islam¹, Asim Raza¹, Nayab John¹

^{1*}Department of Rehabilitation Sciences, The University of Chenab, Gujrat, Pakistan

ABSTRACT

Background: Knee osteoarthritis, a degenerative joint disease, causes pain and stiffness in the knee joint, especially in obese people. Obesity is a significant risk factor for knee osteoarthritis. **Objective:** To estimate the prevalence of obesity and overweight in post-menopausal women secondary to knee osteoarthritis. **Methods:** This descriptive cross-sectional study was conducted from January to August 2022. A sample of 223 participants was collected from Aziz Bhatti Shaheed hospital Gujrat, tertiary headquarters hospital Lalamusa & Kharian and National orthopedics hospital Gujrat. Non-probability convenient sampling technique was used to recruit women categorized according to the set criteria of body mass index and waist-to-hip circumference ratio. Anthropometric measurements were taken by using a weight machine and measuring tape. Data were analyzed by using SPSS version 24. For descriptive analysis, mean and standard deviations were calculated for quantitative variables whereas frequency and percentages were used for qualitative variables. **Results:** Results indicate that out of 223 individuals 52% of participants were overweight, 20.2% participants were obese and 27.8 % participants were of normal weight. The mean age of the participants was 64.2 ± 7.66 . Age group and family history of knee osteoarthritis are highly associated with the body mass index of the participants ($p < 0.001$). Family history of knee osteoarthritis and waist-to-hip circumference ratio were significantly associated with each other ($p < 0.001$). **Conclusion:** The prevalence of overweight women is high and the calculated prevalence of obesity in people with knee osteoarthritis is relatively low. These findings are related to the age group and family history of the condition. Thus, obesity and being overweight are major contributors to knee osteoarthritis.

Access
the
article
online



SCAN ME

*Corresponding Author:

Gulraiz Enderyas, Department of Rehabilitation Sciences, The University of Chenab, Gujrat, Pakistan

Email: gulraizpt@gmail.com

Keywords Knee Osteoarthritis; Obesity; Post-Menopause

Citation: Enderyas G, Rasool S, Islam F, Raza A, John N. Obesity and overweight in women with knee osteoarthritis secondary to menopause. The Healer Journal of Physiotherapy and Rehabilitation Sciences, 2022; 2(3):197-204.

INTRODUCTION

In the human body, the femur, tibia, and patella make up the three bones that form the tibiofemoral (TF) joint, a synovial pivot joint. The knee also has a patellofemoral (PF) joint in addition to the TF joint. The knee is balanced out by both essential and optional stabilizers. Essential adjustment is given through tendons, while muscles around the knee joint assume an optional part, both work harmoniously to assist in knee joint function.¹ Osteoarthritis (OA), the most well-known mild outer muscle disorder that can damage the joint, primarily affects the hip and knee since they support the bulk of the body's weight. Due to the higher prevalence of OA, it is predicted that 250 million people globally suffer from its deleterious effects.²

Knee OA is a degenerative joint condition that affects older adults and is associated with chronic pain, tightness and impairment. Pathologically, it is characterized by modification in articular cartilage and narrowing of joint spaces and osteophytes.

Obesity, joint damage, age, sex and genetics all have a role in the development of the illness.³ OA development and progression are significantly correlated with obesity which negatively impacts weight-bearing joints by increasing joint loading as a result of extra weight.⁴ Obesity significantly affects the knee joint metabolically, placing a significant mechanical strain on the joint. Unusual loads cause changes in the mechanical characteristics and structure of articular cartilage. Body weight has a significant impact on muscle strength which represents the ability to perform work. Muscle weakness can reduce a joint's ability to absorb shock which can cause cartilage fibrillation.⁵

Menopause is defined as 12 months after the last menstrual period and also remarks the end of the menstrual cycle. The main factor contributing to menopause is obesity, not only a medical but a socio-economic problem.⁶

Prevalence of metabolic syndrome closely associated with obesity after menopause. Estrogen connects with receptors that belong to a family of nuclear receptors, to cause biological effects.⁶ Women are more likely to develop OA than males, and other risk factors for the disease include weight, family history, knee injury, the presence of hand OA, and quadriceps strength. There is debate over the existence of this syndrome, but there is no debate over the fact that peri-menopausal women have a higher prevalence of OA than those of other ages.⁷ In previous studies, the prevalence of knee OA had been frequently measured in obese and non-obese populations. Very limited literature is present which tells us about the prevalence of obesity in post-menopausal women affected with knee osteoarthritis. Therefore, the purpose of this study was to find obesity and overweight in post-menopausal women secondary to knee OA.

METHODS

This cross-sectional study was conducted in the tertiary headquarters hospital (Theekrian) Lalamusa, & Kharian, Aziz Bhatti Shaheed hospital and National orthopedic hospital Gujrat from January to August 2022. The sample size was collected through a formula, $n = z^2 p(1-p)/d^2$ where n is the sample size, z is the statistic corresponding to the level of confidence, p means expected prevalence and had a value of 0.50, while d stands for precision (corresponding to effect size) and had a value of 0.05 respectively. Post-menopausal women from 50 to 75 years of age⁸, having OA diagnosed by physician⁹ were

included in the study.¹⁰ Patients having a history of thyroid disease (hypothyroidism),¹¹ malignant tumor,¹² rheumatoid arthritis,¹³ edematous diseases like congestive heart failure, liver cirrhosis and end-stage renal disease.^{12,14} Women diagnosed with knee OA were interviewed and a questionnaire was answered using the patient's file including demographics and medical history.

Anthropometric measurements were taken by using a weight machine and measuring tape. According to the information retrieved, women were categorized according to the set criteria of body mass index (BMI) and waist-to-hip circumference ratio. The validity of waist to hip (WTH) circumference ratio is 0.84.¹⁵ Potentially volunteer participants were included after taking informed consent.

A self-administered performa was used and BMI was checked according to height and weight while waist to hip circumference ratio was checked with a measuring tape to calculate obesity in females with menopause. Data were entered and analyzed through SPSS version 24. For descriptive analysis, mean and standard deviations were calculated for quantitative variables whereas frequency and percentages were used for qualitative variables. The chi-square test was used to analyze the data. All results were calculated at a 95% confidence interval and a p-value ≤ 0.05 were considered a significant value.

RESULTS

Means and standard deviations of age, BMI and waist-to-hip circumference score were mentioned in Table I while descriptive statistics of variables are given in Table II. Age group is highly associated with the BMI of the participants, ($\chi^2=51.253$, $p<0.001$). Family history of knee OA and BMI were highly associated ($\chi^2=29.544$, $p=0.001$). Blood transfusions and BMI were highly correlated with each other ($\chi^2=56.785$, $p=0.001$). Waist to hip circumference ratio was highly associated ($\chi^2=69.195$, $p=0.001$). Parity and waist-to-hip circumference ratio showed significant results ($\chi^2=17.552$, $p=0.025$, <0.05).

On the other hand, gravida and waist-to-hip circumference ratio were also associated ($\chi^2=19.686$, $p=0.012$, <0.05). Family history of knee OA and WTH ratio were highly associated ($\chi^2=12.078$, $p=0.002$, <0.05). Blood transfusions and WTH ratio showed significant results ($\chi^2=56.785$, $p=0.001$, <0.05).

DISCUSSION

The present study finds that the mean age of patients diagnosed with knee OA is above 65, mean BMI among participants was from 25-30kg/m². In a previous study, a cross-sectional study found that women's body composition was more closely associated with the development of knee OA than it was for men. The mean BMI of the participants was (25 \pm 0.2, $p<0.0001$) which shows that higher BMI or BMI in the overweight category is positively associated with obesity and knee OA.

Table I: Demographics

Statistics	Mean \pm S.D
Age (years)	64.2 \pm 7.66
Body mass index (kg/m ²)	28.7 \pm 5.83

Waist-to-hip circumference score

0.93±0.09

Table II: Descriptive Statistics

Variables	Categories	Frequency (%)
Age (years)	50-55	34(15.2)
	56-60	46(20.6)
	61-65	51(22.9)
	>65	92(41.3)
BMI	18.5-25 (Normal weight)	62(27.8)
	25-30 (Overweight)	116(52.0)
	30-35 (Obese class 1)	23(10.3)
	35-40 (Obese class 2)	10(4.5)
	>40 (Obese class 3)	12(5.4)
Waist-to-hip circumference ratio	0.75-0.79 (Good)	10(4.5)
	0.80-0.86 (Average)	49(22.0)
	>0.86 (At risk)	164(73.5)
Number of children	0-2	14(6.3)
	2-4	88(39.5)
	4-6	84(37.6)
	6-8	20(9.8)
	8-10	15(6.8)
Number of pregnancy	0-2	15(6.8)
	2-4	86(38.5)
	4-6	84(37.6)
	6-8	23(10.3)
	8-10	15(6.8)
Family history of knee OA	Yes	147(65.9)
	No	76(34.1)
Comorbidity	Yes	150(67.3)
	No	73(32.7)
Blood transfusion	Yes	54(24.2)
	No	169(75.8)

Table III: Association Between Different Variables

Variables	Chi-Square Value	P-value
Age group vs BMI	51.253	<0.001*
Number of children vs BMI	18.44	0.299
Number of pregnancy vs BMI	16.215	0.438
Family history of knee OA vs BMI	29.544	<0.001*
Comorbidity vs BMI	3.551	0.47
Blood transfusion vs BMI	56.785	0.001*
Age group vs waist to hip circumference ratio	69.195	<0.001*
Number of children vs waist to hip circumference	17.552	0.025*
Number of pregnancies vs waist to hip circumference ratio	19.686	<0.012*
Family history of knee OA vs waist-to-hip circumference ratio	12.078	<0.002*
Comorbidity vs waist to hip circumference ratio	6.281	0.43
Blood transfusion vs waist to hip circumference ratio	56.785	<0.001*

In a recent study, waist to hip circumference ratio of the maximum participants was >0.86. The waist circumference in the previous study was (0.84±0.4, p<0.0001) which shows that obesity and waist-to-hip circumference ratio were closely associated with each other.¹⁶ In a previous study, a cross-sectional study of

middle-aged or older Chinese women revealed the combined effects of reproductive and hormone variables, obesity and knee OA on the prevalence of the condition and knee discomfort that the participants with clinical knee OA of older age, higher BMI, increased number of pregnancies and longer post-menopause duration.¹⁷

This study analysis revealed that the mean age for knee OA is above 65, the mean BMI was 25-30kg/m², mean gravida of the participants was between 4-6 which is about 38.57%. A study concluded that age groups more than 65 years were highly associated with waist-to-hip circumference ratio (>0.86) at risk which was around 47%. Comparing parity with waist-to-hip circumference ratio showed that those who had 4-6 children were more likely to have a good waist-to-hip circumference ratio (0.75-0.79). Participants with waist-to-hip circumference ratio at risk showed positive significance with family history, blood transfusion and multiple comorbidities with knee OA.

Following existing literature waist to hip circumference ratio showed a significant association with age, obesity and multiple comorbidities.¹⁹ A study was performed in china and the study aimed to find the risk of OA with increasing BMI and finds that for every five kg/m² increase in body mass index the risk for osteoarthritis increases by thirty-five percent. Regardless of the country in which the study was performed, sample size, or gender. Knee OA was highly associated with obesity. For the therapy of knee osteoarthritis, experts should consider potential weight loss.²⁰ Furthermore, the current study reveals a high correlation between BMI and knee OA, with 52% of participants being overweight and 20.2% being obese.

A previous cross-sectional study suggests that after correcting for confounding variables like age, height, physical activity, BMI, body weight, fat mass and lean mass were all substantially linked with knee OA ($p < 0.001$). According to this recent research, mean body mass index was 28.7 ± 5.83 . Previous study showed that fat mass was found to be more tightly and substantially correlated with knee OA than lean mass.

Additionally, there was a favorable correlation between knee OA and the fat mass/lean mass ratio ($p < 0.001$).¹² According to a study done in China, 223 of the 391 participants were overweight, 111 were in stage 1 obesity, and 57 were in stage 2 obesity ($p < 0.001$). They claimed that BMI did not affect age or sex, however, our research found a strong correlation between age and BMI. This analysis demonstrated a negative connection between BMI and comorbidities ($p = 0.47$), previous research showed that comorbidities were significantly connected with BMI ($p < 0.001$).²¹ The limitation of this study was that the findings do not apply to the entire country of Pakistan or the surrounding region. All respondents were given assurances regarding the privacy of the data and advised to respond truthfully to all questions about their point of view and not to ask for a second opinion when completing the performa.

CONCLUSION

The prevalence of overweight is found to be high and the calculated prevalence of obesity in people with knee osteoarthritis is mild. These findings are related to the age group and family history of the condition. Thus obesity and being overweight are found to be major contributors to knee osteoarthritis.

DECLARATIONS

Consent to participate: Written consent had been taken from patients. All methods

were performed following the relevant guidelines and regulations.

Availability of data and materials: Data will be available on request. The corresponding author will submit all dataset files.

Competing interests: None

Funding: No funding source is involved.

Authors' contributions: All authors read and approved the final manuscript.

REFERENCES

1. KANG K-T, KOH Y-G, LEE J-A, et al. Computational biomechanics of knee joint arthroplasty: a review. 2020;7(1):19-00338-00319-00338.<https://doi.org/10.1299/mer.19-00338>
2. Primorac D, Molnar V, Rod E, et al. Knee osteoarthritis: a review of pathogenesis and state-of-the-art non-operative therapeutic considerations. 2020;11(8):854.<https://doi.org/10.3390/gene s11080854>
3. Godziuk K, Prado CM, Woodhouse LJ, et al. The impact of sarcopenic obesity on the knee and hip osteoarthritis: a scoping review. 2018;19(1):1-10.<https://doi.org/10.1186/s12891-018-2175-7>
4. Kulkarni K, Karssiens T, Kumar V, et al. Obesity and osteoarthritis. 2016;89:22-28.<https://doi.org/10.1016/j.maturitas.2016.04.006>
5. Sowers MR, Karvonen-Gutierrez CAJCoir. The evolving role of obesity in knee osteoarthritis. 2010;22(5):533.<https://doi.org/10.1097/bor.0b013e32833b4682>
6. Kozakowski J, Gietka-Czernel M, Leszczyńska D, et al. Obesity in menopause—our negligence or an unfortunate inevitability?

- 2017;16(2):61.<https://doi.org/10.5114/pm.2017.68594>
7. Hanna FS, Wluka AE, Bell RJ, et al. Osteoarthritis and the postmenopausal woman: epidemiological, magnetic resonance imaging, and radiological findings. *Seminars in arthritis and rheumatism*: Elsevier 2004;631-636.<https://doi.org/10.1016/j.semarthrit.2004.07.007>
8. Casilda-López J, Valenza MC, Cabrera-Martos I, et al. Effects of a dance-based aquatic exercise program in obese postmenopausal women with knee osteoarthritis: a randomized controlled trial. 2017;24(7):768-773.<https://doi.org/10.1097/gme.00000000000000841>
9. Schlenk EA, Lias JL, Sereika SM, et al. Improving physical activity and function in overweight and obese older adults with osteoarthritis of the knee: a feasibility study. 2011;36(1):32-42.<https://doi.org/10.1002/j.2048-7940.2011.tb00063.x>
10. Runhaar J, van Middelkoop M, Reijman M, et al. Prevention of knee osteoarthritis in overweight females: the first preventive randomized controlled trial in osteoarthritis. 2015;128(8):888-895. e884.<https://doi.org/10.1016/j.amjmed.2015.03.006>
11. Kim HI, Ahn SH, Kim Y, et al. Effects of Sarcopenia and Sarcopenic Obesity on Joint Pain and Degenerative Osteoarthritis in Postmenopausal Women. 2021.<https://doi.org/10.1038/s41598-022-17451-1>
12. Nur H, Tuncer TJJJoPM, Rehabilitation. The relationship between body composition and knee osteoarthritis in postmenopausal women. 2018;64(2):121.<https://doi.org/10.5606/tftrd.2018.1496>
13. Grotle M, Hagen KB, Natvig B, et al. Obesity and osteoarthritis in knee, hip and/or hand: an epidemiological study in the general population with 10 years follow-up. 2008;9(1):1-5.<https://doi.org/10.1186/1471-2474-9-132>
14. Rogers MW, Wilder FVJbmd. The association of BMI and knee pain among persons with radiographic knee osteoarthritis: A cross-sectional study. 2008;9(1):1-6.<https://doi.org/10.1186/1471-2474-9-163>
15. Reidpath DD, Cheah JC-H, Lam F-C, et al. Validity of self-measured waist and hip circumferences: results from a community study in Malaysia. 2013;12(1):1-5.<https://doi.org/10.1186/1475-2891-12-135>
16. Suh D, Han K, Hong J, et al. Body composition is more closely related to the development of knee osteoarthritis in women than men: a cross-sectional study using the Fifth Korea National Health and Nutrition Examination Survey (KNHANES V-1, 2). 2016;24(4):605-611.<https://doi.org/10.1016/j.joca.2015.10.011>
17. Zhou M, Chen J, Wang D, et al. Combined effects of reproductive and hormone factors and obesity on the prevalence of knee osteoarthritis and knee pain among middle-aged or older Chinese women: a cross-sectional study. 2018;18(1):1-9.<https://doi.org/10.1186/s12889-018-6114-1>
18. Chung GK, Ruby H, Woo J, et al. Accelerated progression of waist-to-hip ratio but not body mass index associated with lower socioeconomic position: a cohort study of nonobese early postmenopausal Chinese women. 2020;27(5):550-558.<https://doi.org/10.1097/gme.00000000000001503>
19. Koch E, Bogado M, Araya F, et al. Impact of parity on anthropometric measures of obesity controlling by multiple confounders: a cross-sectional study in Chilean women. 2008;62(5):461-

470.<http://dx.doi.org/10.1136/jech.2007.062240>

20. Zheng H, Chen C. Body mass index and risk of knee osteoarthritis: systematic review and meta-analysis of prospective studies. *BMJ Open*. 2015;5(12):e007568.<https://doi.org/10.1136/bmjopen-2014-007568>

21. Raud B, Gay C, Guiguet-Auclair C, et al. Level of obesity is directly associated with the clinical and functional consequences of knee osteoarthritis. *BMJ Open*. 2020;10(1):1-7.<https://doi.org/10.1038/s41598-020-60587-1>