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Evaluation of Quadriceps Angle and Waist Hip Ratio in Relation to Body Man Index Among Multiparous Women

Atif Maqsood [a]

Abstract: *It is difficult to determine the appropriate way to assess body habitus as a risk factor for chronic illness. This study examined the age, BMI, and WHR data of 200 multiparous women who were diagnosed with knee osteoarthritis (OA) in our registry. The study also conducted stratified analysis by multiparous women and computed risk ratios (RRs) by WHR for those who were already considered obese according to the BMI criterion. According to the study's findings, 38% of multiparous women and 42% of single women were obese according to the BMI criterion. WHR categorised obese women as being multiparous (92% vs. 82%). For multiparous women, the RR of being obese, as measured by WHR, if considered obese according to the BMI criterion was 1.04 (95% confidence range (95% CI 1.03-1.46). The overlap between BMI and WHR is larger in multiparous women than it is in other individuals with knee OA.*

Key Words: (WHR), (BMI), WHR, Knee Osteoarthritis (OA), Multiparous Women

Introduction

One of the most prevalent and maybe the oldest medical conditions in the world is osteoarthritis. Both early cavemen and dinosaurs experienced it! Arthritis may be seen in the fossilised bones of dinosaurs and other large animals from 200,000,000 years ago. People of all ages, both sexes, and all geographical and racial origins are affected by arthritis. Women are particularly at risk since they make up approximately two-thirds of arthritis sufferers. It may be challenging to provide figures for each region since the actual numbers may vary, but if we use America as a benchmark, one in seven Americans, or close to 40 million people, suffer from some kind of arthritis. With life expectancy on the rise, the number of people with this potentially disabling condition is expected to go up still higher. By 2020, an estimated 60 million people in America will have arthritis. Arthritis is a major cause of disability. On the present estimate, the costs for medical care and lost productivity in America alone amount to $65 billion annually (Tosti, & Ilyas, 2012). The most prevalent musculoskeletal disorder, osteoarthritis is also the main contributor to economic stress and disability. The second-most prevalent rheumatologically illness, osteoarthritis, is a general phrase used to describe it (Bocardi et al., 2012).

Both developed and developing countries like Pakistan are seeing an increase in the incidence of obesity. obesity is strongly linked to diabetes, cardiovascular disease, and death-causing factors. It is a crucial part of the syndrome of insulin resistance. The WHO has also suggested the use of body mass index as a quick, useful, and epidemiological way to identify people who are overweight or obese. The distribution of body fat is not taken into consideration, making it a rudimentary indicator. The waist-hip ratio may be used as a quick screening tool in combination with

a MBBS, MRCP, Assistant Professor of Medicine, Aziz Fatimah Medical and Dental College, Faisalabad, Punjab, Pakistan. Email: dratifmaqsoodyahoo.com *(Corresponding Author)*

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other scientifically-proven methods to identify those who are at increased risk of developing coronary heart disease (CHD). Waist circumference and waist-hip ratio have been utilised as indications of central obesity, although body mass index has been employed as a measure of total obesity (where visceral adipose tissue is deposited) (Rouxel et al., 2017).

The waist-to-hip ratio examines the percentage of body fat that is accumulated in these two locations. The majority of people have two patterns of body fat distribution: an apple-shaped pattern around the midsection and a pear-shaped pattern around the hips. For persons who tend to acquire weight mostly in the maximum time-honoured musculoskeletal disorder, osteoarthritis is likewise the principle contributor to financial strain and disability. People with an apple body shape are more susceptible to health issues than those with a pear body shape (Muhammad et al., 2022).

The clinical identification of central obesity is crucial since lifestyle changes are a stronger predictor of outcome than body mass index. 8 However, waist circumference, which has a high correlation with body mass index, cannot differentiate between total abdominal fat, subcutaneous abdominal fat, and total body fat. The development of diabetes and other disorders is more closely correlated with body fat distribution, particularly abdominal localization, than overall body fat (Misra et al., 2005).

Studies were done by Yilmaz et al., (2019) showed sex variations in knee OA incidence, especially after menopause. Age, gender, and repeated knee bending are the main risk factors for knee OA, according to research. The prevalence of knee OA is 4.24%. A significant difference between the prevalence of knee pain in rural communities (13.7%) and urban communities (6.0%) study was carried out in Pakistan, Bangladesh, and India and each country collected data from a number of communities.

Weight in kilograms divided by the top's rectangular area in metres (Kg/m2) yields the frame's mass index, a weight unit that represents the top's debt in kilogrammes (BMI). Despite the fact that it is frequently employed as a health indicator, body mass index is a proxy for body fats since it measures more weight instead of excess fats (Usman et al., 2022).

Body mass index, in contrast to other approaches, only considers height and weight. Individuals with high body mass indices experience increased knee joint stresses and a stronger connection between axial alignment and dynamic loading than patients without OA knee. According to the biomechanical theory, obesity causes the knee joint to repeatedly experience greater axial stress, which results in articular cartilage deterioration and subchondral bone sclerosis. According to a study, the quadriceps angle and body mass index both significantly contribute to the overall clinical deficiencies in arthritic knees (Seok et al., 2022).

Materials & Methods

From June to August 2022, at the Aziz Fatima Trust Hospital, 90 multiparous female participants in the age range of 20 to 65 years who were socioeconomically matched were chosen by simple random selection from the random number table belonging to the city of Faisalabad. In the Aziz Fatima Trust Hospital's main OA knee patients, this study establishes BMI, WHR, and Q-ANGLE. The Institute Ethical Committee (IEC) granted its approval in terms of science and ethics from June to August 2022. To choose the patients, a stratified purposive sample approach was adopted. Patients who met the medical standards established by the American College of Rheumatology for knee osteoarthritis were also included in the research, along with multiparous women who had unilateral or bilateral osteoarthritis. Exclusion criteria for the study included patients with neurological disorders and uncooperative subjects.

Procedures

When approaching volunteers, the study's proposition was made. The sufferers underwent

screening according to the inclusion and exclusion

criteria. The study was fully described to those who met the criteria, and individuals who were ready to participate provided written informed permission in their preferred language. Body mass index, waist-hip ratio, and quadriceps angle are included in the measurement. A portable weighing scale that was calibrated in kilograms was used to determine the individuals' body weight. The individual stood barefoot while being measured for height using a set height measuring tape. Following that, the BMI was determined using the provided formula.

To Measure the Waist Circumference

Measurements had been taken halfway between the lowest point of the last palpable rib and the highest point of the iliac crest. At the broadest part of the buttocks, a measurement of the hip circumference was obtained (Ghulyani et al., 2019). The average of these three values was calculated after three readings were collected. Then, using the stated formula (Waist measurement x Hip measurement = WHR), the waist-hip ratio was determined. The individual was standing with his feet together, his arms at his sides, and his weight evenly spread over both feet. At the conclusion of a typical expiration, the waist circumference was measured. To reduce the abdominal contents' inward pull during the waist measurement, it was advised to all subjects to unwind and take a few slow, deep breaths before the measurement.

The subject was laying supine when the quadriceps angle was measured. on the affected limb, the anterior superior iliac spine (ASIS), the patellar centre, and the tibial tuberosity were all recognised as landmarks. Borders of the patella were felt to determine its centre, and its contour was then traced with a body marker while being careful not to strain the skin. The centre of the patella must be determined by finding the intersection of the patella's maximal vertical and transverse dimensions. The tibial tuberosity is identified as the region. After that, the pelvis was squared. With the pointed upward and perpendicular to the resting surface, subjects were taught to relax their quadriceps muscles. The moveable arm of the goniometer was aligned with the tibial tuberosity, the fixed arm with the ASIS, and the axis with the centre of the patella. It was extended upward to create the quadriceps angle. The continuous and independent variables BMI, WHR, and Q-ANGLE. The "Pearson test" was used to determine whether the data distribution was normal, and it revealed that it was ($p > 0.05$). A 0.05 p-value and a 95% confidence range were used for the tests.

Results

out of a total of 90 multiparous females, 130 were found to meet the inclusion criteria and were assessed; 90 of these women underwent analysis for the research. There, factors and demographic data were measured. BMI, WHR, and Q-ANGLE had mean & standard deviations of 27.28 4.05 kg/m2, 0.91 0.07, and 19.7 2.06 , respectively. only the significant positive connection between BMI and Q-ANGLE was identified among these three variables (p 0.05), whereas the substantial positive correlation between the significant negative correlation and Q-ANGLE were both determined to be inconsequential.

BMI & WHR

Table 1. Displaying the correlation coefficient between BMI and WHR.

Pearson correlation coefficient	BMI
BMI	1
WHR	0.021

The following table shows a positive, insignificant correlation between BMI and WHR, indicating that both parameters contribute equally as risk factors for primary OA knee. WHR stands for waist-hip ratio and BMI is for body mass index.

BMI & Q-Angle

Table 2. Displays the correlation coefficient between BMI and Q-ANGLE.

Pearson correlation coefficient	BMI
BMI	1
Q-ANGLE	0.168

The table indicates a significant positive

relationship between BMI and Q-ANGLE, implying that as BMI rises, so will Q-angle. BMI stands for body mass index, while Q-ANGLE is the quadriceps angle.

WHR & Q-Angle

Table 3. displays the correlation coefficient between WHR and Q-ANGLE.

Pearson correlation coefficient	WHR
WHR	1
Q-ANGLE	- 0.023

In the aforementioned tab1e, the waist-hip ratio (WHR) and quadriceps ang1e (Q-ANG1E) have a negative, negligible correlation, which implies that as WHR increases, Q-ang1e will fall.

Discussion

This look targeted at figuring out the connection among BMI, WHR, and Q-ANG1E in sufferers with the number one osteoarthritic knee when you consider that those 3 modifiable impartial hazard variables are recognized to predispose people to grow OA knee. For this investigation, the subjects' height (m), weight (kg), waist and hip circumferences (cm), and Q-angle (in degrees) had been measured. The outcomes confirmed that BMI and Q-ANGLE have a massive nice link, however, there aren't any giant nice or bad correlations among BMI, WHR, and Q-ANGLE.

The frame mass index (BMI), a weight size that takes a peak into account, is acquired by dividing weight in kilograms through the rectangular peak in metres (Kg/m2) (BMI). Body mass index is a quick, low-cost, and non-invasive substitute for measuring body fat. Body mass index, in contrast to other approaches, only considers height and weight. Individuals with high body mass indices experience increased knee joint stresses and a stronger connection between axial alignment and dynamic loading than patients without OA knee. According to the biomechanical theory, obesity causes the knee joint to repeatedly experience increased axial loading, which causes articular cartilage to deteriorate and subchondral bone to sclerose. The results showed that body mass index significantly positively correlates with Q-ANGLE in terms of overall clinical deficits in the knee (Prakash, Sahay, & Satapathy, 2017).

In a similar vein, Felson et al. (1991) discovered that those with knee OA symptoms had higher BMI values than those without symptoms. 86.5 per cent of the study's participants were obese or obese plus obese. Clinical comparisons between the pull of the quadriceps and patellar ligaments may be made using a metric known as the quadriceps mindset. The tibial tuberosity, which connects to the middle of the patella, and the anterior superior iliac spine (ASIS), which connects to the centre of the patella, make up the quadriceps perspective. In both men and women, the quadriceps attitude ranges from 12 to 15 levels.

The seamless gliding motion of the patella and knee is hampered by a high quadriceps angle. Over time, especially with repetitive motions, the cartilage on the lower portion of the patella starts to deteriorate and weaken, causing generalised knee pain and ultimately leading to osteoarthritis. A quadriceps-centric approach will amplify patellofemoral illnesses by increasing the quadriceps femoris muscle's lateral pull against the patella. Any change in alignment that broadens the quadriceps' perspective causes the patella's lateral pressure to rise.

The results of this study examined a strong, positive relationship between Q-perspective and BMI in OA knees, showing that an increase in BMI significantly causes an increase in Q-ANGLE, predisposing to deficits in OA knee. Over time, especially with repetitive motions, the cartilage on the lower portion of the patella starts to deteriorate and weaken, causing generalised knee pain and ultimately leading to osteoarthritis. A quadriceps-centric approach will amplify patellofemoral illnesses by increasing the quadriceps femoris muscle's lateral pull against the patella. Any change in alignment that broadens the quadriceps' perspective causes the patella's lateral pressure to rise.

The results of this study examined a strong, positive relationship between Q-perspective and

BMI in OA knees, showing an increase in BMI significantly (Phatama et al., 2022).

Emmanuel et al., (2015) stated that the BMI and Q-perspective were common predictors of the overall scientific deficiencies in the people who were selected. The study included more women (82.7%) than males (17.3%), which is consistent with earlier data showing that 10% of men and 13% of women, respectively, had symptoms of knee OA. They ultimately came to the conclusion that the Q-angle and frame mass index greatly contribute to the medical defects of knee OA. They postulated a potential mechanism in which any alignment change that rises a Q-perspective is supposed to hasten the lateral strain on the patella.

Lee et al. (2014) discovered that exceptionally high Q-angles (more than 15 for adult males and 20 for women) are anatomical risk factors for PFPS of the knee. The knee joint endures a magnified axial load as a result of weight advantage, which affects the articular cartilage (elevated BMI). It will also enhance lateral pressure on the knee with three compartments. According to the findings, both BMI and Q-angle raise the likelihood of developing the primary OA knee. As a result, the risk factors for the initial OA knee can also be used as credible interdependent risk factors for the same disease.

In their meta-analysis, Aslan and Genç (2022) discovered a significant increase in the likelihood of knee OA with BMI. Compared to the reference BMI of 22.5 kg/m2, point estimates of BMI at 25 kg/m2 and 30 kg/m2 demonstrated greater odds of knee OA of 1.59 (95% CI: 1.34-1.81) and 3.55 (95% CI: 2.51-5.11), respectively. Furthermore, they observed that when BMI increased, the incidence of knee OA increased nearly tenfold. Certain studies have been conducted to investigate the association between increasing BMI and the risk of knee OA. Carrying too much body weight places a significant mechanical burden on the knee, which is critical. Additionally, a clinical investigation supported the idea that aberrant stresses might alter the structure, composition, and mechanical characteristics of articular cartilage (Metgud et al., 2022).

Conclusion

A risk factor for primary OA knee, according to the current study's results, is a combination of BMI and Q-angle. Clinical evidence shows that when weight increases, the knee joint experiences more axial stress, which changes the Q-angle and ultimately leads the patella to pull to one side, increasing the likelihood of developing osteoarthritis (OA). The current study's findings support the notion that BMI and WHR are independent risk factors for OA knees. This is due to the fact that an increase in body fat mass (WHR) leads to an increase in weight, and an increase in weight changes BMI, which causes OA knee. Additionally, the current study supports the idea that WHR and Q-ANGLE, which are inversely correlated, are not major risk factors for osteoarthritis of the knee. As a result of the analysis, BMI, WHR, and Q-ANGLE are risk factors for the number one OA knee in addition to being independent risk factors for the same.

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