Measurement of Q Angle in Females with Knee Pain

Zainab Ghakhar

Riphah International University

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ABSTRACT

Insall and his colleagues introduced the Q-angle also called as quadriceps angle a clinical measurement to assess patellar alignment. It has since become a standard part of knee examinations and is widely used in orthopedics and sports medicine. [4] A common clinical metric utilized in the evaluation of individuals with knee joint issues, such as Anterior Knee Pain, is the quadriceps angle. [1] The Q angle, defined as the angle between the quadriceps tendon and the patellar tendon, is a widely used clinical measurement to assess lower extremity alignment and its potential relationship with knee pathologies, particularly in females. [2, 3]

Aim: To calculate the Quadriceps angle in females with complain of Knee pain.

Material and Methods: A total of 161 female patients with complain of knee pain were included in this descriptive cross sectional study who qualified the inclusion criteria. Along with patient history, Q-angle was measured in a supine position using universal goniometer and readings were evaluated using spss 17.

Results: The results indicated Age and mean Q angle were moderately correlated, although the relationship was not statistically significant, $r = .39$, $p > .05$. Female subjects experiencing knee pain exhibited a wider quadriceps angle, particularly in the age group 36 to 45. The mean Q angle calculated to be 21.1° with standard deviation of 1.43 (21.1° ± 1.43).

Conclusion: The women with knee pain were found to have larger Q angles.

Keywords: Q angle, Knee Pain, female

INTRODUCTION

The Q angle, also known as the quadriceps angle, is a clinical measurement used to assess the alignment of the quadriceps muscle and its tendon relative to the patella and tibial tuberosity. This angle is particularly important in the evaluation of individuals with knee pain, as it can provide insight into potential biomechanical factors contributing to the condition. [5] Several studies have investigated the relationship between Q angle and knee pathologies, particularly in the female population, who are more susceptible to certain conditions such as patellofemoral pain syndrome. [6, 26] Women are more likely than men to have statistically significant higher Q angles, which makes them more vulnerable to injuries or aberrant knee biomechanics. [7] Elderly individuals frequently develop knee osteoarthritis (OA), with twice as many female patients as male patients. [8, 9)]

An article mentioned that due to wide Q angle there is increased foot pronation, foot eversion, patellofemoral tracking therefore leads to pain. [10] One of the many causes of knee pain in adults is due to some mechanical faults in the patellofemoral joint. [11] A considerable amount of people with

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patellofemoral arthritis had described previous anterior knee pain in their puberty and early adult years; anterior knee pain might be a causative factor in causing patellofemoral osteoarthritis. [12] The frequently known cause of knee pain in grown up individuals is patellofemoral pain syndrome or furthermore called chondromalacia patella. In older generation the increasing cause of pain in knee is arthritis. Joint pain is one of the most common chronic types of pain which is mostly due to arthritis. It impacts around 1 in 4 adults[13]

The alignment of quadriceps muscles create a Q angle. This specific angle is formed by two lines that intersect one of which passes from the anterior superior iliac spine ASIS to the midpoint of patella and the second goes from the tibial tuberosity to the mid of patella. [14]

The Q angle values reported in the literature by different researchers differ. It is commonly known that a normal Q angle should range from 12 to 20 degrees; males often fall within this range at a lower angle, whilst females typically have higher values. [19, 20, 21-22]. According to recent research, levels that fall between 8° and 10° for men and up to 15° for women are considered normal; however, numbers that go outside of those ranges may be problematic. Although Davies and Larson did not provide a range for normal values, they believed that Q angles greater than 20° to be excessive. [19, 23]

In a study by Melissa and Terry the results validated the fact that women had wider Q angles than males. [15] Another study presented that male and females of equivalent height had alike Q angles, another thing was noticed that the individuals with lesser Q angle were taller. [16] A research conducted in India established that when women are in lying position the tibial tuberosity is more inclined to move in a lateral direction which might be the reason for wide Q angle in females. [17] An article mentioned that their results were in favor of those reports in which they found that females had large Q angles than males. [18]

LITERATURE REVIEW

Previous research has highlighted the importance of the Q angle in understanding knee mechanics and its potential role in the development of knee pain. One study examined the use of a semi-active knee joint with a pneumatic damper, where the knee angle was considered as a key comparison criterion. [27] Another review discussed the current methods of investigating patellofemoral pain, including the assessment of the Q angle, and emphasized the need for more robust research in this area. [24] Crossley reported that individuals with patellofemoral pain syndrome exhibited a significantly higher Q angle compared to healthy controls. [25] This research indicates a positive correlation between elevated quadriceps angles and a range of knee conditions, including patellofemoral discomfort syndrome and patella dislocation. [6] A study by Peeler et al investigated the reliability of a simplified Q-angle measurement technique, with the hypothesis that this approach would provide clinically reliable results. [26] Belchior et al specifically investigated the effects of maximal voluntary isometric contraction of the quadriceps muscle on the measurement of the Q angle in symptomatic and asymptomatic individuals. The researchers found that the Q angle was significantly greater in the symptomatic group compared to the asymptomatic group, both at rest and during muscle contraction.[30]

METHODOLOGY

To examine the measurement of the Q angle in females with knee pain, a comprehensive literature review was conducted. The review focused on relevant research articles that investigated the assessment of the Q angle and its implications for knee dysfunction, with a specific emphasis on female populations. The search strategy involved querying academic databases such as PubMed, Embase, and Cochrane Library using keywords related to “Q angle,” “knee pain,” and “females.” Included studies were required to provide quantitative data on the Q angle of female participants with knee pain [2, 24, 3-25]. The literature review

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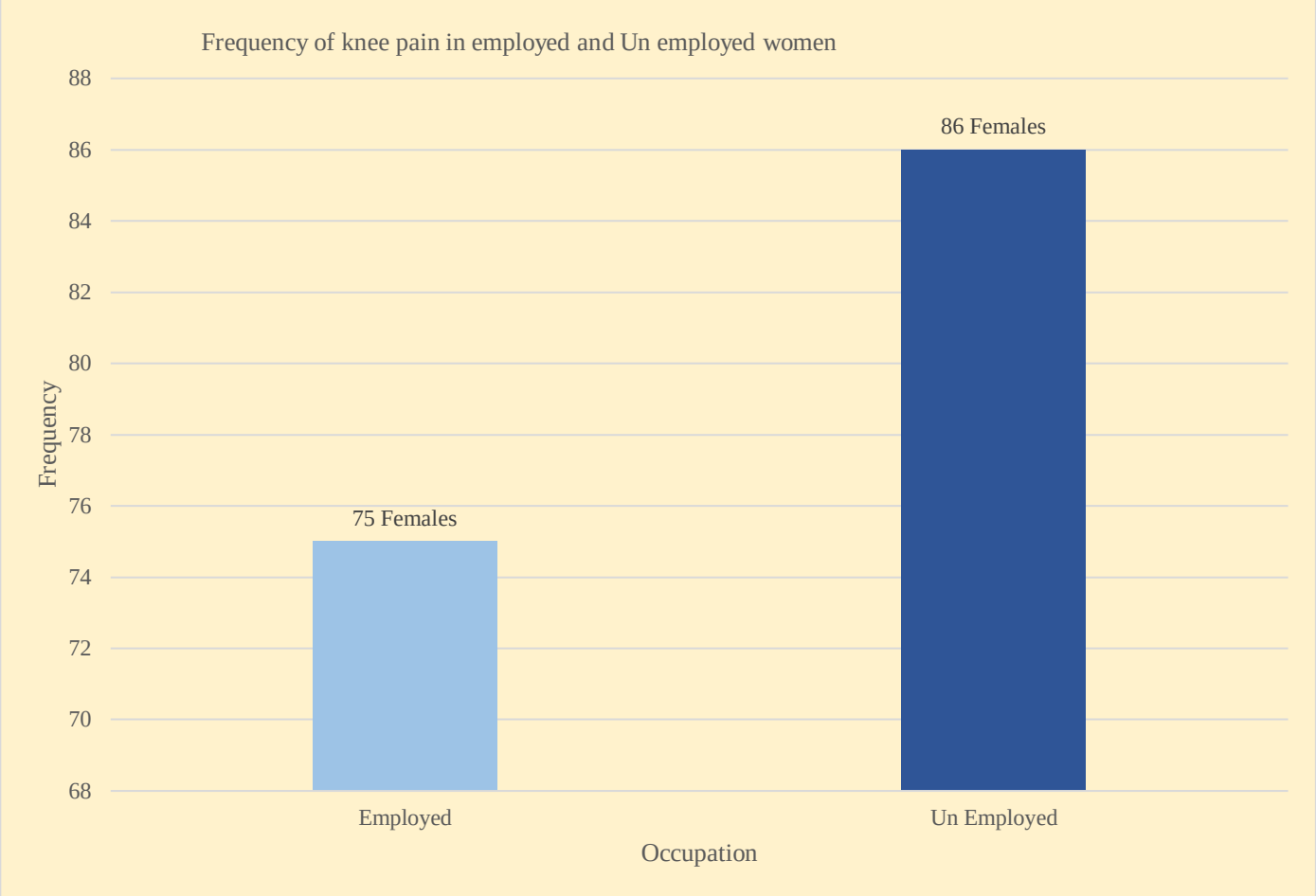
identified several studies that have explored the measurement of the Q angle in females with knee pain. Peeler examined the reliability of a simplified Q angle measurement technique and found it to be a clinically reliable method. [26]

This descriptive cross-sectional study is conducted in the Capital Development Authority Hospital and Railway Hospital of Islamabad, Pakistan. With a sample size of 161 females, purposeful sampling was carried out using predetermined criteria. Women who reported knee discomfort between the ages of 20 and 55 met the inclusion criteria. Males, kids, systemic illnesses, fractures, genetic disorders, and women who did not exhibit any indications of knee discomfort were among the exclusion criteria. The self-structured form and goniometer were the two instruments used to collect the data. Name, age, gender, occupation, address, diagnosis, Q angle readings, and mean value are the variables employed in this study. Goniometric analysis and a self-structured form were used to gather the data. Software called SPSS Version 17.0 (Statistical Procedure of Social Sciences) was used to analyze the data. The patients' participation and agreement allowed for the collection of all the data.

DATA ANALYSIS AND RESULTS

Frequency of knee pain in employed and UN employed Women



Bar Chart: 1

The frequency of knee pain is displayed in this bar graph for 161 females who are both employed and unemployed. Of the sample, 86 women were unemployed, while 75 women from the working class reported having knee pain.

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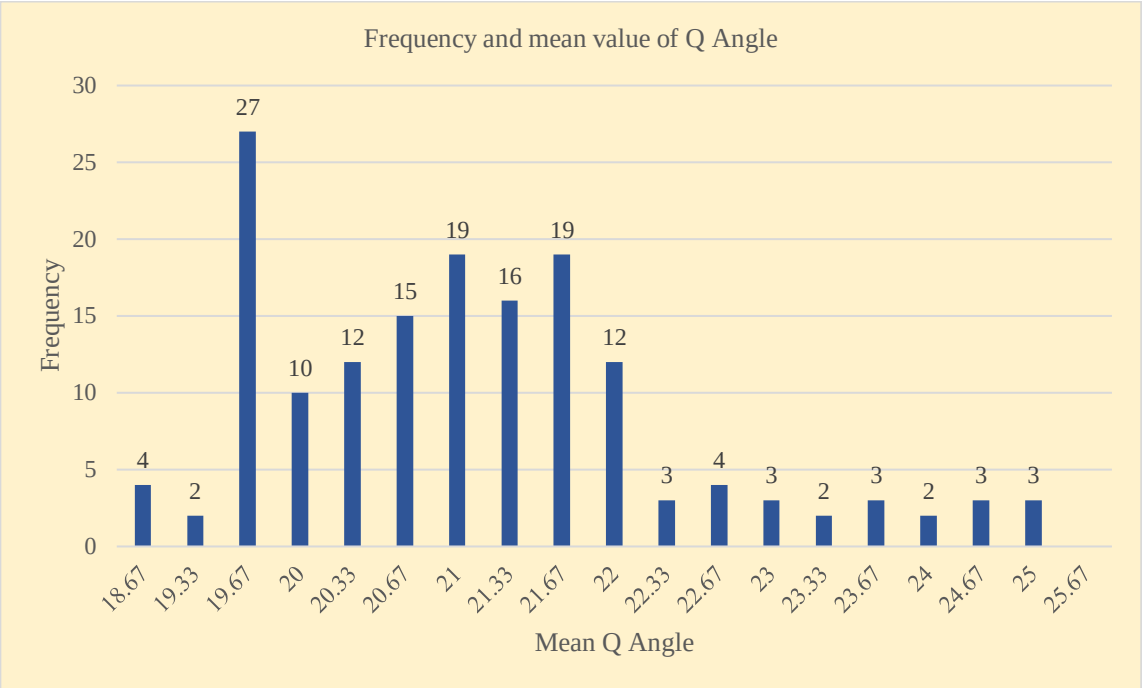
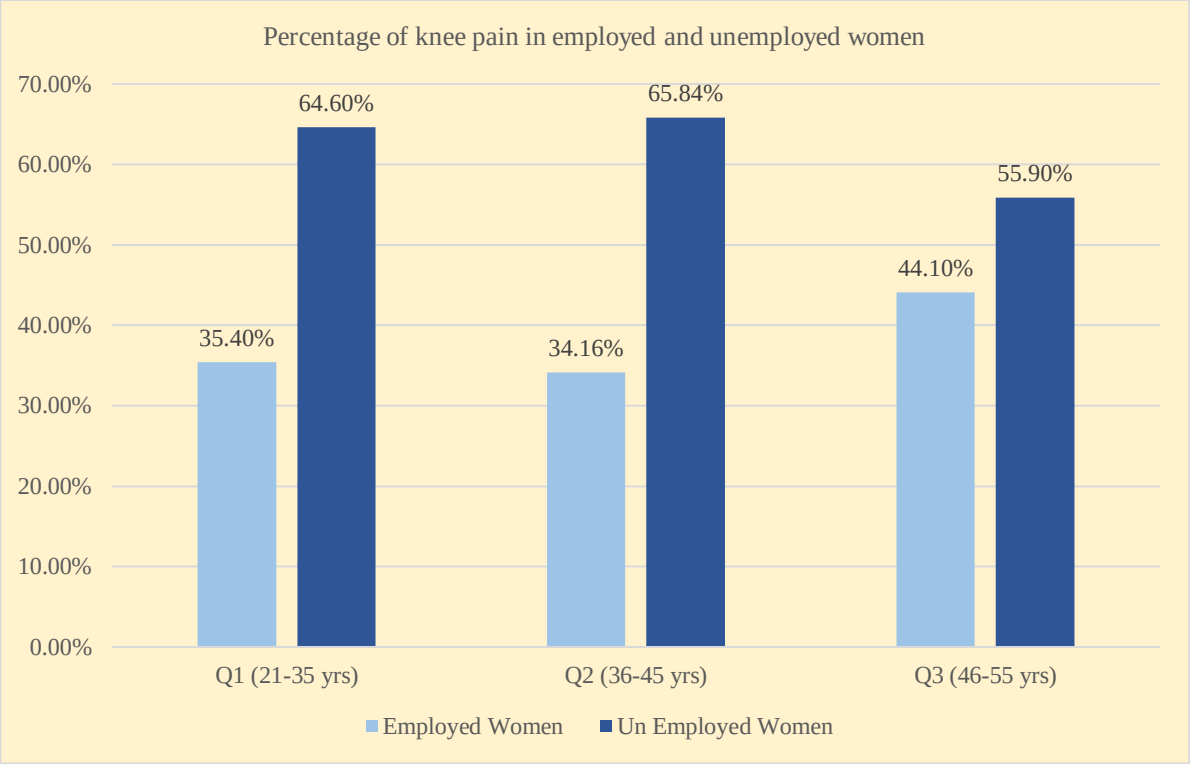
Frequency of Knee Pain among females and Mean Q Angle



Bar Chart: 2

With a mean value computed to be 19.67, this bar chart shows that 27 females out of 161 had the highest frequency of an elevated Q angle.

Percentage of knee pain in employed and UN employed women in varying age groups



Bar Chart: 3

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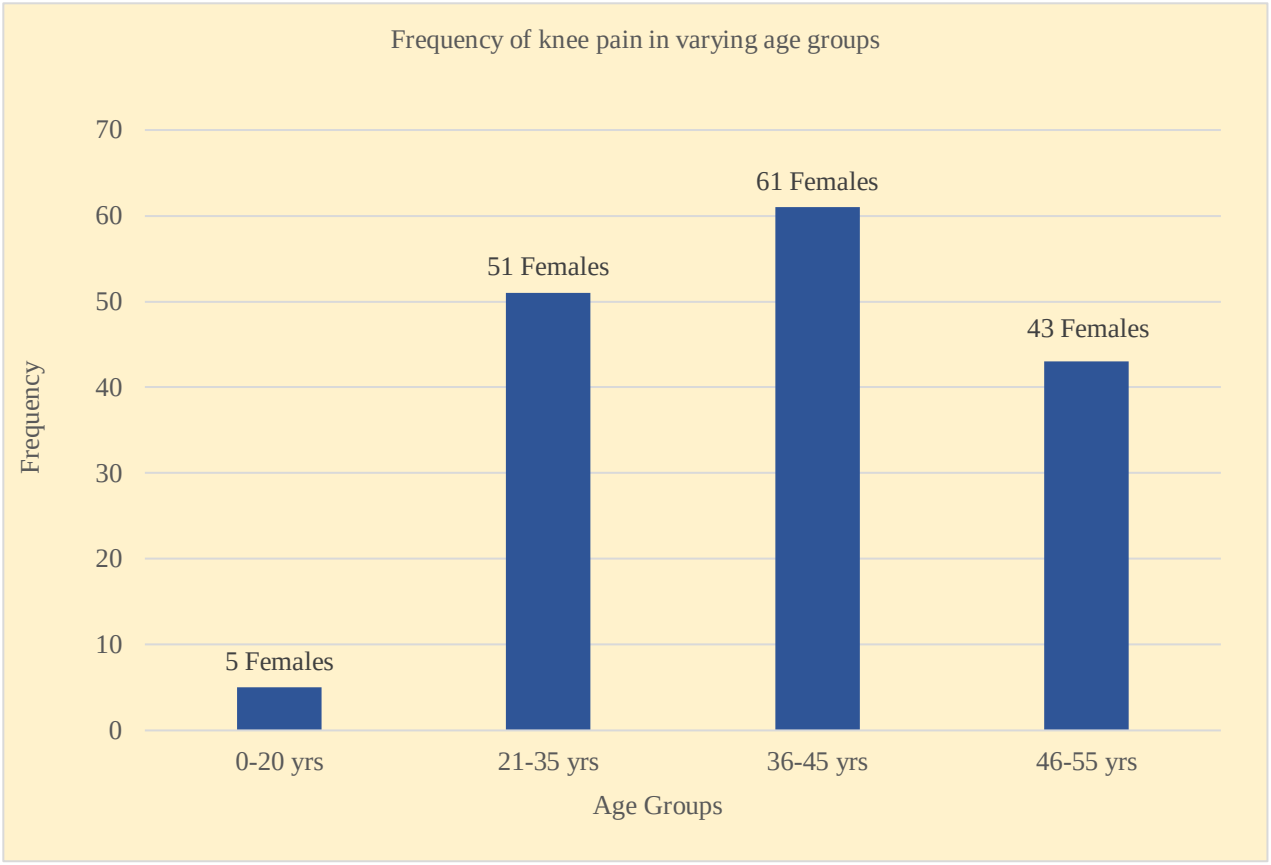
The sample size is shown in this figure divided into three age specific groupings. Ages 21–35 were included in Q1, 36–45 in Q2, and 46–55 in Q3. The Q1 group clearly shows the results, with 35.40% of workers and 64.60% unemployed. In Q2 Working women showed 65.84% and unemployed with 34.16%. Q3 displayed that 44.10 percent were unemployed and 55.90 percent had knee pain.

Frequency of knee pain in varying age groups



Bar Chart: 4

Out of 161 females 61 females presented with knee pain belonging to age group of 36 – 45 yrs.

According to the study's findings, the mean Q angle among women who experienced knee pain calculated to be 21.1°, with a standard deviation of 1.43. The results indicated Age and mean Q angle were moderately correlated, although the relationship was not statistically significant, $r = .39$, $p > .05$. This describes the strength and direction of the linear relationship between age and mean Q angle. [28, 29]

DISCUSSION

The findings of this study contribute to the understanding of the role of the Q angle in knee pain, particularly in the female population. Disruption of patellofemoral joint mechanics can lead to increased stress on the joint structures, potentially resulting in pain and dysfunction. The increased Q angle observed in the female participants with knee pain may be a contributing factor to this altered joint mechanics and the development of patellofemoral pain syndrome. Limitations of this study include the cross-sectional design, which prevents the establishment of causal relationships between the Q angle and knee pain. Future research should focus on longitudinal studies to further explore the predictive value of the Q angle in the development of knee pain. Additionally, investigations into the effectiveness of interventions targeting Q

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angle normalization, such as strengthening exercises or bracing, may provide valuable insights into the management of knee pain in females.

CONCLUSION

In conclusion, the measurement of the Q angle in females with knee pain provides important insights into the biomechanical factors that may contribute to their condition. The increased Q angle observed in this population suggests that it may be a contributing factor to the development of knee pain, and further research is needed to fully understand the relationship between Q angle, knee mechanics, and clinical outcomes. The significance of this study is that it highlights the importance of considering the Q angle in the assessment and management of knee pain, particularly in female patients.

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