ORIGINAL ARTICLE

# Quadriceps Femoral Angle (Q Angle) Variations in Knee Osteoarthritis Patients

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## ABSTRACT

**Background:** Osteoarthritis is a degenerative disease most commonly occur in females, aged and obese population. Knee osteoarthritis is most common. Repetitive stress or some trauma to joint or some genetic disorder may be the cause of osteoarthritis. Q angle is the quantifying value between patellar angle and quadriceps. There is valuable rise in the value of Q angle in knee OA patients because of increased medial tibial torsion. Standard value of Q angle is 17 for females and 14 for males.

**Objectives:** To find out the variations of value of Q angle in knee OA. To find how BMI, age, gender affects the value of Q angle? Is there any effect of increased value of Q angle on foot arches?

**Materials and Methods:** This study is a cross sectional study that has been conducted from December 2015 to June 2016. Data from 200 subjects was collected that had knee osteoarthritis (male and females) of different era. The data was collected from hospitals of Rawalpindi, Islamabad and Wah cantt. With the help of self created questionnaire. Different measuring devices including goniometer for measuring q angle measuring tape for sit to stand navicular drop test, are used weighing machine for weight measurement. Further analysis on collected data was made through SPPS..

**Results:** The study results showed the significant increment in value of Q angle was linked to weight and gender of the subjects. Value of Q angle was higher for overweight and obese females. Increased BMI was linked to increased risk of knee osteoarthritis. Chi-square test with cross tabulation was applied for the association of osteoarthritis and Q angle which were categorized in to 3. Category 1 was ranged from 14-20, category 2 was ranged from 20.1 to 25 and category 3 was ranged from 25.1 to 30 degrees. Chi square test results have shown p value is less than 0.005. This value is significant.

**Conclusion:** The study concluded there was a marked rise in Q-angle in patient with knee OA who were obese ,overweight as compare to the normal BMI.OBESE PERSONS are prone to knee OA. The obese women normally have increased Q angle. Over-pronated feet or different position of foot also puts extra strain on the Q angle because of massive internal rotation of the tibia.

**Keywords:** Osteoarthritis, Q angle

## INTRODUCTION

Osteoarthritis is a Greek word meaning, joints and inflammation. Osteoarthritis is wear and tear arthritis.(1) the natural cushioning between the joints and cartilage wears away in OA. Joint space reduces; bones become closes to one another. They rub each other and erosion of bones occurs. This rubbing of bones causes pain, swelling stiffness and difficulty in mobility.(2) Decreased joint space decreased synovial fluid and continuous rubbing of bones causes bone erosion. And sometimes bone spurs.(3) Osteoarthritis is usually considered as a degenerative disease. It's an old age disease. But it may occur in young age too. Causes may be other than degenerative. (4)In young ones, repetitive joint stress or some trauma to joint or some genetic disorder may be the cause of osteoarthritis. (5)

Osteoarthritis affects every joint like hands, knee, hip and spine. It gets more severe with time without treatment. Joint may feel tender in the morning or after a spell of prolong inactivity person fails to move joint through its full range of motion. He may have a grating when using the join. Knee OA is common among individuals as it is a weight bearing joint and knee pain causes difficulty in walking, running and climbing the stairs etc. (6, 7)

Q angle is the angle formed by drawing a line from anterior superior iliac supine to the centre of patella and a second line drawn from centre of patella to the tibial tubercle.(8) If Q angle is increased it means there is some patellar sublaxation. Biomechanics of the patella femoral joint is largely affected by Q angle.(9) Value of q angle is different for males and females. Normal value of q angle for males is 14.Normal value of Q angle for female is 17.(10)

Q angle for females is greater than for males because of femoral anteversion and larger pelvis. Q angle of value greater than 20 degree is considered to be abnormal. It creates an increased lateral force on the patella and causes pathological changes.(11)

A research Inderbir Singh,Jaspal Singh Sandhu, shyamal and at all (1999) was done to find out the association of obesity with OA . Subjects included were between 35 to 65 year of age . All males and females were obese. study concluded that q angle was greater in obese males and females having knee OA as compare to those having normal weight..(12)

A new research conducted in 2013 suggested that Obesity and Osteoarthritis plays important role in incidence and progression of knee OA.(13)

A study conducted in (2010). In this study Q-angle was assesses through anthropometry measurements in obese females with knee OA by fisioter and Pesqui. They concluded a positive but poor correlation between BMI and Q-angle. They further enlighten relationship of obesity and joint degeneration. (14)

Significance of this study is to make people aware of the variation, severity and effects of Q angle in osteoarthritis patients.

**Objectives**: To find out the variations of Q angle from its normal value in patients with knee OA

## MATERIALS AND METHODS

**Study Design:** A Descriptive Cross Sectional study
**Settings:** Rawalpindi /Islamabad hospitals
**Duration of Study:** 6 months
**Sample size:** 200 people
**Sampling technique**: The Non-Convenient sampling method
**Sample selection: Inclusion criteria:** Both male and female, already diagnosed knee osteoarthritis patients
**Exclusion criteria:** Traumatic patients
   Already diagnosed bone deformities
   Muscle paralysis, stroke

**Data Collection Procedure: Study variables:** Dependant Variable: Q angle
        Independent: osteoarthritis
**Method for collection of data:** For the present study a specified structured questionnaire is designed and then data will be collected through it.
**Data collection tools (Performa /questionnaire):** A questionnaire designed after discussion and guidance's from supervisor in keeping with the objectives and variables of the study. Goniometer for angle measurement, sit to stand navicular drop test, measuring tape, measuring scale (ruler)
**Data Analysis Procedure:** Data has been analyzed on SPSS (statistical procedure of social sciences) software.
**Ethical consideration:** During the development of research plan we took care about the ethical and moral values.
        Our research did not cause any physical or emotional harm to the person
        Informed consent was very necessary prior to ask question

## RESULT

Frequency table no 1( gender) shows that from the total sample size of 200 knee osteoarthritis patients, 163 patients were females with 81.5 % of total sample size.37  patients were male with 18.5% of total sample size. Frequency table no 2 (types of residence) showed that from the total sample size of 200 knee osteoarthritis patients,83  patients were having the upstairs residence with 41.5% of total sample size.117 patients were having the residence at ground floors that was 58.5% of total sample size. Frequency Table no 3 (Sit to Stand Navicular Drop test) showed that from the sample size of 200 knee osteoarthritis patients, after performing sit to stand Navicular drop test, result values lies between 6mm-18mm.47 patients had the value of 9mm with 23.5% of total sample size, 64 patients with 32% had value 10mm.37 patients had value 11mm with 18.5% . Only 1 patient had 18mm with 1% of total sample size.
        The results of the study showed marked increase in Q angle value that is related to gender and weight. Q angle observed higher in overweight and obese women who had knee OA. Value of BMI had a strong impact on knee osteoarthritis.  Chi-Square test with cross tabulation was applied for the association of osteoarthritis and Q angle which were categorized in to 3. Category 1 was ranged from 14-20, category 2 was ranged from 20.1 to 25 and category 3 was ranged from 25.1 to 30 degrees. Chi square test showed significance of result.

Table 1: shows the frequencies and percentages of male and females patients.

| Gender | Frequency of patients | Percentage |
|---|---|---|
| Males | 37 | 18.5 % |
| Females | 163 | 81.5 % |
| Total | 200 | 100 % |

Table 2: shows types of residence

| Types of residence | Frequency of patients | Percent |
|---|---|---|
| Upstairs | 83 | 41.5 % |
| Ground floor | 117 | 58.5 % |
| Total | 200 | 100 % |

Table 3: shows frequencies and percentages of Sit to Stand Navicular drop test

| Sit to Stand Navicular drop test | Frequency of patients | Percent |
|---|---|---|
| 6mm | 1 | .5 % |
| 7mm | 1 | .5 % |
| 8mm | 37 | 18.5 % |
| 9mm | 47 | 23.5 % |
| 10mm | 64 | 32 % |
| 11mm | 37 | 18.5 % |
| 12mm | 4 | 2 % |
| 13mm | 7 | 3.5 % |
| 14mm | 1 | .5 % |
| 18mm | 1 | .5 % |
| Total | 200 | 100 % |

Table 4: shows frequency of osteoarthritis patients with multiple etiologies.

| | | Frequency of patients |
|---|---|---|
| Gender | Male | 37(18.5) |
| | Female | 163(81.5) |
| Type of residence | Upstairs | 83(41.5) |
| | Ground floor | 117(58.5) |
| Which side knee involved | Right | 26(13) |
| | Left | 66(33) |
| | Both knees | 108(54) |
| Since when you are having knee pain | 0 to 1 years | 123(61.5) |
| | 1 to 3 years | 47(23.5) |
| | 3 to 5 years | 22(11) |
| | Others | 8(4) |
| What is the intensity of your pain | Moderate pain 3-6 | 45(22.5) |
| | Worst possible pain 7-10 | 155(77.5) |
| Sit to stand navicular drop test | 6 mm | 1(0.5) |
| | 7 mm | 1()0.5 |
| | 8 mm | 37(18.5) |
| | 9 mm | 47(23.5) |
| | 10 mm | 64(32) |
| | 11 mm | 37(18.5) |
| | 12 mm | 4(2) |
| | 13 mm | 7(3.5) |
| | 14 mm | 1(0.5) |
| | 18 mm | 1(0.5) |
| In which grade of Knee OA patient lies | 1 | 1(0.5) |
| | 2 | 124(62) |
| | 3 | 74(37) |
| | 4 | 1(0.5) |
| Are you taking any treatment for osteoarthritis | Yes | 121(60.5) |
| | No | 79(39.5) |
| If yes which type of treatment you are taking | Medication | 113(56.5) |
| | physiotherapy | 8(4) |
| | Supportive devices | 1(0.5) |
| Are you satisfied with current treatment | Yes | 9(4.5) |
| | No | 112(56) |

## DISCUSSION

Current study showed a significant increase in Q angle that is related to gender and weight. The Q angle is increased in overweight and obese women with knee OA. A higher value of BMI was linked with a high risk of knee osteoarthritis.
        The Pub Med, Pedro, Google scholar, journal of American physical therapy Association and physiopedia were used for searching the literature.
        A  Randomized Control trail RCT by Fisioter  Pesqui . They considered the changes of Q angle in knee OA. The study showed a significant increase of Q angle in obese patients. OA is a progressive joint disease presented by inflammation, pain, and joint deformity; obesity is also a major risk factor. This study showed there is a link between anthropometric measures, Q angle and knee osteoarthritis. 50 obese women, 30 with knee osteoarthritis and 20 with no joint disease aged between 40 to 60 years were examined whereas osteoarthritis was diagnosed by clinical exam. This study revealed a positive but poor relation of BMI with Q angle, furthermore as well as between time of obesity start and degree of joint deterioration.. Adjusted odds ratio for OA revealed that women with BMI >34 kg/m$^2$ and AC >110 cm were respectively 3.7 and 7 times more likely to develop OA. Central obesity possibly contributes to occurrence of knee OA in obese women. Hence this study support  current study results  as there is significant   increase in Q-angle I healthy patients with knee OA.(15)
        Olerud C and Berg P examined the variation of the Q angle with different positions of the foot. While in current study researcher used Sit to Stand Navicular Drop Test. They recruited 34 patients in their study and measure their Q angle by use of three different methods they used different methods. A photographic, a direct, and a direct method on subjects in standing and supine positions.  The result showed Q angle increased as a

result of inward rotation of foot from outward rotation. There was a difference in results of photographic and direct method. (16). In current study patients with increased Q angle had a significant increase in their Sit to Stand Navicular Drop Test values. However, Olerud C et.al did not mention about Navicular Drop Test in their study which make huge impact on results. The study supports the current study because changes of Q angle occurs in different position of foot as one can see in Sit to Stand Navicular Drop Test`

## CONCLUSION

The study concluded there was a significant increment in Q angle due to increased internal rotation of tibia. People having increased BMI are more prone to develop knee OA as compared to lean people.

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