



## OBSERVATIONAL STUDY OF Q ANGLE VARIATIONS IN STANDING & SUPINE POSITION MEASUREMENT METHOD IN WOMEN & MEN WITH & WITHOUT OA. OBSERVATIONAL STUDY

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**ABSTRACT** **CONTEXT:-** The quadriceps angle (Q-angle), formed between quadriceps muscles and the patella tendon, is considered clinically as a very important parameter which displays the biomechanical effect of the quadriceps muscle on the knee, and it is also regarded a crucial factor for the proper and movement of the knee patella. The Q-angle is routinely and regularly used as an assessment parameter during the diagnosis of many knee-related problem, including the anterior knee pain, osteoarthritis, and degenerative knee disorders.

**AIM:-** The aim of study to observe the Q-angle variation in standing and supine and measurement methods in women and men with and without OA.

**SETTING AND MATERIAL:-** The interventional study was carried out in Rajasthan, (Abu road) and Gujrat (Palampur and Morvi).

**METHOD AND MATERIAL:-** 50 Subject were included in basis of inclusion and exclusion criteria and divided into 2 groups with 25 participant in each group. In both group taking measurement of the Q-angle.

**RESULT:-** Statistically is significant ( $p < 0.05$ ) the result showed high significant different between two group. There was increase Q-angle on OA (supine position) and Normal (standing position) as compare to Q-angle in OA (standing position) and Normal (supine position).

**CONCLUSION:-** The study concluded that Q-angle observed in OA and Normal person in both position (supine and standing) has higher value in OA person in Standing position and Normal person in standing position as compare to OA person in supine position and Normal person in supine position and easy to perform for the participants.

**KEYWORDS :** Goniometry, quadriceps angle, kinematics, position, osteoarthritis.

### INTRODUCTION

**Q (QUADRICEPS) ANGLE** The quadriceps or Q angle describes the vector of pull exerted by the quadriceps muscles on the patella. The component of the quadriceps complex attach at the anterior superior and anterior iliac spines (ASIS and AHS) of the pelvic and converge to from the patella tendon.<sup>1</sup>

The Q angle is measured by dropping a plumb-line through the tibial tubercle and middle of the patella and another from the ASIS to intersect with the first line at the mid-patella. The angle created by the intersecting lines is the Q angle.<sup>1</sup>

The Q angle has come to accepted as an important factor in assessing knee joint function. An increase in Q angle beyond the normal range is considered as indicative of extensor mechanism misalignment, and has been associated with knee joint hyper mobility and patellar instability. Moreover, its role in assessing other lower extremity injury in sport has been documented.<sup>2</sup>

Recent studies have shown that female athletes have a greater susceptibility to injuries of the anterior cruciate ligament (ACL) when compare with male athletes. The national collegiate athletic association (NCCA) gathered statistics over a three-year period in the early 1990 comparing incidents of injuries of men to women.<sup>3</sup>

The most common properties of OA are loss of cartilage structure, subchondral bone sclerosis, synovial inflammation, and osteophyte formation, with involvement of the whole joint (i.e. joint failure).

Standing quadriceps angle was measured in the frontal plane using a standing goniometer modified with an extension goniometer modified with an extension rod attached to the stationary arm to insure accurate alignment with the anterior superior iliac spine.<sup>5</sup>

The inferior prominence of the anterior superior iliac spine was palpated, and the subject's finger was carefully and firmly placed over the prominence. The boundaries of the patella and tibial tuberosity were palpated, and the center position were marked.<sup>5</sup>

### NEED OF STUDY

The aim of study is to observe the Q angle variation in standing position and measurement methods in women and men with and without OA.

A variety of soft tissue can influence the Q angle by changing the relative position of the femur to the tibia. At the hip, shortened hip flexors, principally the rectus femoris, iliopsoas, and iliotibial band (ITB), can cause the pelvic to be held in an anteriorly rotated position and change the Q angle.

If the adductor muscles, principally the adductor longus, are short (or overactive), this will cause the femur to be held in an internally rotated and adducted position, increasing the Q angle.

### AIM OF THE STUDY

The aim of the study is to observe the Q angle variation in standing and supine position and measurement method in women and men with and without OA.

### OBJECTIVES OF THE STUDY

- To find the Q angle in OA person in standing and supine position both men and women.
- To find the Q-angle in Normal person in standing and supine both men and women.
- To observe the Q-angle variation in standing and supine position and method in women and men with and without OA.

### HYPOTHESIS

#### NULL HYPOTHESIS

- There is significant difference between in OA and Normal person standing and supine position for both male and female.

#### ALTERNATE HYPOTHESIS

- OA (There is no significant difference of Q-angle in OA for both position in (standing and supine)
- There is significant difference of Q-angle in Normal for both position in (Standing and Supine)
- There is significant difference of Q-angle in OA (Standing) and Normal (Standing)
- There is significant difference of Q-angle in (Supine) and Normal (Supine).

### MATERIAL AND METHODOLOGY

- Study setting:-** Shri U.S.B. Collage of Physiotherapy, Abu Road.
- Source of data:-** Data is collected from (Rajasthan and Gujrat)
- Method of collection of data:**

- **Study population:-** Various area of Rajasthan and Gujrat.
- **Sample size:-** 50(25 Osteoarthritis and 25 normal) Q angle.
- **Sampling method:-** Convenient sampling.
- **Study design:-** An observational study.

**Martial to be used:**

- Consent form
- Data form
- Pen
- Goniometer
- Measure tape
- Spirit
- Cotton
- Weight machine
- Notepad
- Marker pen

**C criteria for selection**

• **INCLUSION CRITERIA**

- Male
- Female
- OA
- Normal Q-angle
- Obesity
- Diabetes mellitus
- X-ray
- Cooperative

• **Exclusion criteria**

- Surgery on knee
- Dislocation of knee and rheumatoid arthritis
- Pain radiating from the columnar vertebralis
- Genu verus
- Patello-femoral pain
- Congenital deformities
- Noncooperative participate

**MEASUREMENT PROCEDURE**

- The study included 50 participated male and women between age of 20 to 80 years. They were recruited from Community Based Health Clinical via their physicians. We explained the observational procedure and outcome measure to the patient participants. Formal written informed consent was obtained from each other participant before they took part in this study.
- In additional, a brief description of the procedure was demonstrated to make it familiar to the subjects after recording their, Age, Gender, Weight, Height, BMI, on a specific investigation paper sheet. Before starting the study, the brief assessment was taken.

Subjects were than explained about procedure to be conducted. Total 50 subjects were randomly divided into two groups. Each had 25 subjects.

**Group-A: OA (Q angle) Group-B: Normal (Q angle)**

- **Group A:- Osteoarthritis (Q-angle)**

**Kellegren-Lawrence<sup>6</sup>**

- Grade 1: Unlikely narrowing of the joint space, possible osteophyte
- Grade 2: Small osteophytes, possible narrowing of the joint space.
- Grade 3: Multiple, moderately sized osteophytes, definite joint space narrowing, some sclerotic areas, possible deformation of the bone ends.
- Grade 4: Multiple large osteophytes, severe joint space narrowing, marked sclerosis and definite bony end deformity.

• **Group B:- Normal (Q-angle)**

- The quadriceps or Q-angle describes the vector of pull exerted by the quadriceps muscles on the patella. The component of the quadriceps complex attach at the anterior superior and anterior inferior iliac spines (ASIS and AIIS) of the pelvis and converge to form the patellar tendon.
- The Q-angle is measured by dropping a plump-line through the tibial-tubercle and middle of the patella and another from the ASIS

to intersect with the first line at the mid-patella. The angle created by the intersecting lines is the Q-angle.

- With the growth the pelvis widens, displacing the ASIS and AIIS laterally in relation to the knee. This places a lateral pull on the patellar tendon. During puberty the pelvis widens more in girls than boys owing to hormonal influence.
- The wider gynecoid structure results in Q angle that are greater in female than in male.

• **Procedures.**

- The Q angle was measured for both group from two position standing and supine position at the same session
- **Standing Q-angle:** Measured in the frontal plane using a standard goniometer modified with an extension rod attached to the stationary arm to insure accurate alignment with the anterior superior iliac spine. The inferior prominence of the anterior superior iliac spine was palpated, and the subject's finger was carefully and firmly placed over the prominence.
- The boundaries of the patella and tibial tubersity were palpated, and the center positions were marked. With the goniometer axis over the patella center, the angle formed by a line from the anterior superior iliac spine to the patella center and a line from the patella center to the tibial tuberosity was measured.<sup>7</sup>
- **Supine Q-angle:-** The subjects were supine, their quadriceps relaxed and their knee flexed 10°. The hip and the leg were maintained in neutral rotation with patella pointing upward, the longitudinal axis of the foot is vertical and horizontal line. The Q-angle was measured by using a standard goniometer and applying in same procedure.<sup>8</sup>

**RESULTS**

**TABLES AND GRAPHS**

Fifty Subjects were divided into two groups.

Group A (OA. Q-angle) an observational group.

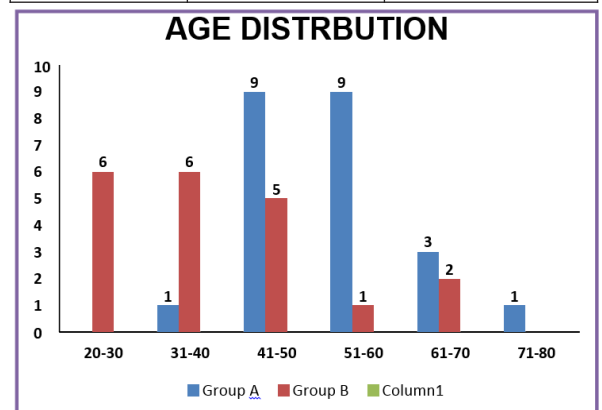
Group B (normal Q-angle) an observational group. Group A (M=25) and Group B (M=25)

**Table.1.1:- Mean and SD age in years.**

Group	N	MEAN	SD
Standing (A)	25	19.9200	92.95691
Supine (A)	25	21.8000	2.87228
Standing (B)	25	16.5200	2.45153
Supine (B)	25	14.2000	2.58199

**Table.2.1: Age distribution of OA person (Group A) and Normal person (Group B)**

Age	Group A	Group B
20-30	0	6
31-40	1	6
41-50	9	5
51-60	9	1
61-70	3	2
71-80	1	0



**Graph.2.2: Age distribution of OA person (Group A) and Normal (Group B)**

**Interpretation**

The above table 2.1 and 2.2 show the age distribution (year) in Group A and Group B.

**Wilcoxon sign Rank test:**

Was used to observe the Q-angle variation in standing and supine position for both OA and Normal person comparison for Group A and Group B.

**Table.31.- The result of Q-angle in OA person for both position (standing and supine)**

Group A	Mean		SD		P
	Supine	Standing	Supine	Standing	
	19.9200	21.8000	2.95691	2.87228	0.000

**INTERPRETATION:**

The above 3.1 shown the result of wilcoxon sign Rank test which shows there highly significant difference between the OA person Q-angle in both Standing and supine in Group A.(p<0.001)

**Table.3.2: The results of Q-angle in Normal person for both position (standing and supine)**

Group B	Mean		SD		P
	Supine	Standing	Supine	Standing	
	14.2000	16.5200	2.58199	2.45153	0.000

**INTERPRETATION:**

The above 3.2 shows the result of wilcoxon sign Rank test which shows there highly significant difference between the Q-angle in Normal both Standing and supine in Group B.(p<0.001)

**Table.3.3:- Comparison of OA in (supine) and Normal (supine) person.**

Group A + B	Mean		SD		P
	Supine	Supine	Supine	Supine	
	14.2000	19.9200	2.58199	2.95691	.412

**INTERPRETATION:**

The above table.3.3 shows the result wilcoxon sign Rank test which shows there was significant difference between both the group. (p<0.05)

**Table.3.4:- Comparison of OA(standing) and Normal (standing) person.**

Group A + B	Mean		SD		P
	Standing	Standing	Standing	Standing	
	21.8000	16.200	2.87228	2.45153	.402

**INTERPRETATION:-**

The above 3.4 shows the result wilcoxon sign Rank test shows there highly was significant difference between both the group. (p<0.05)

**DISCUSSION**

- The aim of the study was to observe the Q-angle in OA person (standing and supine position) and Normal person (Supine and Standing position)
- Numerous studies on Q-angle have been conducted worldwide aimed to correlate the variation in Q-angle values to the variation rate.
- The present study provides new findings, about Q-angle variation in OA person (Supine and Standing) and Normal person (Supine and Standing).
- The outcome of this study, which revealed that the Mean value of Q-angle was greater in OA person in standing position and Normal person in standing position as compare OA person in supine position and Normal person in supine position.
- On other hand, we also find that the Mean value of Q-angle in OA person in standing position was greater than Normal person in standing position. And the mean value of OA person in supine position less than Normal person in supine position.
- In our study, we made use of the goniometer to assess the Q-angle in OA person and Normal person. The result shows a significant increase in the Q-angle as condylar distance in both OA person and Normal person.
- **Yi-Ming Zeng et al.Jun. (2012):-** The study conducted on “Does the subtalar joint compensate for ankle malalignment on orientation of the knee joint line in knee surgery”. A more valgus femoral joint line can be expected in women and in person; a more varus tibial joint line can

be found in men and in persons with varus lower extremity alignment.<sup>9</sup>

- **Jennifer E Earl et al.Jan. (2011):-** The study conducted on “A proximal strengthening program improve pain function, and biomechanics in women with patella-femoral pain syndrome”. Significant improvements in pain, functional ability. Lateral core endurance, hip abduction, and hip external rotational strength were observed. There was a significant reduction in the knee Abduction moment during running, although there were no significant change in joint ROM.<sup>10</sup>
- **Theresa Helissa Nakagawa et al.Seo. (2012):-** The study conducted on “Frontal plain biomechanics in male and female with and without patella-femoral pain”. Female presented with altered frontal plane biomechanics that may predispose them to knee injury. Hip abductor strengthening and motor control training should be considered when treating female with PFPS.<sup>11</sup>

**LIMITATION**

- Both male and female participants were taken.
- Long term follow up was not taken.
- Only OA and normal person can be taken.
- Result could be generalized to all group.

**FURTHER RECOMMENDATION**

- The study can be done with different outcome measurement.
- Q-angle can be measured on patello-femoral pain.
- Further studies can be done with different occupational group.

**CONCLUSION**

Excessive Q-angle has been identifying as a risk factor for knee injuries. The study shows that a positive correlation exists between the Q-angle in OA and Normal person (both supine and standing position) from table A and B.

- The outcome of this study, which revealed that the Mean value of Q-angle was greater in OA person in Standing position and Normal person in standing as compare to OA person in supine position and Normal person in supine position.
- On other hand, we also find that the Mean value of Q-angle in OA person in standing was greater than normal person in standing position as compare to OA person in supine position and normal person in supine position.
- In our study, we made use of the goniometer to assess the Q-angle in OA person and Normal person. The result shows a significant increase in the Q-angle as distance in both OA person and Normal person.

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