

ASSOCIATION BETWEEN Q ANGLE AND FLAT FOOT ON KNEE DISABILITY IN PATIENTS WITH KNEE OSTEOARTHRITIS

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Abstract- The knee joint is one of the joints that can easily be damaged or diseased among many joints in the human body. Osteoarthritis of knee is the most common type of joint disorder affecting the majority of people and it causes a huge burden of pain and disability. It is a degenerative disease of the cartilage of the joints. It is most prevalent in middle aged and older adults. The purpose of this study is to systematically evaluate the association between flat foot and Q angle in Knee OA patients which would allow effective treatment methods to be devised. It would also help us understand the alterations that can be made in foot posture using appropriate shoes, arch supports or foot orthotics. This study may hence, help reduce risk of developing Knee OA and excessive angulation of Quadriceps muscle. A total of 50 elderly with osteoarthritis participated in the study with the age group of 45 to 65 years old were recruited. Knee injury and osteoarthritis outcome scale (KOOS) was used to assess the quality of life of knee OA patients. Foot posture index was used to assess the severity of flat foot in knee OA patients. It was hypothesized that there is a significant relationship between Q angle, flat foot and knee disability in patients with knee osteoarthritis.

Keywords: Association, Q-Angle, Flat Foot, Knee Osteoarthritis, Elderly.

INTRODUCTION:

The knee joint is one of the joints that can easily be damaged or diseased among many joints in the human body. Osteoarthritis of knee is the most common type of joint disorder affecting the majority of people and it causes a huge burden of pain and disability. It is a degenerative disease of the cartilage of the joints. It is most prevalent in middle aged and older adults.

Individuals with knee OA experience pain, stiffness, and decreased range of motion of the joints. These symptoms significantly limit an individual's ability to rise from a chair, stand comfortably, walk, or climb stairs. Ultimately, these limitations lead to a loss of functional independence. Risk factors are multifactorial and include older age, female gender, obesity (particularly in knee OA), previous joint injury, genetics and muscle weakness, repetitive use of joints, bone density, joint laxity. All play roles in the development of joint OA determination of risk factors particularly in the weight bearing joints and their modification may reduce the risk of OA and prevent subsequent pain and disability.

The foot plays an immediate role in absorbing mechanical stresses from ground contact and sculpting the pattern of postural alignment and joint motion at the knee and throughout the lower extremity. During weight bearing activities, the posture and motion of the foot and knee are coupled within a closed kinematic chain. This kinematic coupling may cause excessive rotation of the knee in people with flat feet. Correct alignment of the knee joint depends on the muscle balance of the vastus medial and lateralis muscle of the femur, and the force generated between these muscles is the quadriceps femoris angle. The quadriceps angle or Q angle is the angle formed by the intersection of lines, one joining the anterior superior iliac spine (ASIS) and going to the center of the patella, and another from the tibial tuberosity to the center of patella.

The Q angle determines the tracking of the patella through the trochlea of the femur. As the angle increases, the chance of patellar compression problem increases. Excessive foot pronation which occurs in flat foot deformity is characterized by flattening of medial arch and hypermobile midfoot. The KOOS has been validated for several orthopedic interventions such as anterior cruciate ligament reconstruction, meniscectomy and total knee replacement. The KOOS is a valid, reliable and responsive self-administered instrument that can be used for short-term and long-term follow-up of several types of knee injury including osteoarthritis. To ensure content validity for the older population with osteoarthritis, the questions from the Western Ontario and MacMaster Universities (WOMAC) Osteoarthritis Index (an outcome measure covering pain, stiffness, and function) were included in their full and original form in the KOOS questionnaire. The WOMAC scores can thus be calculated from the KOOS questionnaire.

The Foot Posture Index (FPI) is a novel, foot specific outcome measure that was developed in order to quantify variation in the position of the foot easily and quickly in a clinical setting. The FPI consists of a series of criterion-based observations that combine to provide a quantification of postural variation in 3 major regions of the foot (rearfoot, midfoot, forefoot) in the 3 cardinal body planes. The FPI has been used in a variety of clinical and research settings. The applications of the FPI include identifying foot type as a basis for screening subjects as inclusion or exclusion criteria in clinical research, investigating the relationship between foot types and risk factors for sports and training injuries, investigating whether foot posture is associated with falls in older people and as a means of assessing age-related differences in foot structure.

MATERIALS AND METHODOLOGY:

The study was reviewed and permission was obtained from the Institutional Ethical Committee at Tilak Maharashtra Vidyapeeth, Pune.

Sampling and Participants Recruitment: Around 53 elderly with osteoarthritis across Pune city, Maharashtra India, were approached. The aim and purpose along of the study was thoroughly explained and the players were screened for Inclusion & Exclusion criteria. The Player with the Age ranged between 45 to 65 years, both males and females were included for the study.

Data Collection: Finally 50 elderly were recruited for the study.

Knee injury and osteoarthritis outcome scale (KOOS) was used to assess the quality of life of knee OA patients. The questionnaire will be asked to the patient covering the 5 subscales: Pain, Symptoms, ADL Function, Sport and Recreation Function, Quality of Life. The answer given by the patient among the 5 possible options were marked and the score were calculated.

Foot posture index was used to assess the severity of flat foot in knee OA patients. The patients were asked to stand still in their relaxed stance position with double limb support and looking straight ahead. During the assessment, it was ensured that the patient did not swivel to try to see what was happening, as that would have significantly affected the foot posture. Foot posture was evaluated by assessing six items, where each item is scored between -2 and +2. Items included: talar head palpation, curves above and below the lateral malleoli, calcaneal angle, talonavicular bulge, medial longitudinal arch, and forefoot to rear foot alignment.

For measuring the Q angle, two imaginary lines were formed. The first line was formed from the ASIS to the midpoint of patella and the second line was formed from the tibial tuberosity to the midpoint of patella. The Q angle was traced and measured for the osteoarthritic knee using a pen and a Goniometer.

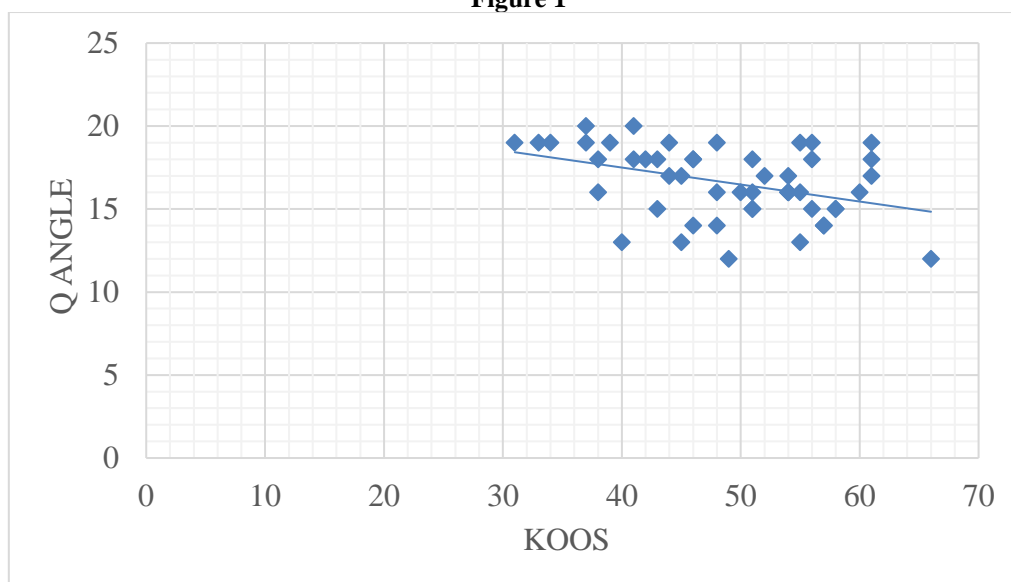
RESULT:

The table 1 shows the relationship between KOOS and Q angle. The coefficient correlation of KOOS and Q angle is -0.3966, hence there is a **negative correlation** between them. The p value is 0.0044 and hence the correlation is significant.

Table 1

	KOOS	Q angle	r value	p value
Mean±SD	48.8±8.3	16.6±2.14	-0.3966	0.0044

Figure 1

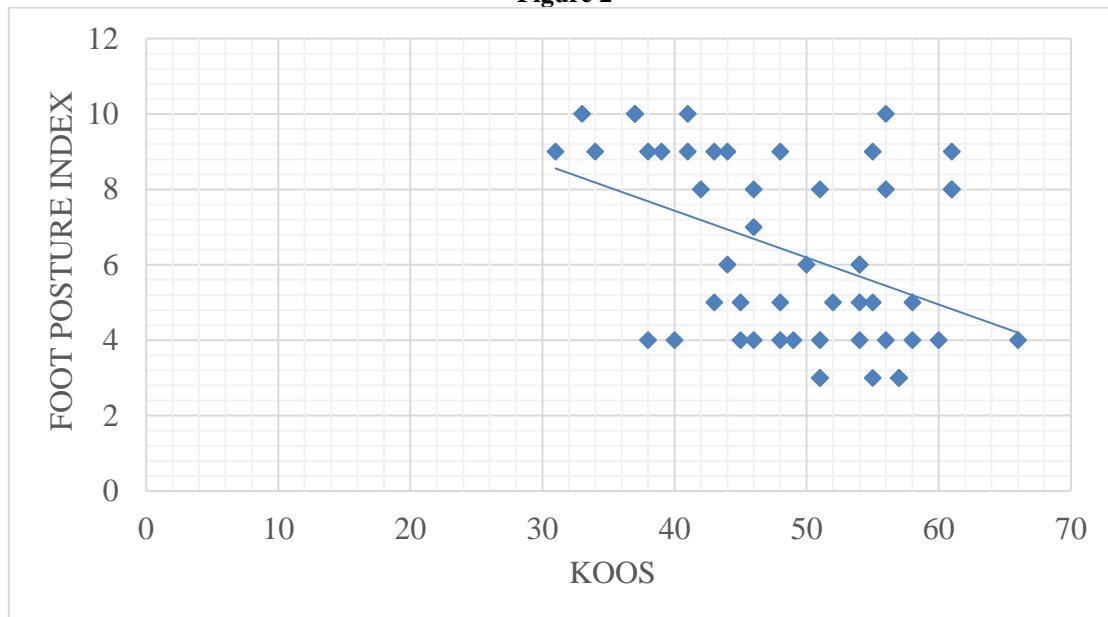


The table 2 shows the relationship between KOOS and Flat Foot Index (FFI). The coefficient correlation of KOOS and FFI is -0.4259, hence there is a **negative correlation** between them. The p value is 0.002 and hence the correlation is significant.

Table 2

	KOOS	FPI	r value	p value
Mean±SD	48.8±8.3	6.34±2.42	-0.4259	0.002

Figure 2

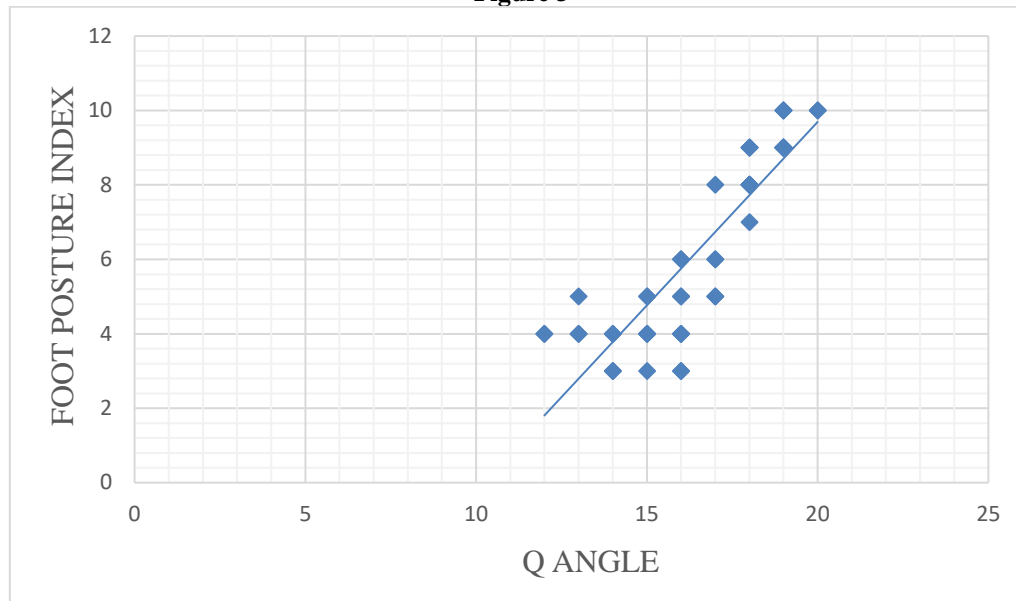


The table 3 shows the relationship between Q angle and FPI. The coefficient correlation of KOOS and FPI is 0.8715; hence there is a **positive correlation** between them. The p value is <0.0001 and hence the correlation is extremely significant.

Table 3

	Q angle	FPI	r value	p value
Mean±SD	16.6±2.14	6.34±2.42	0.8715	<0.0001

Figure 3



DISCUSSION AND IMPLICATION:

The study showed that there was a significant but negative correlation between KOOS and Q angle in both males as well as females. This suggests that the disability of the knee joint in knee OA patients do not specifically worsens or reduces with increase or decrease of Q angle. There was a significant but negative correlation between KOOS and FPI in both males as well as females. A research conducted by Gross KD et al, on Association of flat feet with knee pain and cartilage damage in older adults, mentioned in their study that while the causal relationship between flat feet posture and OA-related knee pain and cartilage damage is yet to be established, an association has already been observed.

The study also showed that there is statistically significant relationship between Q angle and flat feet on both the sides. The result suggested increase in the Q angle of the participants who suffered from flat feet. Also, there were no statistically significant differences in participants Q angle between left and right sides.

This finding is consistent with the study by Ginika G et al, on correlation between Foot Arch Index and Q angle among patients with Knee OA. The result of their study shows significant relationship between Q angle and foot deformity that may result in lateral patella rotation which increases Q angle. Our results matched with another study done by Amir Letafatkar et al, 2013, the aim of this study was the surveying of Relationship between flat foot deformity with Q angle and knee pain in Iranian freestyle wrestlers. The results of this study indicated that there is significant relationship between flat foot deformity and knee pain in wrestlers ($r=0.686$). There is significant relationship between Q angle increasing in dominant leg and knee pain ($r=0.949$). Also there is significant relationship between Q angle increasing in dominant leg and flat foot deformity ($r=0.278$).

CONCLUSION

There is a significant relationship between Q angle, flat foot and knee disability in patients with knee osteoarthritis. Based on kinematic chain system, foot deformity may result in lateral patella rotation which increases the Q angle and may possibly predispose the knee to osteoarthritis. Evaluating foot arch indices and Q angle may bring additional information for assessing and treating patients with knee osteoarthritis.

LIMITATIONS

- The sample size included in the study was small.
- Limited age of the patients was included.

FUTURE SCOPE

- Study can be done with large sample size.
- Study can be done including other arthritic joints like, hip and ankle.
- Study can be done by assessing foot pain as well.

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