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CO-RELATION BETWEEN HAMSTRING MUSCLE TIGHTNESS AND QUDRICEPS ANGLE IN ADOLESCENCE FEMALE WITH OR WITHOUT ANTERIOR KNEE PAIN

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ABSTRACT

Aim: Aim is to find out the co-relation of the value of Qudriceps Angle And hamstring tightness With or Without Anterior Knee pain

Background: Anterior knee pain Charactrized by insidious onset of poorly defined pain, localized to Anterior retropatellar pain and peripatellar region of the knee with the prevalence of 40%

Methodology: 100 female subjects was participated ,Age 20 to 40 years and it was allocated into two group in group A 50 subjects are allocated and Group b 50 subjects are allocated Group A with Anterior knee pain and it was Measured with hamstring muscle tightness and Qudriceps angle and Group B without Anterior knee pain it was measured with hamstring muscle tightness and Qudriceps Angle and Hamstring muscle tightness check with the Active knee Extension Test and Qudriceps angle are measured.

Result: According to Finding of the Present study, Group A with Anterior knee pain, Dominant leg r= -0.137 and Non dominant Leg r= -0.189 and Group B is Without Anterior knee pain Dominant leg r= -0.246 Non dominant leg r= -0.062

Conclusion: Study was concluded that Co-relation of Group A with Anterior knee pain, Dominant leg and non-Dominant leg founded Negative co-relation and without anterior knee pain dominant leg and non-dominant leg founded Nagative co-relation.

Keywords: Anterior knee pain, Hamstring muscle tightness, Qudriceps angle

INTRODUCTION

Anterior knee pain syndrome (AKPS) is a significant clinical problem for the patient and the clinician. Various authors have attributed this pain to intrinsic and extrinsic factors **[1]**. One extrinsic factor is malalignment of the patellofemoral joint. A common tool used to assess malalignment is the quadriceps angle (Q Angle) **[2]**.

Patellofemoral pain syndrome and anterior knee pain (AKP) are terms that are frequently used interchangeably. In AKP, the patella's articular cartilage softens without the presence of further intraarticular or peripatellar pathologies **[3]**.

The changes mention above lead to chondromalcia with time in normal subjects, affecting their functional activities and performance. Activities like descending stairs, sitting for lengthy periods of time, and crouching might aggravate AKP. Patellar maltracking also malalignment generally are common causes of AKP at different angles **[4]**.

The patella's movement inside the trochlea is regulated by patellar tracking. Unbalances in the static and dynamic stabilizers can alter this movement by altering the distribution of forces throughout the patellofemoral articular surface, the patellar and quadriceps tendons, and the soft tissues surrounding them. This has a tight connection to the Q-angle **[5]**. Women are prone to AKP more than males because of differences in their anatomy. This is due to the fact that women's pelvises are broader than men's, which overstretches the knee. Estrogen has been shown to have an impact on connective tissue synthesis **[6]**.

The Q-angle measurement's dependability is Just Q-angle reliability values were reported by Horton and Hall in a seven-subject study. They found that the interrater reliability was 87 and the intrarater reliability was at least 92 **[7]**.

As a result, one often studied parameter in AKP is the Q-angle. It is believed that people with a high Q-angle (≥ 15°–20°) are more susceptible to AKP due to their lateral subluxation or higher lateral patellar position. Q-angle is valid and trustworthy measure for AKP. Even though Q angle has an impact on AKP, we cannot just rely on it to evaluate the function of the knee joint that AKP affects.

The Q line of pull, which extends from the middle of the patella to the anterior superior iliac spine, forms the quadriceps (Q) angle. The force between the patella tendon and the

Q muscle group in the frontal plane of an extended knee can be calculated. Men's average Q angles are 14˚ and women's average Q angles are 17˚. A Q angle value excess of 15-20˚ is generally thought to be associated with patellofemoral discomfort and knee extensor dysfunction. It is frequently utilized as an anatomical risk factor for the development of patellar subluxation or dislocation and chondromalacia patella. The angle of the Q is thought to be a less accurate physical evaluation tool for lower extremity injuries than was previously thought **[8]**.

Anterior Pain (PFP) patients often have weak quadriceps, especially during eccentric knee extension, and the development of PFP is associated with this weakness **[9]**. Individuals who suffer from PFP also frequently exhibit an imbalance in their hamstring and quadriceps muscles. This muscle imbalance was usually caused by weak quadriceps and normal hamstring strength, which changed the ratio of hamstrings to quadriceps (H: Q) **[10]**.

Particularly when walking, the quadriceps and hamstring muscles are crucial to lower extremity movements **[11]**. Numerous studies have documented a significant frequency of this muscle's injuries and tension. A number of factors, including an imbalance in strength between the hamstrings and quadriceps, repeated muscle strain, lower extremity immobility, and tissue scarring, can result in hamstring tightness and injury **[12]**.

Reduced flexibility in the hamstring muscles, which are antigravity muscles, is linked to a variety of sports injuries, including ligament ruptures and strains. Moreover, a contracture of this muscle may cause additional issues such plantar fasciitis, lumbopelvic rhythm disturbance, functional abnormalities in the knee, and postural deviations of the trunk and lower back **[13]**. It is a condition that is encountered in sports and orthopedic care practices, and as much as 40% of the general population may be affected by it **[14]**. Patellofemoral pain is thought to affect 8 to 40% of people. The patellofemoral joint and the knee's extensor mechanism are the most common causes of anterior knee discomfort in the teenage Indian population **[15]**.

METHODOLOGY

100 female subjects participated, Age 20 to 40 years and it was allocated into two group in group A 50 subjects are allocated and Group b 50 subjects are allocated Group A with Anterior knee pain and it was Measured with hamstring muscle tightness and Qudriceps angle and Group B without Anterior knee pain it was measured with hamstring muscle tightness and Qudriceps Angle and Hamstring muscle tightness check with the Active knee Extension Test and Qudriceps angle are measured.

Subject including only having Anterior knee pain and retropatellar area during Activity like Assending and Descending stairs, prolong sitting and running. The Exculsion Criteria inculding intra articlur pathology, patellar instability,hip pain and any Previous surgery in lower limb Prior to any measurement, the procedures was explained to the subject in detail ,and they were asked to give a written consent and information about their age and training sessions per week.

Measurements

A goniometer were used to determine the hamstring muscle tightness and value of Q angle.Each variable was measured three times,and the average was recorded as the individuals score.

Outcome Measure

1) Active knee extension test

The participants were assessed on a plinth in the supine position. Each assessor marked the greater trochanter, and another to the lateral knee joint line with washable ink. Two lines were drawn from this point. The first was drawn to the greater trochanter, and another to the apex of the lateral malleolus. The participants were asked to flex the hip until the thigh touched the horizontal PVC bar.

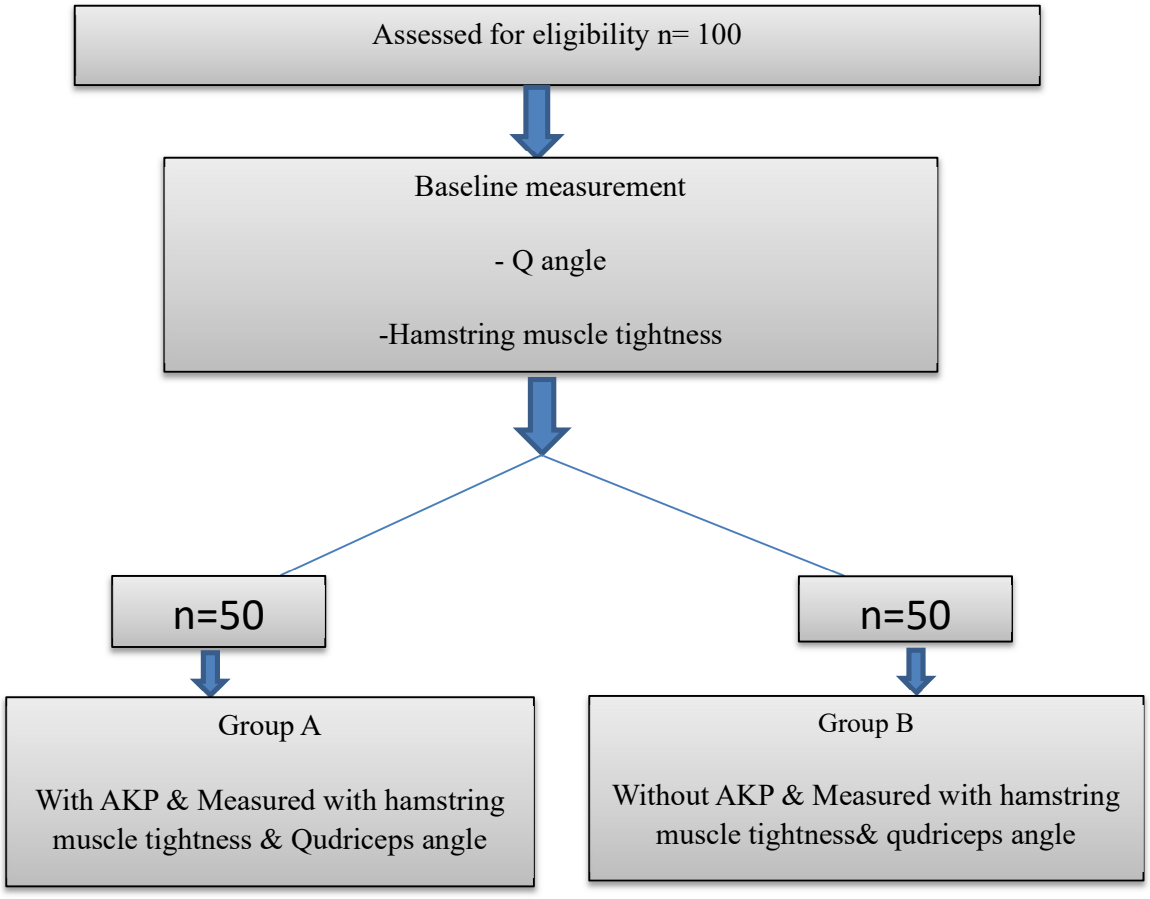
While maintaining the contact between the thigh and horizontal PVC bar, the participants were asked to extend the leg as much as possible while keeping their foot relaxed and to hold the position for about five seconds. The goniometer was placed over the previously marked joint axis with its arms aligned along the femur and fibula. The test was positive if the person felt severe tension on his back, knee and thigh before reaching the last 250 **[16]**.

2) Measurement of Q angle

Q angle or action angle of quadriceps is the angle between the line drawn from anterior superior iliac spine (ASIS) to the middle of the patella and the line drawn from the middle of the patella to the center of tibial

tubercle. In order to measure the Q angle, the first line marking was drawn from the ASIS to the middle of the patella and the second line was drawn from the mid patella to the tibial tubercle. The midpoint of the patella was determined by the intersection of the line from the medial to the lateral patella and the line from the inferior to the superior patella. The axis of a manually extendable arm goniometer was placed over the center of the right patella, with its proximal arm placed over the anterior superior iliac spine andand the distal arm over the center of the tibial tubercle **[17]**.

PROCEDURE



RESULT

This study conducted on 100 Female with or without Anteriorn knee pain According to result of the Present study, Group A with Anterior knee pain, Dominant leg r= -0.137 and Non dominant Leg r= -0.189 and Group B is Without Anterior knee pain Dominant leg r= -0.246 Non dominantlegr= -0.062

Table 1: Group -1

Correlatios			
		AKET dominant leg	QArt
AKET Dominant leg	Pearson Correlation	1	-0.137
	Sig. (2-tailed)		0.338
	N	50	50
QA Dominant leg	Pearson Correlation	-0.137	1
	Sig. (2-tailed)	0.338	
	N	50	50

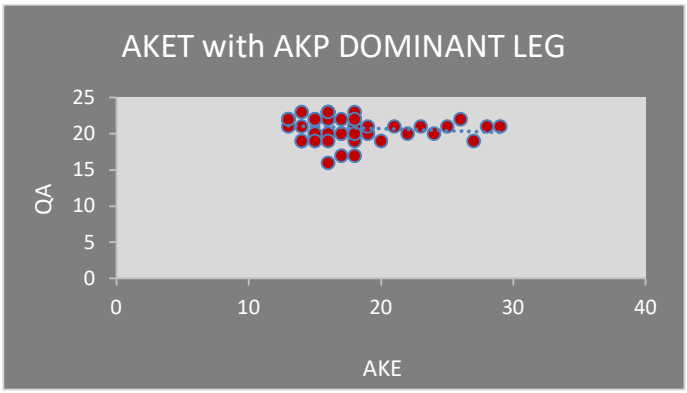


Table 2: Group 1

Correlations			
		AKET	QAlt
AKET Non dominant leg	Pearson Correlation	1	-0.189
	Sig. (2-tailed)		0.185
	N	50	50
QA Non Dominant	Pearson Correlation	-0.189	1
	Sig. (2-tailed)	0.185	
	N	50	50

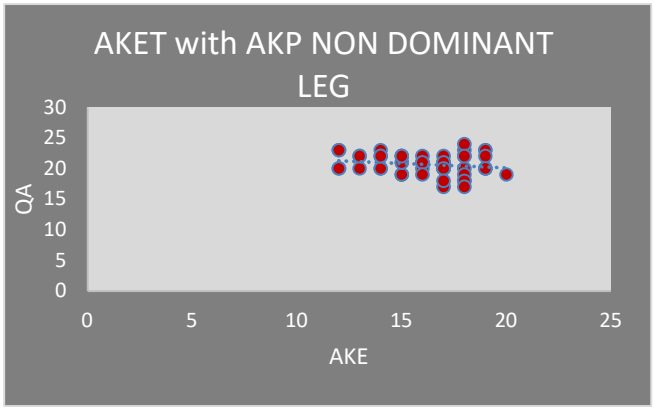


Table 3: Group -2

Correlations			
		AKET dominant leg	QArt
AKET Dominant leg	Pearson Correlation	1	-0.246
	Sig. (2-tailed)		0.082
	N	50	50
QA Dominant leg	Pearson Correlation	-0.246	1
	Sig. (2-tailed)	0.082	
	N	50	50

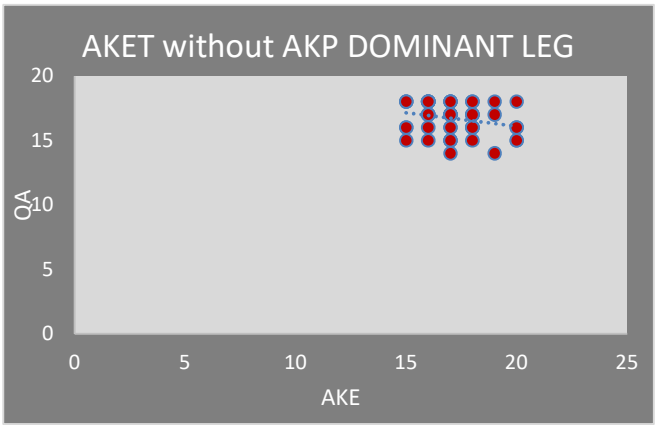
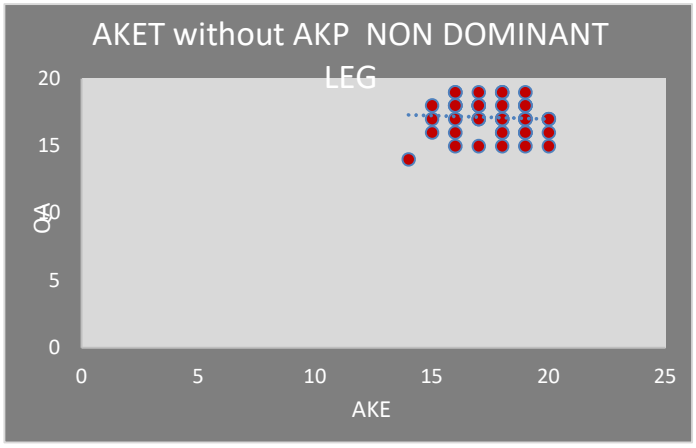


Table 4: Group 2

Correlations			
		AKET Non dominant	QAlt
AKET Non dominant leg	Pearson Correlation	1	-0.062
	Sig. (2-tailed)		0.667
	N	50	50
QA Non Dominant leg	Pearson Correlation	-0.062	1
	Sig. (2-tailed)	0.667	
	N	50	50



DISCUSSION

The current study demonstrated a negative correlation between the quadriceps angle and the tightness of the hamstring muscles in women with anterior knee discomfort. According to Haim *et al*. **[18]**, anterior knee

pain may be linked to a Q angle greater than 20 degrees. They came to the conclusion that tightness in the hamstrings against the quadriceps caused these malalignments (increased Q angle), as muscle imbalance is one of the causes of knee injuries and pain.

Different theories have been put out in the literature to explain why women's Q angles are higher than men's. Building on the work of previous theories, Pincivero **[19]** investigated the hypothesis that shorter femurs in women could improve the valgus of the lower leg and boost the Q angle. But their outcomes were negligible. Furthermore, it's been proposed that engaging in physical activity and strengthening the Q could alter the Q angle 20's degree. Moreover, further research is necessary to support or refute this theory.

An elevated Q angle might result in a lateral strain from the rectus femoris muscle to the patella due to an augmented external tibial torsion or hip anteversion. Women's naturally wider pelvises result in a higher Q angle in most cases. Because the average Q angle for men and women is roughly 10 degrees and 15 degrees, respectively, we only included the female participant in this study who had anterior knee pain, and they established the nagative co-relation.

It should be noted that postural malalignments brought on by muscle imbalance can be treated using physical rehabilitation techniques **[20]**. Muscular imbalances can also result in improper postural alignment and bony abnormalities. Because this may affect the alternatives for therapy, it is imperative that athletic trainers pinpoint the exact cause of postural malalignments.

According to a study by **[21]**, hamstring tightness over time can cause this muscle's ability to support less weight to gradually decline. One of the main muscles regulating tibial torsion is the hamstring. Increased tibial torsion as a result of these muscles' decreased capacity to support weight leads to an increase in the patellar tendon angle with the tibia and Q angle.

According to the current study, in females without anterior knee pain, quadriceps angle and hamstring muscle tightness were found to be negative correlation.

Doug Caylor, SPT, ATC2 *et al*. proposed that: 1) they seen that the Q-angle did not significantly alter with 24.3' of knee flexion; and 2) they found that the Q-angle can be determined by two unskilled measurers with the knee in an extended posture. and 3) that there is no discernible variation in Q-angle between the sick and asymptomatic groups. they speculate that additional etiological factors contributed to the symptoms in this group of AKPS patients. Thus, a thorough evaluation of lower extremity alignment, flexibility, and strength should be carried out when examining individuals with AKPS.

In this study, we established a negative correlation in females without anterior knee pain because they did not have any abnormalities or difficulties in running, squatting, stairs climbing, standing for extended periods of time.

CONCULSION

Study was concluded that Co-relation of Group A with Anterior knee pain, Dominant leg and non-Dominant leg founded Negative co-relation and without anterior knee pain dominant leg and non-dominant leg founded Negative co-relation.

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REFERENCES

[1] The Relationship between Quadriceps Angle and Anterior Knee Pain syndrome'

[2] Heckmann TP: Conservative versus postsurgical patellar rehabilitation. In: Mangine RE (ed), Physical Therapy of the Knee, pp 127- 129. New York, NY: Churchill Livingstone, 1988

[3] Giles B, Henke P, Edmonds J, McNeil D. Reproducibility of isokinetic muscle strength measurements in normal and arthritic individuals. Scand J Rehabil Med 1990;22:93-99

[4] Sheehan FT, Derasari A, Fine KM, Brindle TJ, Alter KE. Q-angle and J-sign: Indicative of Maltracking Subgroups in Patellofemoral Pain. Clinical Orthopaedics and Related Research. 2010;468(1):266-275.

[5] Fulkerson, John & Arendt, Elizabeth. (1999). The female knee--anterior knee pain. Connecticut medicine. 63.

[6] Ward SR, Terk MR, Powers CM. 2007. Patella alta: association with patellofemoral alignment and changes in contact area during weight bearing. J Bone Joint Surg 89:1749–1755.

[7] Horton MC, Hall TL: Quadriceps femoris muscle angle: Normal values and relationships with gender and selected skeletal measures. Phys Ther 69:897- 901, 1989

[8] A Systematic Review on Quadriceps Angle in Relation to Knee Abnormalities

[9] Smith AM. The co activation of antagonist muscles. Can] Physiol Pharmacol1981; 59: 733-747.

[10] 0-Piva SR, Fitzgerald K, Irrgang JJ, Jones S, Hando BR, Browder DA, Childs JD. Reliability of measures of impairments associated with patellofemoral pain syndrome. BMC Musculoskelet Disord. 2006;7:33–46. doi: 10.1186/1471-2474-7-33.

[11] Cibulka MT, Rose SJ, Delitto A, Sinacore DR. Hamstring muscle strain

treated by mobilizing the sacroiliac joint. Physical Therapy. 1986; 66(8):1220-22

[12] Prior M, Guerin M, Grimmer K. An evidence-based approach to hamstring strain injury: A systematic review of the literature. Sports Health: A Multidisciplinary Approach. 2009; 1(2):154-64. doi: 10.1177/1941738108324962

[13] White LC, Dolphin P, Dixon J. Hamstring length in patellofemoral pain syndrome. Physiotherapy. 2009; 95(1):24-28. doi: 10.1016/j.physio.2008.05.009

[14] Manzer MH, Zutshi K, Mandal P. Response of therapeutic exercise and patellar taping on patella position and pain control in the Patellofemoral pain syndrome. Indian Journal of Pain. 2013 May 1;27(2):75.

[15] Shroff R, Panhale V. Anterior knee pain and lower extremity functions in Indian adolescent population. International Journal of Medical Research & Health Sciences. 2016 Jan 1;5(1):15-8.

[16] Mohamad Shariff AH, Mohamed Razif MA, Ashril Y. Interrater and intrarater reliability of the active knee extension (AKE) test among healthy adults. Journal of Physical Therapy Science. 2013; 25(8):957–61. PMCID: PMC3820221

[17] Weiss L, de Forest B, Hammond K, Schilling B, Ferreira L. Reliability of goniometry-based Q-angle. PM&R. 2013; 5(9):763-68. doi: 10.1016/j.pmrj.2013.03.023

[18] Haim A, Yaniv M, Dekel S, Amir H. Patellofemoral pain syndrome: validity of clinical and radiological features. Clinical orthopaedics and related research. 2006; 451:223-28. doi: 10.1097/01.blo.0000229284.45485.6c

[19] Clark M. Muscle energy techniques in rehabilitation. In Techniques in musculoskeletal rehabilitation. New Jersey: McGrawHill; 2001.

[20] Magee DJ. Orthopedic physical assessment. Philadelphia: Saunders; 1992.

[21] Clark M, Russell A. Optimum performance training for the performance enhancement specialist. Calabasas: National Academy of Sports Medicine; 2001.