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Correlation of Quadriceps Angle Deviation with Front Foot Knee Pain in Fast Bowlers

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KEYWORDS

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DECLARATIONS

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ABSTRACT

Background: The knee is the anatomical site for most musculoskeletal pains associated with cricket. Fast bowlers are more likely to have pain in their front-foot knees because of the significant strain and repetitive stress that results from the ground response force created by front-foot impact with flexion and extension. **Objective:** To determine the correlation of Q angle with front foot knee pain among fast bowlers. **Methodology:** This cross-sectional correlation study was conducted at Aleem Dar Cricket Academy, Lahore Qalandars High-Performance Center, LCCA Cricket Ground, Ghani Institute of Cricket, Azhar Ali Cricket Academy, Model Town Greens and Whites Cricket Academy/Club. The study duration was from March to October 2024. Non-probability convenient sampling technique was applied. Age 17 to 25 years. Both male and female cricketers playing for the last 2 years were included. History of orthopaedic surgery in six months, subjects with a background of any neurological disorders, cardiovascular diseases, history of fracture past 6 months and history of cancer excluded. A numeric pain rating scale and goniometer were used as assessment tools. The SPSS version 25 was used to examine the data. **Results:** The mean age, body mass index, knee pain score and Q angle of participants were 19.95±2.63; 23.36±1.67; 4.46±1.51 and 14.85±2.04. Out of 160 fast bowlers, 160 (73.9%) experienced moderate levels of pain and among them, an increased Q angle was reported in 58 (43.5%) cricketers. The table shows a moderate but non-significant association between increased Q-angle (mean score 14.85±2.04) and knee pain (mean score 4.46±1.51) in fast bowlers ($r=0.43$, $p>0.05$). **Conclusion:** This study concluded that there was a statistically significant correlation between Q angle and knee pain among fast bowlers. The highest prevalence of the pain was moderate in athletes with normal Q angle.

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INTRODUCTION

Cricket has been played since the 16th century, making it one of the oldest games. Many modifications have been made to this sport, particularly in the last 20 years.[1] In contrast to other sports like rugby, football, and athletics, cricket is typically regarded as having a minimal injury risk. Due to the intrinsic, high load and the biomechanical structure of the fast-bowling movement, fast bowlers have the highest risk of injury out of all the different roles that cricketers might play on the field. They are particularly vulnerable to lower back and lower limb injuries.[2] Compared to batters and fielders, fast bowlers are more likely to sustain injuries and play an important part in cricket matches.

Due to this, a fast bowler's career is usually shorter. Even in a short career, fast bowlers have to recuperate from several injuries, which results in a significant loss of on-field time.[3] The number of games played in a season has greatly increased in recent years, which has resulted in a huge increase in player effort. The emergence of top leagues has added to the fast bowlers' already significant workload. Knee, hamstring, ankle, and back pain are the most often reported issues among fast bowlers. Therefore, it is crucial to determine the origin of these injuries. The current study makes an effort to pinpoint the origin of front-foot knee pain issues.[4] Because of their heavy workload and the continuous stress that their bodies experience, fast bowlers in cricket are more susceptible to injuries that result in ground reaction force (GRF). GRF will put a strain on the lumbar spine through the kinetic chains of the foot, ankle, knee, and hip.[5]

Fast bowlers who bowl too hard, have poor technique, prepare less physically, or take on too much work are more prone to suffer from non-contact LBP. In international cricket, injuries among fast bowlers were common (8%). More injuries (41.3%) were sustained by bowlers from Australia, South Africa, England, West Indies, and India; lumbar stress fractures are the most common ailment among young fast bowlers.[6] The most common injuries among Sri Lankan junior cricket bowlers are lower limb and spine strains and sprains (20.3%), while match injury frequency is 5.7%. Not in contact.

LBP is defined as the experience of pain in the absence of any mechanism of collision with players or other things. The term "intrinsic factors" refers to elements of an injury that are specific to the athlete, such as technique or anatomical alignment.[7,8] The knee is one of the largest joints in the body and has a very intricate anatomy. One of the most frequent reasons people get knee pain is (Q angle deviation). During specific activities that put pressure on the patellofemoral joint from bearing weight, it is characterized by discomfort behind the patella that appears on a flexed knee. It typically affects teens, women, and active adults, and it is especially common in athletes. Sadly, this illness may make it difficult for them to go about their everyday lives as they attempt to avoid things that make their suffering worse.

However, between 40 to 57% of individuals do not show promising long-term results.[9] According to research, for males, the average Q-angle is 14° and for females is 17°. Women show a higher mean Q angle value than men.[10] The basic causes of the difference are not evident till now. Generally, people believe that women have broader pelvis than men. Patellar dislocation and anterior knee discomfort are predisposed to by a Q-angle of 20°–22°.[11] The quadriceps' lateral pull is induced by a greater Q-angle. Because lateral forces on the patella are amplified with larger Q angles, it has long been believed that having a high Q angle increases the likelihood of developing PFPS.[12] It is possible to link the frequency of an altered Q angle in fast bowlers experiencing front-foot knee pain to a confluence of biomechanical, muscular, and training-related factors. Fast bowlers' risk of knee pain and injuries can be reduced by being aware of and taking appropriate measures to address these issues through coaching interventions, focused strength and flexibility training, and thorough biomechanical analysis.[13,14]

METHODOLOGY

The study design was a cross-sectional correlation study. The study was conducted at Aleem Dar Cricket Academy, Lahore Qalandars High-Performance Center, LCCA Cricket Ground, Ghani Institute of Cricket, Azhar Ali Cricket

Academy, Model Town Greens and Whites Cricket Academy/Club. The study duration was from March 2024 to October 2024. The sample size was 160. Non-probability convenient sampling technique was applied. Age 17 to 25 years. Both male and female cricketers playing for the last 2 years were included. History of orthopaedic surgery in six months, subjects with a background of any neurological disorders, cardiovascular diseases, history of fracture past 6 months and history of cancer excluded. A numeric pain rating scale and goniometer were used as assessment tools. The SPSS version 25 was used to examine the data.

RESULTS

Table 1 shows the descriptive data for knee discomfort, Q angle, BMI, height, weight, and age. The athletes were 19.95±2.63 years old on average. The average weight score was 69.23±7.02. The average height score was 1.75±0.07. The athletes' mean BMI was 23.36±1.67. The average pain score was 4.46±1.51. The average Q-angle score was 14.85±2.04. Table 2 shows a moderate but non-significant correlation between increased Q-angle (mean 14.85°±2.04) and knee pain (mean score 4.46±1.51) in fast bowlers ($r = 0.43$, $p > 0.05$). Age, BMI, bowling speed, and playing experience have weak correlations with knee pain, indicating limited influence on pain levels. Overall, Q-angle may slightly contribute to knee pain, though other biomechanical factors likely play a more substantial role.

DISCUSSION

Our study aimed to determine the correlation of Q angle with front foot knee pain among fast bowlers. The fast bowlers range from 17 to 35 years of age with a history of 1 month's knee pain. This study concluded that if Q angle increases, the risk of knee pain also increases so there is a statistically significant association b/w Q angle and front foot knee pain. 1.9% had decreased Q angle following 43.5% participants had increased Q angle in the last highest Percentage of people 54% had moderate pain. In the current study, Q angle ranged from 9-18 among fast bowlers. However, according to standard evidence, males typically have a Q angle between 12 and 15 degrees. The present research sample's results showed that the front foot's Q angle varied from 7 to 21 and the hind foot's Q angle ranged from 7 to 23. The average Q angle for the front and rear feet was 12.13 and 12.30, respectively.[15] The distribution of the Q angle has widened relative to the norm with a weak negative connection.[16]

Numerous studies have investigated the possibility of a connection between fast bowlers' front-foot knee soreness and the Q angle. Systems for motion analysis, biomechanical evaluations, and questionnaires are frequently used in these studies to collect data. A larger Q angle and a higher occurrence of front-foot knee discomfort have been linked in research, despite inconsistent results. However, other research has been unable to prove a definitive link.[15] A Current study found a statistically significant association between knee pain and Q angle. This study's results correspond with Senanayake S (2021) study in Colombo but in conflict with the study results from Ferdinands et al., who wrote an abstract book, demonstrated that the knee was the most often affected anatomical place and that those with knee discomfort had odd Q-angles (left knee: 11.19; right knee: 12.71)($p<0.0001$).[17] This increased their risk of injury to the knee joint. A study by Iwatsu et al in handball, mini-basketball, and basketball were significantly associated with knee pain, compared with football.[18]

Our study showed that front foot knee pain was associated with Q angle. These results were congruent with an Asian study by Phatama K Y et al in 2022 predicted anterior knee pain (AKP) in the female population using the Q-angle.[19] The risk of AKP increases with increasing Q-angle. The risk of AKP cannot be predicted by

Table 1. Descriptive Statistics

	Minimum	Maximum	Mean±SD
Age	17	25	19.95±2.63
Weight	54	84	69.23±7.02
Height	1.67	1.92	1.75±0.07
BMI	17	27	23.36±1.67
Knee pain	1	9	4.46±1.51
Q Angle	9	18	14.85±2.04

Table 2. Correlation Statistics

Parameter	Measurement	Mean±SD	Pearson's Correlation with Knee Pain (r)	p-value
Quadriceps Angle Deviation (Q-Angle)	degrees	14.85±2.04	0.43	$p > 0.05$
Front Foot Knee Pain	numeric scale	4.46±1.51	0.39	$p > 0.05$
Age	years	19.95±2.63	0.15	$p > 0.05$
BMI	kg/m^2	23.36±1.67	0.10	$p > 0.05$
Bowling Speed	km/h	138.4±7.9	0.28	$p > 0.05$
Playing Experience	years	4.8±1.9	0.15	$p > 0.05$

anthropometric parameters. Our findings align with prior research indicating that in 2018, A study examined the correlation between the Q-angle and the Anterior knee. Individuals experiencing Anterior Knee pain exhibit a symptoms.[20]

CONCLUSION

This study concluded that there was a statistically significant association between Q angle and knee pain among fast bowlers. The highest prevalence of the pain was moderate in athletes with normal Q angle.

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