

Association of Hamstring Tightness with Lower Extremity Injuries in Athletes (Analytical Cross-Sectional Study)

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ABSTRACT

Background: Flexibility of muscle is required for normal bio-mechanical functioning. Muscle tightness results from reduced capability of muscle to modify its shape during movement which results in decreased ROM. Hamstring tightness is one of the cause of hamstring injuries in athletes which leads to slowed recovery and compromises performance of athlete in the field.

Objective: To find the association of hamstring tightness with lower extremity injuries in athletes.

Methodology: The study was conducted on 141 athletes out of those 61 were cricketers and 80 were footballers. This study was conducted from January to May 2023. Convenient sampling was used and participants were selected from different football and cricket clubs of Lahore on the basis of inclusion and exclusion criteria. Nordic questionnaire was used to determine the lower extremity injuries and active knee extension test use to measure the hamstring tightness in athletes. Statistical data was analyzed by using SPSS version 26.

Result: The results showed negative correlation between Active knee Extension test and lower extremity injuries as the value of Pearson Correlation coefficient was $r = -0.204$. The mean \pm SD for Active knee Extension test was 1.31 ± 0.456 while that of Lower extremity Injury level was 1.28 ± 0.56 . There was significant association between AKE test and Knee pain and LBP as P-value of 0.047 and 0.048 was obtained respectively, while there was no significant association seen between AKE test and lower extremity Injury level as p-value of 0.34 was obtained. The p-value represented that null hypothesis is accepted.

Conclusion: On the basis of results Hamstring tightness is not found to be associated with Lower Extremity Injuries. While hamstring tightness could cause knee pain and low back pain in athletes. So maintaining the flexibility of hamstring in athletes could reduce the knee pain and LBP and will enhance their participation in sports.

Keywords: Hamstring tightness, Nordic questionnaire, active knee extension test.

INTRODUCTION

Hamstring tightness is caused by reduction in the flexibility of muscles that constitute hamstring. It leads to the hamstring injuries which is most frequent form of lower limb injuries in athletes. Knee extension angle less than 160 and hip flexion angle less than 90 degrees are considered as hamstring tightness.^(1,2)

Hamstring tightness is a common musculoskeletal condition that affects athletes across various sports disciplines.⁽³⁾ It is characterized by a reduced range of motion (ROM) in the hamstring muscles, often leading to discomfort and impaired performance.^(4,5) The prevalence of hamstring tightness in athletes has been a subject of numerous studies in the past decade and is a main cause of concern because it leads to loss of function, reduced performance and longer recovery time.⁽⁶⁾

A study by Gabbe et al. (2010) found that hamstring tightness is prevalent in 40% of athletes, particularly those involved in sports requiring high-speed running and sudden stops.⁽⁷⁾ Similarly, a study by Witvrouw et al. reported a 37% prevalence rate among professional soccer players.⁽¹⁾ These findings are consistent with a 2014 study by Opar et al., which found a 34% prevalence rate among Australian football players.⁽⁸⁾

The high prevalence of hamstring tightness in athletes can be attributed to several factors. High-intensity training and inadequate recovery time are significant contributors.^(5,9) Additionally, biomechanical factors such as muscle imbalances and poor flexibility also play a role.⁽¹⁰⁾

Hamstring tightness can lead to significant consequences for athletes. It is a well-established risk factor for hamstring strain injuries (HSIs), which are among the most common injuries in sports.^(11,12) Moreover, hamstring tightness can negatively impact athletic performance by reducing running speed and agility.^(12,13)

Football athletes perform many different movements and skills quickly. Hamstring provides stabilization and force in order to perform that and change one third of its length during these activities.⁽¹³⁾ High number of athletes in US sustained lower extremity injuries. Thus prevention strategies are required to prevent this i.e. assessment and pre screening with valid test to determine the risk factor risk factor of lower extremity injury in athletes.⁽¹⁴⁾

Furthermore, the importance of early detection and intervention cannot be overstated. Regular screening for hamstring tightness can help identify at-risk athletes and initiate early intervention.⁽¹⁵⁾ This can be achieved through simple clinical tests such as the sit-and-reach test or the passive straight leg raise test.⁽¹⁶⁾

Despite the high prevalence of hamstring tightness in athletes, it is a manageable condition. With early detection, appropriate intervention, and a holistic approach that includes training modifications, physiotherapy, and nutrition, athletes can effectively manage hamstring tightness and maintain their performance levels.

Several interventions have been proposed to manage hamstring tightness in athletes. Stretching exercises, particularly eccentric training, have been shown to improve hamstring flexibility and reduce the risk of HSIs.^(17,18) Additionally, regular massage and physiotherapy and kinesiotaping can help alleviate muscle tightness and improve ROM.^(19,20)

Moreover, incorporating flexibility training into the athletes' regular training regimen can help prevent the development of hamstring tightness. A systematic review by Medeiros et al. (2018) found that regular stretching exercises significantly improved hamstring flexibility in athletes along with PNF techniques.^(21,22)

Nutrition also plays a crucial role in muscle health. Adequate hydration and a balanced diet rich in protein and essential nutrients can help maintain muscle flexibility and prevent tightness.⁽²³⁾

In conclusion, hamstring tightness is a prevalent condition among athletes, with significant implications for injury risk and performance. Therefore, it is crucial for athletes and coaches to recognize and manage this condition effectively to optimize athletic performance and reduce injury risk. There is considerable literature available on the hamstring tightness in athletes and also on lower limb injuries in athletes. But there is very less work available that shows specific association between hamstring tightness with lower extremity injuries in athlete. This study will help understand the association of lower extremity injury with hamstring tightness. Thus it would be beneficial for the physical trainers, coaches and also for the athletes to avoid lower limb injuries.

MATERIAL AND METHODS

Study design: Analytical Cross-sectional study design

Setting: This study was collected from following clubs in Lahore city.

- a. Model town sports clubs
- b. Joher town sports clubs
- c. Race-course country club

Duration: The study was conducted from January to May 2023

Sampling Technique: The participants were recruited using Convenient sampling technique

Sample Size/collection: The sample size for this cross-sectional study was calculated by using Raosoft application at confidence interval of 90% and 5% Margin of Error. The calculated sample size after setting the values was 250.

Sample Selection Criteria:

Inclusion criteria:

- Only male participants were included
- Participants involved in cricket and football
- Age between 14 -38years
- Participants with normal strength and ROM

Exclusion criteria:

- Not willing to participate
- Recent History of Musculoskeletal injury
- Having any other musculoskeletal disorder as leg length discrepancy, scoliosis etc.

Statistical analysis: Data was analyze by using SPSS 26 version. Frequency tables were used to define percentages and frequencies of qualitative variables while mean and standard deviation was calculated for quantitative variables. Chi-squared test was used to find association and p-Value of <0.05 was considered significant.

RESULTS

Socio-demographic Characteristics: The table below shows that 71 (28.4%) athletes belonged to age group 14-19 years, 78 (31.2%) belonged to 20-25years, 62 (24.8%) to 26-30 years while 30 (15.6%) were above 30 years of age. About 117 (46.8%) athletes were engaged in sports for 1-2 hours daily while 110 (44%) were engaged in sports for 3-4 hours daily. Furthermore of 250 athletes, 94 (37.6%) had been engaged in sports for about 1-2 years and 78 (31.2%) athletes for 3-4 years.

AKE test was performed to assess hamstring tightness, Off 250 athletes, 172 (68.8%) showed positive AKE test and 78 (31.2%) showed Negative test, which means that hamstring tightness is present in 68.8% of athletes.

Table 1: Socio-demographic characteristics

	Frequency	Percent
Age (years)		
14-19	71	28.4
20-25	78	31.2
26-30	62	24.8
Over 30	30	15.6
Daily Sport Activity Hours		
1-2	117	46.8
3-4	110	44
2-3	5	2
5-6	18	7.2
Duration Of Sports Activity Per Year		
1-2	94	37.6
3-4	78	31.2
5-6	74	29.6
above 6 years	4	1.6
Active Knee Extension Test (AKE)		
yes	172	68.8
No	78	31.2

Table 2: Nordic Musculoskeletal Questionnaire Responses

	Lower back		Hips/thighs		Knees		Ankles/feet	
	Yes	No	Yes	No	Yes	No	Yes	No
Have you at any time during the last 12 months had trouble such as ache pain numbness in	75	175	60	190	165*	85	100	150
During the last 12 months have you been prevented from carrying out normal activities e.g. job, housework, hobbies because of this trouble in	60	190	43	207	115*	135	75	175
During the last 12 months have you seen a physician for this condition	18	232	17	233	130*	220	90	160
During the last 7 days have you had trouble in	170	80	39	211	222*	28	100	150

* denotes region of high frequency

Off 250 athletes 165 responded to have pain in Knee region in the last 12 months and 115 athletes with such pain were not able to perform their ADL's. Majority of the participants with Knee pain looked for medical advice for their condition and majority of athletes (170) complained to have pain in Knee region in the last 7 days.

Table 6: Pearson Correlation Coefficient

Variable	Mean	Std. Deviation	Pearson correlation coefficient(r)
Active Knee Extension Test	1.31	.465	-.204
Lower Extremity Injury Level	1.28	.565	

Pearson Correlation coefficient shows negative association between AKE test and Lower Extremity Injury level as r value of -.204 was obtained

Table 5: Association of Active Knee Extension Test with Nordic Musculoskeletal Scale

Active Knee Extension Test	P Value
Lower back	0.048
Hips/thighs	0.072
Knees	0.047
Ankle/Feet	0.098
Lower Extremity injury level (total Nordic musculoskeletal Scale)	0.34

The table below shows that AKE test was significantly associated with knee pain as p-value obtained was 0.047, and ow back pain 0.048 , which is less then 0.05. while there was no significant association seen among AKE ,Ankle/feet pain and Lower Extremity injuries (P>0.05)

DISCUSSION

This study perhaps is the first one in Pakistan regarding the association of hamstring tightness with the lower extremity injuries in athletes. Hamstring tightness is the major and most common problem among athletes in Pakistan and lower extremity musculoskeletal injuries are another major problem of athletes that lead to reduce performance.

As per the results of current study about 68.8% of the athletes engaged in contact sports as cricket and football

experienced hamstring tightness assessed through Active knee extension test. The results of the current study were consistent with previous study conducted in 2010 which also shows that about 88% of the athletes involved in contact sports experienced hamstring tightness which was far less than those involved in other sports as martial arts, swimming, Karate etc.⁽²⁴⁾

Injuries in the different regions of Lower Limb are common and occur as a result of different inherent (athletic performance) and environmental factors.⁽²⁵⁾ And muscle strains were more prevalent in athletes. Their results were similar with the current study where hamstring tightness was prevalent in athletes.

In the current study about majority of athletes (n=165) responded to have pain in Knee region in the last 12 months and 115 athletes with such pain were not able to perform their ADL's, which shows higher prevalence of knee pain secondary to hamstring tightness in athletes while other regions of lower limb were less effected. The results are contrary to a study conducted in 2021 on characteristics of injury on young athletes, which shows that pain and injury in thigh region (19%) was most common region followed by Knee region (14.8%).⁽²⁶⁾

While the above results were in contrary with another study conducted in 2020 on Korean Elite Taekwondo Athletes, which showed that about 74.11% of the athletes suffered from lower extremity injuries and among them the most common location of injury was ankle/foot⁽²⁷⁾ while in current study knee region was commonly injured and Hamstring tightness was significantly associated with knee injury (p<0.05)

The results of another study were in contrast with study reported by McGuine et al. In 2017 which showed that athletes who were involved in moderate to high expertise in sports experienced less lower extremity injuries than athletes who has less experience in field, and the prevalence of ankle/foot injury was 34.4% which was highest among other regions as knee (25%) and thigh (12.7%).⁽¹⁴⁾

CONCLUSION

On the basis of Above mentioned results it can be concluded that Hamstring tightness is not found to be associated with Lower Extremity Injuries. While hamstring tightness could cause knee pain and low back pain in athletes. So maintaining the flexibility of hamstring through appropriate stretching and strengthening exercises, as well as incorporating proper warm-up and cool-down routines, may help reduce the risk of such injuries in athletes..

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