Original Article

Risk Factors for Hamstring Muscle Strain Injury in Athletes

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Abstract

Background: Injury to the hamstring muscle is a common non-contact injury among athletes. Several modifiable and non-modifiable factors are responsible for hamstring strain injury. **Objective:** The objective was to determine the modifiable and non-modifiable risk factors for hamstring strain injury in the athletes. **Methods:** This cross-sectional study consisted of 102 athletes using convenient sampling. Athletes age range between 18 to 25 years playing nationally at a provisional level among different universities of Lahore were included while those having pathological conditions like tendon rupture, chronic tendinopathy, fracture, tumor, and acute injury were excluded from this study. For qualitative data, bar charts and percentages were used. The quantitative data like age, dominant hand, gender and smoking were presented as mean and standard deviation. **Results:** Findings showed that almost 40.2% of athletes missed their training match out of which 73.5% experienced soreness or stiffness because 87% did not fully cool down after training or match. Almost 45.1% of athletes suffered from hamstring strain injuries and their symptoms aggravated during stretching while 28.4% during jogging, 21.6% during changing direction when running and 28.4% while accelerating. Modifiable risk factors were found as 33.3%, 31.4% and 51% due to reduced muscle strength, flexibility and lower back pain respectively. **Conclusion:** Inappropriate coaching, advancing age and history of the previous injury are identified as major risk factors causing hamstring strain injuries among athletes of universities. Lack of knowledge of fully warming up the hamstrings before training and cooling down after training may lead the athletes susceptible to strain injuries.

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Introduction

The hamstring muscles are the two-joint muscles that extend the hip and flex the knee joint.[1] Hamstring strain injuries (HSIs) are classified as grade I in which there is a minor strain to rupture of some muscle fibers, grade II in which moderate tear or strain happens and grade III refers to the full rupture of all fibers.[2] In sports, common hamstring injuries are

strain-type which occurs as a result of a sudden alteration in direction and running, speeding up, losing speed and jumping.[3] The incidence of recurrent injuries range between 30% of Australian football players and about 12 to 14% of soccer players.[4] While the incidence of hamstring injuries has shown an increasing trend over the past two decades in team sports, such as rugby, and has been estimated between 12 to 17% of total injuries, with an increased rate of recurrence.[5,6]

Risk factors have been classified as non-modifiable and modifiable factors, which are collectively known as muscle risk factors. Non-modifiable factors such as gender, height and age while modifiable factors are those that can change through physical activity or behavioral approaches such as weight, balance, strength or flexibility.[1] In general, there are two types of risk factors responsible for hamstring injuries and they are classified into muscle and clinical risk factors. Muscle risk factors comprise reduced extensibility, muscle stiffness, postural fault, poor warm-up, muscle fatigue and weakness.[7]

Clinical risk factors involve injures that occur due to direct trauma following ecchymosis, contusion, bruises and other pathologies like hematoma formation and a hairline fracture of the femur. An overuse injury or traumatic blow to the hamstrings muscles makes the athlete unable to completely participate in training or matches.[8] Factors contributing to hamstrings injury include poor muscle flexibility,[9,10] and poor muscle strength,[11,12] muscle imbalance and fatigue, leg length discrepancy, poor or no warm-up, history of the previous injury to hamstring or calf,[13] poor lumbopelvic strength and stability, old age, extra-foraminal L5 nerve root compression.[14] Musculoskeletal injuries are much common in athletes as a result of direct or indirect strain, therefore the current study is designed to determine the associated modifiable or non-modifiable risk factors in athletes who participate in different competitive activities in different universities of Lahore.

Methods

The data were collected from athletes from various universities of Lahore using a cross-sectional study in which six months. The sample was calculated with a 95% confidence interval and 5% absolute precision. A sample of 102 players was withdrawn from different universities in Lahore by using non-probability convenient sampling. The inclusion criteria were athletes playing different sports including rugby, cricket, football, badminton, hockey and sprinting, aged between 18 to 25 years from different universities playing at national and provisional levels. Athletes having any kind of injury such as contusion, bruises or ecchymosis, tendon tears, chronic tendinopathies, fracture, tumor and injury to ACL were excluded.

Consent was taken from athletes for participation in the study. Then the data were collected through patient proforma, two athletes per day had filled self-made questionnaire and it was analyzed by using SPSS-21 statistical software. For the qualitative data, bar charts and percentages were used. The quantitative data like a dominant hand, smoking, age, and gender were presented as means and standard deviations (S.D.). The p-value ≤ 0.05 was considered significant.

Table-I: Frequency of pain level among athletes

	Yes	No
Missed training match	41 (40.2%)	61 (59.8%)
Experienced soreness/ stiffness/ had complaint from your hamstrings	75 (73.5%)	27 (26.5%)
Pain increases while stretching	46 (45.1%)	56 (54.9%)
Pain increases while jogging	29 (28.4%)	73 (71.6%)
Pain increases while accelerating	29 (28.4%)	73 (71.6%)
Pain increases while changing direction during running	22 (21.6%)	80 (78.4%)
Pain increases while breaking speed after running	46 (45.1%)	56 (54.9%)
HSI due to decreased muscle strength	34 (33.3%)	68 (66.7%)
HSI due to decrease muscle flexibility	32 (31.4%)	70 (68.6%)
HSI due to groin cause	48 (47.1%)	54 (52.9%)
HSI due to lower back cause	52 (51%)	50 (49%)
HSI due to knee cause	42 (41.2%)	60 (58.8%)
HSI due to ACL reconstruction	30 (29.4%)	72 (70.6%)
Warm up before training	75 (73.5%)	27 (26.5%)
Fully cool down after training	89 (87.3%)	13 (12.7%)

**n: number of participants*

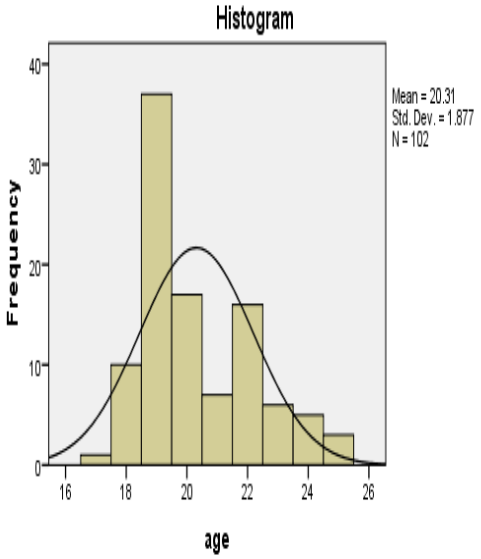
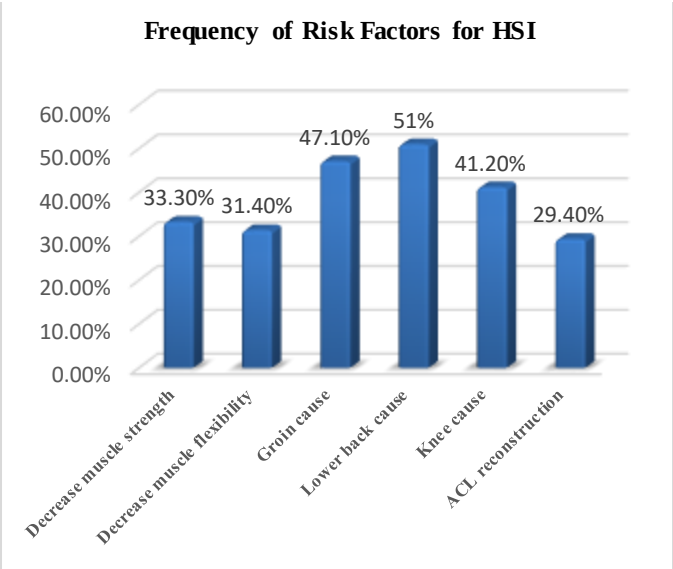


Figure-I: Age distribution in athletes (n=102)



**HSI: Hamstring strain injury*

Figure-II: Associated risk factors of HSIs

Results

There were 102 respondents in this study which included 39 (38.2% female and 63 (61.8%) male players. Age distribution in athletes is given in figure-I. Study results showed 35.3% of athletes were at least once previously injured and mostly were right-sided. About 40.2% missed their training match out of which 73.5% experienced soreness or stiffness because 87% did not fully cool down after training or match. Athletes who suffered from HSIs said their symptoms aggravate during stretching were 45.1%, during jogging 28.4%, while accelerating 28.4% and when changing direction during running 21.6% (Table-I). Modifiable risk factors were found as 33.3%, 31.4% and 51% due to reduced strength, decreased flexibility and lower back pain respectively (Figure-II). The major cause of HSIs was found that athletes did not warm up their bodies properly before training and competition.

Discussion

The purpose of the study was to identify factors responsible for HSIs in athletes of six different sports including rugby, cricket, football, badminton, hockey and sprinting. There is a total of 102 athletes out of which 63(62%) were male and 39(38%) were female players. About 35% of athletes were seen at least once previous a hamstring injury. According to the latest evidence, male athletes are more prevalent to acute injuries than females.[4,5]

In soccer players, more injuries were reported in girls players.[6] Moreover, the risk of injury is enhanced in female swimmers than in males, and in cross-country runners of high school has been reported.[7,8] Per result findings, no differences were found in injury incidence in various sports after adjustment for exposure time.[15] According to evidence, gender-based differences were found.[16] It seems that possible gender differences in the injury rate may be partly due to or explained by differences in exposure time. The current study comprised 102 athletes out of which 63 respondents were male players and 39 were female ones.

Hamstring strain injuries are commonly found in sports involving maximal sprinting, kicking and sudden change in direction.[17] It was reported in another study that the most frequent injury is acute thigh injury in soccer players.[18] Current evidence showed that history of previous strain and age are independent risk factors for HSIs.[19] Thigh injuries may partly be explained by high training intensities, muscle spasms, fatigue, and inadequate warm-up [20], but the literature shows insufficient evidence.[1,19] In some cases, fewer players per soccer team were found and increased playing duration per player may enhance the risk for these muscles strain injuries.

The study reported no significant difference found between the genders in acute thigh injuries. Higher joint laxity in females may contribute to this finding.[21] The present study consisted of athletes with age ranges from 18 to 25 years, in which athletes of 19 years most commonly participated. Hamstrings strains mainly occur as a result of an improper warm-up and cool-down period at the start and end of any kind of sports training respectively.

It was difficult to carry out a study on professional players due to certain constraints like lack of funding sources and time constraints. There is also a lack of sports-specified well-trained coaches available in universities. In the future, studies can be carried out by choosing any one sport with the same parameters for specific risk factors related to that sport.

Conclusion

It is included from this study that hamstring strain injuries are common among university students because of inappropriate knowledge of muscle anatomy and functional capabilities of muscles among coaches and athletes. Any previous injury, increasing age of athletes, sudden alteration in direction, poor flexibility and strength, drug abuse, no warm-up and cool-down period before and after training, muscle imbalance, faulty technique and muscle fatigue also affect the performance of athletes and results in strain injuries.

Declarations

Consent to participate Written consent had been taken from patients. All methods were performed following the relevant guidelines and regulations.

Availability of data and materials: Data will be available on request. The corresponding author will submit all dataset files.

Competing interests: None

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