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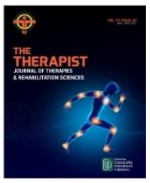

Original Article

Risk Factors Association with Recurrent Hamstring Injuries in Sports Athletes

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ABSTRACT

Hamstring injuries are commonly strained and occur proximally around the muscle-tendon junction, injuring the biceps femoris laterally. Gashes, wounds, and strains are three different types of muscle damage depending on the event instrument. **Objective** is to assess recurrent hamstring injuries in sports athletes **Methods**: A cross-sectional research was observed in 183 participants .18 to 35 years were observed. Special informed consents were gathered from the participants before the study. Most of the participants were student athletes of the University of Lahore. Data was collected using a non-probability handy sampling strategy. SPSS statistics v. 25 was used to analyze the data. **Results**: Participants in the sample were on average 24.69 years old, the youngest is eighteen years old, while the oldest is thirty-four years old. In this study included both genders .102 were males (55.7%) and 81 female (44.3) participants, with 27 of the participants married and 4 divorced individuals. 35.% of the athletes play Football, 11.5% play Basketball, 14.8% play both Football and Basketball. While, 23.5% play Cricket and only 14.8% play Badminton. 36.6% of the participants had playing experience of 5 years or more. While others averaged between 1-4 years of experience. Only 75 of the 183 participants indicated that they stretched 5 minutes before any exercise or sports. 63 participants stretched 10 minutes before any exercise or sports. While, only 13 claimed they stretched for 20 minutes and 2 participants stretched for 25 minutes. A history of previous injury was noted in 48.6% of athletes, while 51.4% claimed to not have had any previous injury. Positive pain or tightness in the thighs was noted for 134 (73.2%) athletes. 48.6% of the dataset population had a recurrent hamstring injury. While, 51.4% did not. **Conclusions**: Notable associations were noted for hamstring injuries with stretching of muscles, muscle tightness, low back pains, inadequate warm-ups before playing and playing days after the occurrence of an injury. Results also shows that fatigue and old age is not a strong risk factor for the recurrence of hamstring strain.

INTRODUCTION

Hamstring injuries are commonly strained and occur proximally around the muscle-tendon junction, injuring the biceps femoris laterally. Gashes, wounds, and strains are three different types of muscle damage depending on the event instrument [1-2]. Wounds in the hamstring muscle are caused by a combination of controllable and non-modifiable risk factors [3]. Non-modifiable risk factors include advanced age, past hamstring or other lower limb muscle injuries, and a dark or aboriginal ethnic heritage. Fatigue, muscle imbalances in the hamstrings and quadriceps, a lack of warm-up, increased training volume, poor muscle flexibility or compliance, cross-pelvic posture (characterised by an anteriorly tilted pelvis and

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increased lumbar lordosis), and poor lumbopelvic quality and stability are all suggested modifiable risk factors. [4]. During the course of their careers, athletes might suffer from a number of hamstring injuries. Hamstring strains, complete and partial proximal hamstring tendon avulsions, ischial apophyseal separations, proximal hamstring tendinopathy, and transferred posterior thigh discomfort are some of the conditions that can occur [5].

A hamstring strain is the most common hamstring injury, and it causes competitors at all levels of competition to lose time [6]. Acute hamstring strains are longer to heal from and are more susceptible to repeated damage for a longer length of time [7]. Around 33% of hamstring injuries reoccur, with the risk of recurrence being highest in the first two weeks following resuming to sports [8]. This higher risk of recurrence might be due to a lack of treatment, an early return to sport, or a combination of the two [9]. Recurrence has substantial consequences, with recurrent hamstring strains requiring considerably more time off than first-time strains. Acute hamstring injuries are more common in sports involving a lot of running, kicking, and rapid skill development [10]. Football, soccer, rugby, and track & field are all examples of sports that need extensive muscular stretching actions, as do dance and other pastimes. Field sports (such as football, soccer, and field hockey) are more likely to cause acute hamstring strains than court sports (ball, volleyball), in competition rather than practise, and in the preseason rather than the regular season or postseason. Non-contact procedures, the most well-known of which are running and sprinting exercises during sports, cause the majority of hamstring strains [11].

The HMC, or posterior fascial compartment of the thigh, is made up of the biceps femoris on the outside and the semimembranosus and semitendinosus on the inside. Because the muscles span two joints and have lengthy proximal and distal tendons, they have long muscle-tendon junctions (MTJ) that reach deep into the muscle bellies and overlap inside the muscle belly [12]. The three hamstring muscles emerge from a smooth surface on the ischial tuberosity's posterior, superior, lateral section, which is only minimally split by a transverse border. An oblique ridge separates the upper/lateral and lower/medial surfaces of the hamstring origin [13]. The top, lateral section of the semimembranosus (SMB) tendon is crescent-shaped and extends super inferiorly over 3 cm and transversely over 1 cm. The lower, medial section of the semitendinosus biceps femoris (ST-BF) gives birth to the conjoint tendon of the semitendinosus biceps femoris (ST-BF), which is more posteriorly positioned and oval in shape with typical measurements of 2.7 cm super inferiorly and 1.8 cm transversely [14].

Eccentric constriction is more likely to cause muscular damage than concentric contraction because opposing tensile stresses of stretching and contraction are applied to the muscle fibres in the former. Muscle strain can range in intensity from moderate (Delayed Onset Muscle Soreness, or DOMS) to severe rupture or avulsion with variable degrees of partial strain. Muscle strains occur suddenly with hard exertion, but DOMS develop gradually [15]. Muscle strains can be avoided or reduced by stretching exercises. They have no protective effect on DOMS, though. Furthermore, the biceps femoris, in particular, is prone to strain injury because to its fusiform condition, as observed in the hamstrings. The transcendence of fast-twitch (Type II) muscle fibres, which are capable of creating more stress at a faster pace than slow-twitch (Type I) muscle fibres, which create less tension over a longer period of time, is another underlying propensity to strain damage [16]. The former is more suited to severe contractions in short spurts. A 100-yard run, for example, is progressively suited for delayed less remarkable muscular activity, as one might expect from a marathon runner (26 miles). Type II (fast-twitch) muscle fibres make up a major component of the hamstring [17]. Hamstring strain is a serious and complex condition in athletes especially for sports involving running sprinting sports. Hamstring injuries are frequently repeated and may become recurrent. Both athletes and sports medicine physicians can become dissatisfied with the rate of recovery during the healing phase because of the slow progress and chronic symptoms that often linger. when football players were sprinting or running utmost hamstring strains occur in them [18].

According to most studies, hamstring strains develop when the hamstrings decelerate the extension of the knee during the latter part of the swing period. The muscle produces tension as it lengthens. The hamstrings must go from eccentric activity, which slows knee extension in the late swing, to concentric effort, which turns them into an active hip extensor. The muscle is most sensitive to injury during the rapid shift from eccentric to concentric action. Returning to competition before completely recuperating increases the chance of getting a persistent or potentially more serious injury. It's unclear if decreased hamstring flexibility is a cause or consequence of hamstring injury because most risk data is acquired

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retrospectively. Preventive actions must be put in place [19-20]. A variety of possible hamstring strain risk factors have been postulated. A handful are based on empirical evidence, while others are entirely theoretical assumptions. In the literature, non-modifiable elements were demographics, which have further persons of advanced age and those of black or aboriginal ethnicity. Muscle fatigue, hamstring tightness, inadequate warm-up, and muscle strength imbalances with a low hamstring to quadriceps ratio (H: Q ratio) are the most prevalent controllable causes [21].

Soccer players with more hamstring muscle strain had a considerably higher likelihood of eventual musculoskeletal damage, according to Witvrouw *et al.*, prospective cohort.'s research. In the year leading up to the 1999/2000 Belgian soccer season, the research looked at 146 male professional soccer players. None of the athletes had experienced any lower-extremity muscle injuries in the previous two years. Athletes who had a hamstring muscle injury during the 1999/2000 season had considerably less hamstring muscular flexibility than those who were not impacted previous to the injury, according to the research [22]. The highest risk factor for hamstring injuries is a history of past hamstring injuries, with the greatest risk in the first two weeks following returning to the sport. Reduced hamstring strength has been linked to injury, although the data is mixed [23]. After an athlete returns to the sport, MRI scans have showed signs of scar tissue in humans for up to a year. Scar tissue can affect the muscle transmission path by lowering tendon/aponeurosis complex compliance and producing changes in deformation patterns in muscle tissue around the fibrous scar. It has been shown that previously damaged muscles had less tissue mobility and somewhat higher muscle stresses around the proximal myotendinous junction than undamaged muscles [24].

METHODS

This was a cross-sectional research with 183 sports players ranging in age from 18 to 35 years old. The data was obtained from University of Lahore sports participants after they gave their informed consent. Data was collected using a non-probability handy sampling strategy. The population included were ≥18 years, both male and female, those people having previous hamstring injury especially sports-related hamstring injuries. The athletes having Tendon or avulsion injury, Patient with Amputated limb, non-Sports-related hamstring injuries or people having history of fracture were excluded. Data were analysed using SPSS Statistics v. 25. The clinical and demographic features of the participants, as well as the risk variables linked with recurrent hamstring injuries, are presented using descriptive statistics such as mean, standard deviation, and percentages, where applicable. Qualitative data e.g., gender was analyzed through frequencies, percentages, cross-tabulation, bar chart etc. While, the quantitative variables were calculated as mean and standard deviation, range and histogram. After taking informed written consent, data were collected using the self-made questionnaire.

RESULTS

Mean age of the athletes in this study was 24.69 years (Table 1). A dataset of 183 participants was considered for this study with higher incidence of re-injuries in male (102) than female (81) (Table 2). This study showed that 35% of the hamstring re-injuries occur in athletes playing football and 23.5% playing cricket. Multiple factors were involved in hamstring re-injuries. Some of them include history of previous injury, Tight Muscles, Low back pain, Inadequate warm up, lack of flexibility and return of athlete to sport within the first 2 weeks of injury to be the greatest risk factor (Table 3). Out of 100% players, 16.9% players strongly agree, 42.1% players agree, 17.5% players neither agree nor disagree, 18.0% players disagree and 5.5% players strongly disagree to notice any pain at the time of injury as shown Table 4, Figure 1. Association of Recurrent hamstring injury with an inadequate warm-up. Table 5 shows that there is a significant association between recurrent hamstring and inadequate warm-up injury.

N	183
Mean	24.69
SD	3.35
Minimum	18.00
Maximum	34.00

Table 1: Age of Athletes

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Gender	Frequency	Percent
Male	102	55.7
Female	81	44.3
Total	*183*	*100*

Table 2: Gender of Athletes

Reoccurrence	Frequency	Percent
Yes	89	48.6
No	94	51.4
Total	183	100

Table 3: Recurrent Hamstring Injury

Pain	Frequency	Per cent
Strongly disagree	10	5.5
Disagree	33	18.0
Neither agree/ disagree	32	17.5
Agree	77	42.1
Strongly agree	31	16.9
Total	*183*	*100*

Table 3: Pain at the Time of Injury

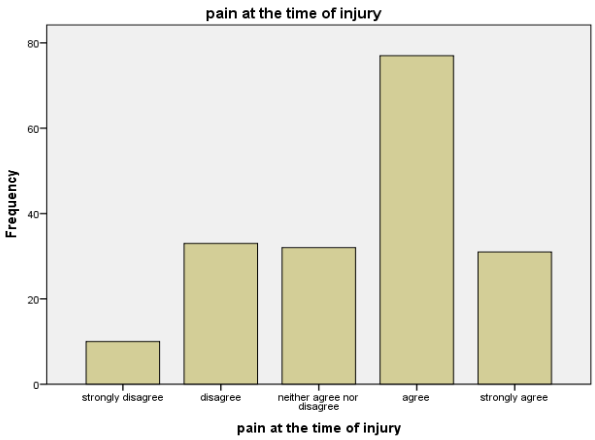

Figure 1: Frequency of athletes with pain at the time of injury

Recurrent Hamstring Injury	Inadequate Warm-up							
	Strongly Disagree	Disagree	Neither agree nor disagree	Agree	Strongly Agree	Total	Chi-Square	P-value
YES	8	20	10	30	21	89		
NO	4	10	26	44	10	10	18.207[a]	.001
TOTAL	12	30	36	74	31	31		

Table 5: Response of Athletes regarding recurrent hamstring injury

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DISCUSSION

A previous study conducted by John Orchard focused on Australian football athletes. Both intrinsic and extrinsic muscle strain risk factors were examined in the study. The author analysed different risk factors associated with injuries in muscle groups. The study looked at 83,503 games on average between 1992 and 1999. The study found 672 hamstring, 163 quadriceps, and 140 calf muscular strain injuries using logistic regression analysis. A recent history of an injury was the highest risk factor, followed by a partial history of an injury that had happened. The average age of the players was 23.53 years. The players' heights were separated into two categories for logistic regression: lower stature and average/taller stature. Hamstring injuries were divided into four categories: recent injury, previous hamstring injury, previous calf injury, and older player age. The study also found a link between hamstring injuries and average 7-day rainfall. Orchard's findings show that intrinsic or player-related factors are more predictive of muscle strain injuries than extrinsic or environment-related factors, corroborating earlier research that a history of muscle group injury is the most relevant risk factor for future injuries to that group [6]. It's also quite likely that when type II fibre muscle strength declines with age, low hamstring muscle strength and subsequent hamstring injuries result. In this study, factors such as age, gender, marital status, sports played by the athlete, number of hours played, and levels of competition were included. Furthermore, factors such as stretching before a sport or exercise, history of previous injuries, recurrence of hamstring injury, discomfort while squatting, cool down timings after a sport were also considered. The smoking habits of players, their weight lifting habits, regular playing, running, cycling, and weight training hours were also measured for analysis. A special emphasis was placed on associations of recurrent hamstring injuries with fatigue, back pain, use of artificial supplements, old age, muscle tightness, adequacy of warm up routine, and with stretching of muscles. Other factors considered were feelings of discomfort felt during squatting, tightness or pain in thighs, stretches while running, days after injury taken to play again, procrastination of personal goals, feelings of loneliness, confidence to handle personal problems, feelings of fatigue or dehydration, stretching ex without back pain, swelling on thigh without injury, and fear of pain/reinjures. Notable similarities in result between the two studies were noted. The previous study's participants were on average 23.53 years old, but this study's participants were on average 24.69 years old, with 55.7 percent male athletes and 44.3 percent female athletes. Gender was not included as a possible risk factor in Orchard's study.

CONCLUSIONS

Results from the study indicate that a strong association was noted between the recurrence of a hamstring injury and an Inadequate warm up before playing a sport. Fatigue is not strong risk factor for the recurrence of hamstring strain whereas a higher frequency of injuries was observed due to them in previous literature and some are still under study.

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