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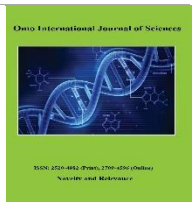

Research Article

Prevalence of hamstring muscle injuries and associated factors among soccer players the case of Southern Ethiopia

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Abstract

Determining the hamstring injury and associated factors among soccer players will assist the Youth sports injury prevention and rehabilitation programs and concerned stakeholders to plan good sports injury prevention intervention. The objective of this study was to assess the magnitude of hamstring muscle injuries and associated factors among soccer players in selected three zones of southern Ethiopia. The study design was a cross-sectional study design conducted at soccer clubs at Gamo Gofa, Halaba and Wolayta Zones, from March 11/2019 to May 12/2019 G.C. Simple random sampling technique was applied to select 226 Participants. To Collect relevant data both close and open-ended questions were used and Anthropometry measurement was measured by using standardized techniques and also Inspection and palpation of posterior thigh plus PSLRT was done. Data were entered using the computer program, epi-data version 4.4.3.1 exported into SPSS version 21 software for analysis. A descriptive summary was used to present the study results. All variables in bivariable logistic regression with p< 0.25 were fitted into multivariable logistic regression. In multivariable logistic regression with backward LR elimination P-value (< 0.05) was used to decide whether the observed difference is statically significant or not. Out of 226, 88.5% were males and 11.5% were females, the overall magnitude of hamstring strain injury was 17.3% with 95% CI. The number of all other body injuries sustained [AOR=14.4, 95% CI = 4.55, 45.67] and Previous History of posterior thigh pain [AOR = 4.58, 95% CI=1.87, 11.25] were identified as significant associated factors with HSI in soccer players. One-sixth of the payers sustained HSI and a player who has a previous Hx of posterior thigh pain had 4.58 times risk of developing HSI than a player with no previous Hx of posterior thigh pain this will remind the soccer clubs coaches and medical team to evaluate and standardize their rehabilitation protocols for decision making on the length of days for rehabilitation.

Keywords: Hamstring muscle; Injuries; Soccer players; Straight leg raise test

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1. Introduction

A hamstring injury is defined as a muscle or tendon injury of the biceps femoris muscle, semitendinosus muscle or, Semimembranosus muscle which Affects a player from taking a full part in soccer training or matches (van der Horst, 2017). Hamstring muscle strains are common in Games that place high demands on running speed and power such as soccer and athletics (Warren et al., 2010). Soccer is the most popular sport available in the world across both sexes and ages groups with around or above 265 million participants. Soccer has beneficial heatlh related effects in addition to the social aspect of the sport (van der Horst, 2017; Bergh and Ohlander, 2012; Mufty et al., 2015). Hamstring strain injury (HSI) is the most prevalent injury in football, representing 12% of all injuries in high-level players (Ekstrand et al., 2011b). A professional team can expect 5-6 HSIs per season, and these injuries typically have persistent symptoms and high recurrence rates (Ekstrand et al., 2011a; Tol et al., 2014). HSI accounts for 75% of all lower limb strains and represents 24.1% of all injures in the sport (Røksund et al., 2017; LaBella, 2007). Although the etiology of HSI is complex and multifactorial, a few specific intrinsic factors have been associated with higher injury rates.

Previous HSIs and advanced age are accepted as the main non-modifiable risk factors (Opar et al., 2012; Freckleton and Pizzari, 2013). Previous HSI appears to be the best independent predictor of future HSI. Prospective studies in elite soccer players have found that players who sustained an HSI in the previous season were up to 11.6 times more likely to experience a recurrent injury in the following season. Similarly, elite and community-level Australian footballers with a history of HSI are at significantly greater risk of future HIS (Ekstrand et al., 2011a; Bourne, 2016; van der Horst, 2017). The consequences of hamstring strain injury depend largely on the severity, and the extent of the damage can vary from microscopic muscle-fiber ruptures to a complete tear involving several muscle fascicles. These injuries account for more than one-third of all time-loss in high-level European professional football, and represent a significant cost burden for the clubs and a major challenge to the players' careers (Kahn et al., 2002; Leppänen, 2017).

It is important for clubs and players that rehabilitation and return to play take place as quickly as possible after hamstring strain injury. On the other hand, incomplete rehabilitation increases the risk of another and often more severe hamstring strain injury. Since the most commonly cited risk factor for a future hamstring strain injury is a previous hamstring strain injury so sufficient rehabilitation is crucial. (Ardern et al., 2018; Horst, 2012). The objective of

this study was to describe the prevalence of the main intrinsic risk factors for HSI in professional and under-20 male football players.

2. Materials and Methods

2.1. Study design, period and sampling

Cross-sectional study was conducted at three premier league, three higher leagues, and three national leagues football clubs in Gamo, Gofa, Halaba& Wolayta zones, SNNPR, Ethiopia, We randomly selected nine clubs from the South Nation and Nationalities State. Randomly selected players in nine clubs were 23 men primer leagues, 26 women's, 22 Higher leagues, 86 National leagues and 69 under 20 premier leagues. Players who had medical problems and took analgesic drugs 48hrs before the test were excluded. In addition, players who consumed stimulant substances on the day of the test were excluded.

The study was conducted with the approval of the Institutional Review Board of Arbaminch University College of Medicine and Health Sciences. Informed consent was obtained from each study subject before the interview after explaining the purpose of the study to respondents. Confidentiality of the information was assured and the privacy of the respondents was also maintained. While, doing physical examinations, especially for females' due attention was given to ethical issues, as a general rule wearing white coats with identifiers, involving female coaching staffs, exposing only the examining part was considered. Players who sustain any other injury other than the study of interest were reassured and linked to a team of medical staff or to the nearest health facility.

2.2 Data collection procedure

Assessments were performed in the morning, and the coaching staff was informed that the players should not perform vigorous training sessions on the previous day. In addition, players received the following recommendations: (1) not to perform high-intensity physical activities 24 hours before the tests; (2) not to take any kind of analgesic and/or anti-inflammatory drugs 48 hours before the tests; (3) not to consume stimulant substances (e.g., caffeine) on the day of the test, A specific questionnaire was used to record the sociodemographic, lifestyle, and clinical characteristics and training and match related characteristics. Each player was subjected to an anthropometric and passive straight leg test. The Clinical staff was instructed how to perform the SRT procedure at the soccer club. Participants were not allowed to warm-up before doing the SLRT so that the test was conducted before they start their routine warm-up exercise at the training field.

Assessment of anthropometric measurement

The anthropometric measurement such as weight, height, waist circumference, were measured by using standardized techniques, and the passive straight leg raise test was also made. Waist Circumference Measurement: a Tape was placed around the bare abdomen, just above the hip bone, the tape was snugged, but didn't compress the skin. The tape was parallel to the floor, midway between the top of the iliac crest and the lower rib margin on each side. The participant was made relaxed and exhaled while the measurement was made.

Height Measurement: the subject stood erect and barefooted on a stadiometer with a movable headpiece. The headpiece was leveled with a skull vault and the height was recorded to the nearest 0.5 cm.

Weight Measurement: adult weight scale, DT-01 which is standardized with salter scale was used. The manufacturer's manual was followed. Before each weighing the scale was re-adjusted to zero, weight was recorded to the nearest 100 gm.

Assessment of passive straight raise test

The PSLR is a test that allows for passive assessment of apparent hamstring flexibility. The PSLR is performed with the patient supine and the clinician passively raising the leg with the patient relaxed; care should be taken to avoid rotation of the pelvis or flexion of the uninvolved leg. Participants who had posterior thigh pain in the past 4weeks duration were selected for clinical examination. Confirmation of the injury was based on clinical examination (Inspection, Palpation, and passive straight leg raise test) (Hansberger et al., 2019).

2.3 Data quality management

To ensure the quality of data, a pre-test for the data collection tools was done on 12 players who were not included in the main study by taking.

2.4 Data processing and analysis

The analysis was started by data entering, cleaning and coding. Data entry into the computer was carried out using the computer program, epi- data version 4.4.3.1 after the data template was developed based on the data collection tool, and analysis was done using a statistical package for social sciences (SPSS) for window version 21.

Frequency and percentage were used to describe the data and mean, median and standard deviations were also used as a summary measure. Bivariable logistic regression was conducted to see whether there is an association between the test variable and one categorical predictor variable at a time and the predictor variable with a p-value less than 0.25 was recruited for multivariable

logistic regression. In multivariable logistic regression with backward elimination, P-value (< 0.05) was used to decide whether the observed difference is statically significant or not. Multicollinearity was done, if variable inflation factor (VIF) greater than 10, it indicates collinearity effect. Whether the necessary assumptions for the application of multiple logistic regressions are fulfilled, Hosmer -Lemeshow goodness- of - fit statistic was applied, a large p-value, nearest to 1 indicates a good fit.

3. Results

3.1. Socio-demographic and anthropometric characteristics of soccer players

A total of 226 study participants were interviewed in this study with a 100% response rate. Out of the 226, 200(88.5%) were males and 26(11.5%) were females with the minimum and the maximum age of study participants was 17 and 35 years respectively (SD=±3.31). The median age was 21 years ±IQR. The majority of the participants (57.1%) completed secondary school education and were single (86.3%) (Table 1).

Table 1. Socio-demographic and anthropometric characteristics of soccer players in 2019 (n=226)

Variables	Categories	Frequency (n)	Percentage (%)
Age (years)	18-20	87	38.5
	20-35	139	61.5
Sex	Male	200	88.5
	Female	26	11.5
Level of education	Primary school	5	2.2
	Secondary school	129	57.1
	Higher Education	92	40.7
Marital status	Single	195	86.3
	Divorced	19	8.4
	In a relationship	9	4
	Married	3	1.3
Player experience (year)	2 - 4	15	99
	4-6	18	55
	6-8	4	20
	8-10	2	13
Monthly income (Ethiopian birr)	490-8000	181	80.1
	8000-16000	22	9.7
	16000-24000	4	1.8
	24000-40000	13	5.8
	40000-80000	6	2.7
Body mass index (Kg/m^2)	<18.5	4	1.8
	18.5-24.9	204	90.2
	25-29.9	17	7.5
	≥30	0	0
Waist circumference	<94	222	98.2
	≥94	4	1.8

3.2 Training and match related characteristics of the participants

The majority of study participants 186 (82.3%) started soccer specific training at the age of between 13 and 14 years. More than half of the participants did 5 to 6 trainings per week. Almost one-third of the participant were self-trainees (Table 2).

Table 2. Training and match related characteristics of soccer players in 2019 (n=226)

Variables	Categories	Frequency	(%)
Age at the beginning of soccer specific training	13-14	186	82.3
	15-16	25	11.1
	17-19	15	6.6
Sport club exposure of the player	Club exposure (self-trainees)	76	33.6
	Zonal competition	38	16.8
	Same club level	6	2.7
	U17 or U19 project	34	18.6
	University competition	60	26.5
Level of the club in the Ethiopian soccer league	Transferred from similar level club	12	5.3
	Premier league (men)	23	10.2
	Premier league (women)	26	11.5
	Higher league	22	9.7
	National league	86	38.1
	Premier league U20	69	30.5
Player position in the soccer club	Attacking Midfielder	23	10.2
	Central Midfielder	19	8.4
	Forward	55	24.3
	Wingback	51	22.6
	Central back	48	21.2
	Goal keeper	30	13.3
Number of trainings per week	3-4	67	31.3
	5-6	110	51.4
	≥7	37	17.3
Number of participations in games at this season	2-5	12	5.5
	6-9	82	37.3
	≥10	126	57.3

3.3 Lifestyle and clinical characteristics of study participants

Of the respondents, 41 (18.10%) sustained instantaneous posterior thigh pain the last 4 weeks duration. More than half (50.4%) of the respondents played soccer for 2-4 years at the Ethiopian soccer league. (Table 3).

Among 39 respondents who had positive straight leg test, 87.2% respondents had sustained posterior thigh pain during match or training while 12.8% were sustained posterior thigh pain gradually.

Table 3. Lifestyle and characteristics of soccer players in 2019 (n = 226)

Variables	Categories	Frequency	%
Water consumptions per training	No water intake	8	3.5
	One litter	117	51.8
	Two litters	93	41.2
	Two Litters and above	8	3.5
Leg dominance	Right legged	182	80.2
	Left legged	19	8.4
	Two legged	25	11.1
Number of injuries in adjacent region	Not sustained any injury	114	50.4
	1-5	102	45.2
	≥5	10	4.4
Instantaneous posterior thigh pain within 4 weeks duration	Yes	41	18.10
	No	185	81.9
Previous Hx of hamstring injury	Yes	75	33.2
	No	151	66.8
Players years of experience	2-4	114	50.4
	4-6	73	32.3
	6-8	24	10.6
	8-10	15	6.6

On the other hand, over one-third of participants sustained posterior thigh pain without any external contact. Among injured respondents 28.2% lays-off one week from the training field (Table 4).

Table 4. Lifestyle and clinical characteristics of soccer players 2019 (n=226)

Variables	Categories	Frequency	%
Onset of posterior thigh pain	Training or Match	34	87.2
	Gradually	5	12.8
Situation or mechanism of Hamstring injury occurrence on the player	Without any external contact	30	76.9
	Wrong Landing	1	2.6
	Fall to the ground	3	7.7
	Contact with opponents	5	12.8
Complete training/ match plays at time of injury occurred	Yes	22	56.4
	No	17	43.6
Number of absent from training or match play (weeks)	4	7	17.9
	3	4	10.3
	2	8	20.5
	1	11	28.2
	No absence	9	23

3.4 The magnitude of hamstring injury

The overall magnitude of hamstring strain injury was 17.3% with 95% CI (12, 22);17 % in males and 19% in females.

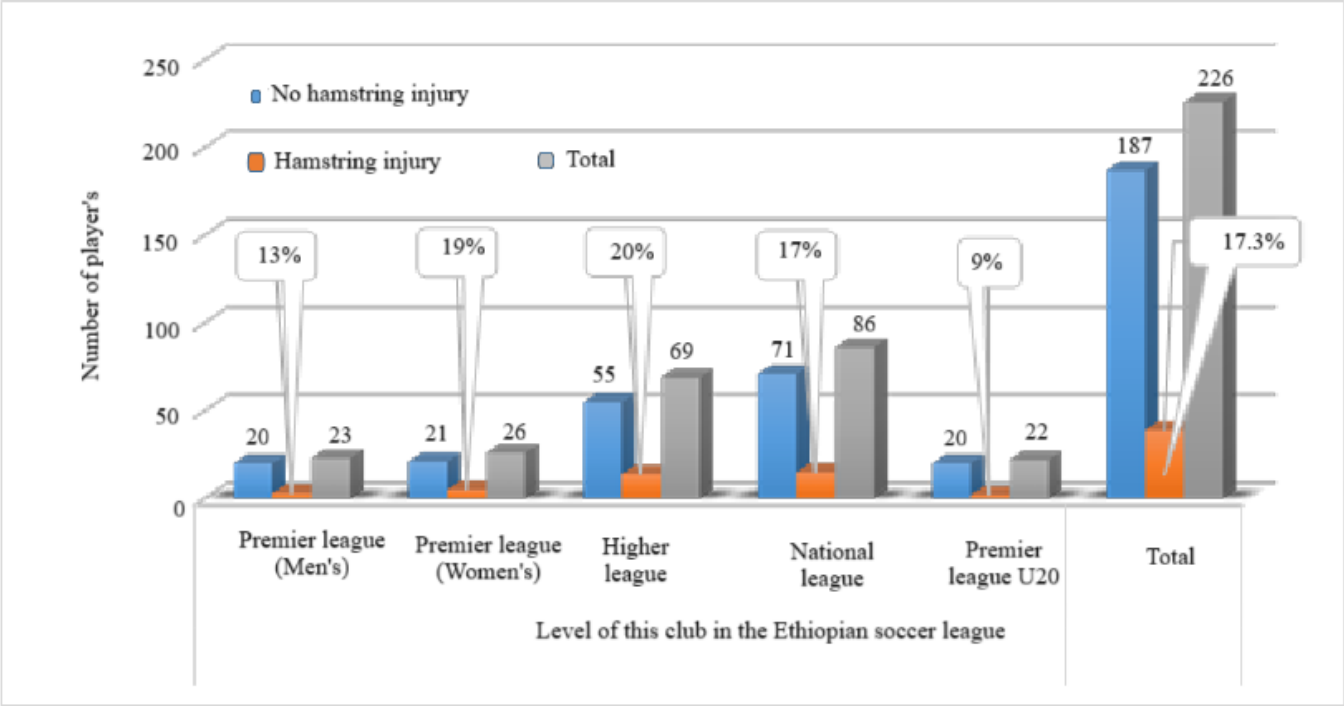

Figure 1. Prevalence of hamstring injury in different soccer league levels in 2019

The magnitude was the highest in the central back and the lowest in the central midfielder. On the other hand, it was the highest in the national league and the lowest in the primer league under 17. However, these variables were not statically significant in bivariate data analysis.

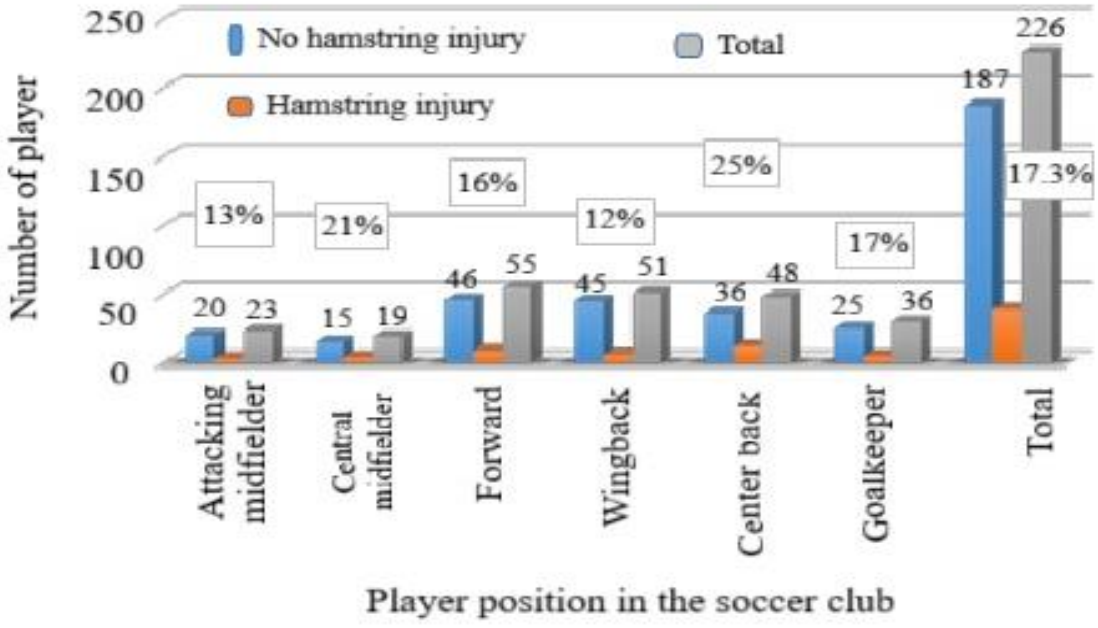

Figure 2. Prevalence of hamstring injury in different playing positions at soccer in 2019

3.5 Factors associated with hamstring strain injury in soccer players

Level of the club in the Ethiopian soccer league, Water consumptions per training, number of competitions at this season, Number of all other injuries sustained by the player, Previous Hx of posterior thigh pain, number of injuries in adjacent regions and BMI were significant risk factors for hamstring injury in the bivariate analysis. Variables with a P value <0.25 were included in multiple logistic regression.

According to the result of the multivariate analysis both previous history of posterior thigh pain and history of injury in the adjacent region with 95% CI (14.41 (4.55, 45.67) 95% CI (4.58 (1.87, 11.25), respectively were found significant factors **(**Table 5). Players with one to five injuries in the adjacent regions were 14.41 times more likely to be affected by hamstring injury than those without injury (AOR=14.41,95%, CI=4.55, 45.67). Similarly, players with a previous history of posterior thigh pain was 4.85 times more likely to be affected by hamstring injury than without posterior thigh pain (AOR=4.58, 95%, CI=1.87, 11.25).

Table 5. Bivariate and multivariable logistic regression for factors associated with hamstring injury of soccer players in 2019

Variables	Category	Hamstring injury status		COR (95% Cl)	AOR (95% Cl)	p-value
		Yes (n(%))	No (n(%))			
Level of the club in the Ethiopian Soccer league	Premier league (men)	3 (7.7)	20 (10.7)	1.5 (0.23, 9.96)	0.13 (0.009,2.79)	0.19*
	Premier league(women)	5(12.8)	21 (11.2)	2.38 (0.41,13.70)	4.10 (0.60,28.15)	0.15*
	Higher league	14(35.9)	55 (29.4)	2.55 (0.53,12.20)	2.79 (0.51,15.30)	0.24*
	National league	15(38.5)	71 (38)	2.11 (0.44,10.02)	2.0 (0.35,11.56)	0.44*
	Premier league U20	2(5.1)	20 (10.7)	1	1	
Number of competition at this season	2 thru 5	25(64.1)	62 (34.4)	2.92 (1.16,7.31)	2.14 (0.52,8.82)	0.29*
	6 thru 9	7(17.9)	64 (35.6)	0.77 (0.25,2.33)	2.02 (0.36,11.51)	0.43*
	≥10	7(17.9)	49 (27.2)	1	1	
Number of injuries in the adjacent region	Not sustained injury	4(10.3)	110(61.1)	1	1	
	1 thru 5	33(84.9)	69 (38.3)	13.15	14.41 (4.55,45.67)	0.00**
	≥ 5	2(5.1)	8 (4.4)	6.88 (1.10,43.41)	3.93 (0.51,30.72)	0.19*
Water consumptions per training	One litter	21(53.8)	96 (53.3)	1	1	
	Two litters	14(35.9)	79 (43.9)	0.81 (0.40,1.70)	1.16 (0.35,3.80)	0.81*
	>2 litters	1(2.6)	7 (3.9)	0.65 (0.08,5.60)	0.20 (0.007,6.32)	0.36*
	No water intake	3(7.7)	5 (2.8)	2.74 (0.61,12.38)	3.15 (0.31,32.20)	0.33*
Previous Hx hamstring injury	Yes	22(56.4)	53 (29.4)	3.27 (1.64,6.64)	4.58 (1.87,11.25)	0.001*
	No	17(43.6)	134(74.4)	1	1	0.001*
BMI (Kg/m^2)	18.5-24.4	27(69.2)	164(88.9)	1	1	
	24.5-29	2 (5.1)	23(12.2)	0.39 (0.09, 1.75)	0.68 (0.45,10.22)	0.78*

4. Discussion

The present study assessed the prevalence of hamstring strain injury and associated factors among 226 soccer players in Southern Ethiopia. It was the first study in kind performed in Ethiopia aiming to determine the prevalence and associated factors among soccer players 'towards hamstring injury. Using a questionnaire and simple clinical measures several associated variables have been identified. The overall magnitude of hamstring strain injury was 17.3% with a 95% CI (12, 22). It was comparable with the study done in England (12%) (Woods et al., 2004) and Hong Kong (15.4%) (Lam et al., 2017).

On the other hand, it was higher than the study done in Nepal (40.19%) (Shakya and Manandhar, 2018). The possible reasons for the difference could be rehabilitation trends or racial differences on the population studied. In this study, significant associations between the history of injuries in adjacent regions and previous histories of hamstring injuries were observed. Accordingly, players having one to five injuries in adjacent regions were more at risk for hamstring injury than without injuries. This is in line with the study done by Orchard found that a history of calf muscle strain was associated with the risk of hamstring injury (Orchard, 2001). Similarly, Verrall et al reported that hamstring injury was associated with a history of knee injury ($p=0.04$) and a history of osteitis pubis (Verrall et al., 2006). This is could be due to inadequate rehabilitation or premature return to play after an initial injury. It is also due to residual deficits in the previously injured joint or muscle that leaves the player more liable to re-injury. Restriction from following full preventive exercises due to other region injuries could be the possible reason for developing HIS.

The previous history of hamstring injury was another variable found to be significantly associated with a hamstring injury. Those players who had a history of a hamstring injury were more likely to be affected by hamstring injury than those without a history of hamstring injury. This finding is in agreement with the study done in Australian football players with a previous history of hamstring injury who were 2.1 times more likely to sustain another injury (Bennell et al., 1998). This is also in line with the study done by Hagglund *et al.* (2006). This could be due to inadequate rehabilitation services. Increasing age has been identified as a significant predictor of future HSI in Australian football and soccer players. The risk of HSI appears to increase by 10% per year in elite Icelandic soccer players (Bourne, 2016). In contrast, our study found that no association between age and hamstring injury. This difference might be due to the similar age categories and the analytical methods we used.

Playing position as a risk factor for football injury, in general, has been reported but with conflicting results. Some studies showed no difference in injury rates between playing positions while others found an increased injury rate for midfielders, forwards, and lower injury rates among goalkeepers. In our study, no significant difference was observed in the number of hamstring injuries among different playing positions. In contrast, a study conducted by Woods *et al* showed that goalkeepers sustained significantly fewer injuries than outfield players ($p<0.01$) (Woods et al., 2004). This difference could be due to the small sample size used. In our study, no significant difference was observed in the number of hamstring injuries between the dominant and non-dominant legs. This is in agreement with the study done by Henderson *et al.* (2010) and Verral et al. (2006). Limitations to this study exist and must be acknowledged. Although the gold standard diagnostic tool for the assessment of hamstring injury is MRI due to limitation of resources the study applied clinical signs and physical examination (inspection, palpation, and straight leg raise test (SLRT) as a diagnostic tool for identifying a player with Hamstring strain injury.

5. Conclusion

In this study the overall magnitude of hamstring strain injury was 17.3% it was 17% in males and 19% in females. Some variables like the previous history of a hamstring injury and adjacent region injury have been found associated with a hamstring injury. This study aids the soccer clubs' coaches and medical team to evaluate and standardize their rehabilitation protocols for the decision on the length of days for rehabilitation.

Conflict of Interest

The author (s) did not disclose any potential conflicts of interest

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Ethical approval and consent to participate

The ethical clearance board of Arba Minch University, College of Medicine and Health Sciences ethically approved all the study methods and protocols and responded with a letter reference number IRB/129/12 on the date of 14/11/2019. Informed consent was taken from pregnant women before data collection.

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