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Prevalence and Associated Risk Factors of Ankle Sprains in Maldivian Basketball Players

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Abstract

Basketball players must perform jumps with both feet off the ground in the game, and they frequently land off balance and sustain ankle injuries. Despite the fact that the ankle supports the entire body's weight and has a wide range of motion, it is a frequently injured joint. In order to prevent recurrent ankle sprains and secondary consequences, the objective of this study is to identify the prevalence, risk factors and preferred treatment for ankle sprains among Maldivian basketball players. A questionnaire was provided to the basketball players in the greater Male' region in the Maldives which helped obtain the necessary information to perform the study. Prevalence was analysed by frequency and the significance of risk factors was analysed using the Chi-Square Test on SPSS version 26. In total, 92.7% of the 193 basketball players had an ankle sprain. Age, frequency of playing per week, player's position, and injury mechanism were identified as significant risk factors. Majority of the participants (62.6%) preferred the RICE (Rest, Ice, Compression, Elevation) approach for treating ankle sprains, followed by visits to physiotherapy clinics (14.5%) and hospitals (22.9%). Participants with prior educational experience in injury prevention made up 27.4% of the group. The results revealed a high prevalence of ankle sprains among basketball players from the Maldives Male' region, with age, weekly playing frequency, injury mechanism, and player position serving as important risk factors. This study provides an opportunity to start a conversation amongst athletes, coaches, and medical professionals because the majority of the participants lacked prior knowledge about injury prevention. Future intervention studies can be carried out to lessen the frequency and seriousness of ankle sprains in Maldivian basketball players.

Keywords

Ankle sprain, basketball players, injuries, risk factors

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Introduction

Basketball is one of the most popular team sports in the Maldives nowadays. It is played at all levels, including school, national, and international, with multiple tournaments throughout the year, such as the South Asian Basketball Association (SABA) Championship.

The lower leg and foot make up the ankle joint complex, which creates the kinetic linkage that enables the lower limb to interact with the ground for a crucial component of walking and other daily tasks. The bony and ligamentous nature of the ankle allows it to function with a high degree of stability while sustaining substantial compressive and shear pressures during locomotion. In comparison to other joints like the hip or knee, the ankle functions with more stability. Sprains are defined as partial or complete tears of ligaments caused by stretching them beyond their normal range (Michael et al., 2008). In order to prevent the ankle joint from moving back and forth, its ligaments offer stability. However, the ankle sprain mostly affects the lateral compartment of the ankle joint (Bahr & Bahr, 1997; Mir et al., 2021). Inversion, eversion, and syndesmotic ankle sprains are the three basic forms. Inversion sprains cause tarsal joint lateral ligaments to be torn because of severe inversion and plantarflexion. The medial collateral ligament in the ankle is torn when the foot is subjected to too much force during eversion. Last but not least, quick or strong external rotation and dorsiflexion might rupture syndesmotic ligaments (Beynnon et al., 2002).

Basketball is the most fast-paced and intense non-contact activity, and some evidence suggests that the risk of injury may be higher than in other full-contact sports (Kofotolis & Kellis, 2007). These ankle sprains result in temporary pain and swelling (McKay et al., 2001), but they can also have long-term consequences such as high medical costs, decreased strength, joint instability, delayed muscle reaction time, and incapacity swelling (McKay et al., 2001). Additionally, they increase the risk of subsequent sprains, such as complete ligament ruptures, which can lead to capsular loosening. In order to help prevent further injuries and lengthen the athlete's career, it is necessary to identify the risk factors linked to an ankle sprain in various modalities (Osborne & Rizzo, 2003; Peres et al., 2014).

As a result, the study was designed to look at the prevalence, risk factors and preferred treatment among basketball players with ankle sprains in the Maldives.

Methodology

A descriptive cross-sectional quantitative study was carried out targeting active Maldivian basketball players in the region of Male. The target population was basketball players, both recreational and professional, between the ages of 18 and 40, with a minimum of 1 year of experience playing basketball at any level, with a sample size of 384 players (18–40 years of age).

Players with any history of orthopaedic surgery in the lower limb, spinal deformity, lower limb fracture, ankle and foot congenital abnormalities or diseases, and also patients with inflammatory symptoms in the lower limb such as redness, swelling, pain, and limited ROM were excluded.

A questionnaire was provided to the basketball players in the greater Male' region in the Maldives, which helped obtain the necessary information to conduct the study. Upon receiving clearance, a Google Docs questionnaire was created and shared on Instagram, Facebook, Snapchat, WhatsApp, and Viber with the participants.

The study's purpose was briefly explained to participants before they completed the online questionnaire, and they were then asked to sign an informed consent form. The study was approved by the university ethical committee (INTI-IU/FHLS-RC/BPHTI/7NY12021/010).

Outcome Measure of this Study

Preceding to employing a validated self-structured questionnaire, permission from the authors of the prior study was acquired (Al Amer & Mohamed, 2020). The questionnaire is broken up into two sections: basketball-related demographic data and risk factors related to the sport. The participant's age, sex, marital status, level of education, height, and weight made up their basic demographic information.

Furthermore, the participants' dominant leg, years of basketball experience, how frequently they play during the week, the typical length of a playing or training session, and if they play basketball competitively or for leisure. Potential risk factors for ankle injuries include previous ankle injuries, the mechanism of damage, the kind of ankle sprain, protective gear, player position, playing surface, type of shoes, if the player stretched and strengthened during warm-up, and more. Education about injury treatment and injury prevention is also included.

Statistical Analysis

The surveys were checked to make sure they were fully completed. The Statistical Package for the Social Sciences (SPSS) version 26.0.0 was used to enter the data after evaluation and analyse it. All categorical information is presented as frequency (n) with percentage (%), such as the kind of ankle sprain and years of basketball experience, among other things. The Pearson's chi-squared test is used to analyse the relationship between risk variables and the frequency of ankle sprains. For the result to be deemed significant, the p value had to be lower than 0.05. (Al Amer & Mohamed, 2020; Mir et al., 2021; Pourgharib Shahi et al., 2020).

Results and Discussion

The questionnaire was completed by 209 people in total, but 16 of them were eliminated for the reason of not meeting the inclusion criteria. For this study, the data from 193 individuals was analysed.

Table 1 & Table 2 below displays the participant characteristics' frequency distributions. Male participants were 55.4% (n = 107) and females were 44.6% (n = 86), with nearly half (43.5%) having played basketball for six to ten years and more than half (60.1%, n = 116) being between

the ages of 18 and 25. The majority of participants experienced ankle sprains (92.7%, n =179), with the right leg accounting for 34.6% (n =62), the left leg for 21.8% (n =39), and both sides for 43.6% (n =78) of ankle sprains. Approximately 66.5% (n = 119) of those who had an ankle sprain in the previous year had only one incident, whereas the remainder 33.5% saying they had more than one in the preceding 12 months. From the findings, it was determined that the age and amount of playing each week were important demographic risk variables. Injury mechanism and playing position were important play-related risk variables.

Table 1. Characteristics of participants (n=193)

Variables		**Frequency (percentage)**
Age (years)	18-25	116 (60.1)
	26-30	34 (17.6)
	31-35	19 (9.8)
	36-40	24 (12.4)
Sex	Female	86 (44.6)
	Male	107 (55.4)
Marital Status	Married	60 (31.1)
	Single	133 (68.9)
Educational level	School	60 (31.1)
	Diploma	69 (35.8)
	Bachelors	44 (22.8)
	Masters	17 (8.8)
	Doctoral (PhD)	3 (1.6)
BMI	Underweight (<18.5)	6 (3.1)
	Normal (18.5-22.99)	81 (42)
	Overweight (23-24.99)	51 (26.4)
	Pre-obese (25-29.99)	41 (21.2)
	Obese (>30)	14 (7.3)
Dominant Leg	Right	159 (82.4)
	Left	34 (17.6)
Experience playing Basketball	1 to 5 years	42 (21.8)
	6 to 10 years	84 (43.5)
	11+ years	67 (34.7)
Frequency of playing per week	1 time per week	49 (25.4)
	2 times per week	39 (20.2)
	More than 2 times per week	105 (54.4)

Duration of playing/ training per session	Less than 30 mins	4 (2.1)
	30 mins – less than 1 hour	21 (10.9)
	More than 1 hour – less than 2 hours	133 (68.9)
	More than 2 hours	35 (18.1)
Competitive or Recreational basketball player	Competitive	68 (35.2)
	Recreational	125 (64.8)
Occurrence of ankle sprain	Yes	179 (92.7)
	No	14 (7.3)

Note: Values are in frequency (percentage)

According to the study's findings, young basketball players were more likely to sprain their ankles than older players. As did authors of other studies, we separated the participants into age groups (Stevenson et al., 2000; McKay et al., 2001; Ramirez et al., 2006). In the previous 12 months, ankle sprains occurred most frequently in people between the ages of 18 and 25. Stevenson et al. (2000) found that athletes between the ages of 18 and 25 had a higher risk than athletes younger than 18 and older than 30 years, despite the fact that it was more significant in athletes aged 26 to 30 years. According to Murphy et al. (2003), McManus et al. (2006), and Hewett et al. (2006), younger athletes with an average age of 25.2 were found to have physiological changes that impair neuromuscular control. These changes could lead to muscular strength imbalances, a loss of stability while landing, a dependency on the dominant leg, and postural instability. An unreliable landing mechanism and ankle injury could result in ankle injuries (Belcher et al., 2020). Additionally, it's possible that the bulk of the older players have more experience, which could help them comprehend the proper playing techniques and how to prevent injuries like ankle sprains.

Table 2. Characteristics of ankle sprain (n=179)

Type of ankle sprain	Eversion	23 (12.8)
	Inversion	135 (75.4)
	Syndesmotic	21 (11.7)
Injury mechanism	Bump into another player	36 (20.1)
	Fell down	21 (11.7)
	Jump and land	82 (45.8)
	Quick stop	9 (5)
	Twisting	31 (17.3)
Time of injury	During a match in a tournament	91 (50.8)
	During practice	88 (49.2)

Note: Values are in frequency (percentage)

However, Turbeville et al. (2003) noted that older, more experienced players have a higher risk of injury since they would have had more game time and a greater chance of injury. According to our findings, the weekly playing frequency of basketball players was a key risk factor for ankle sprains. The majority of athletes who sustained ankle sprains once or more than once in the previous year participated in practise or a game more than twice a week. Similar to this, more games and practise sessions were associated with higher injuries, according to a paper by Caparrós et al. (2016). These players have a higher chance of suffering an injury as their playing time increases. In contrast to the findings from Caparrós et al. (2016) and the present study findings, Singh et al. (2013) observed that it was unable to draw any conclusions about the relationship between the practise and injuries.

When examining the types of ankles sprains these basketball players had, inversion ankle sprains made up the majority, accounting for 75.4% of cases, followed by eversion at 12.8% and syndesmotic ankle sprains at 11.7%. 45.8% of these ankle sprains happened during leaps and landings, with fast stops being the least frequent at 5%. Injuries happened frequently throughout a tournament's practise and game, at 49.2% and 50.8%, respectively, as seen in Table 3. Ankle sprains were revealed to be a substantial risk factor for basketball players in our study due to their injury mechanisms.

Table 3. Demographic risk factors for ankle sprain (n=179)

Risk Factors		Incidence of Ankle Sprain		*df* value	*p* value
		1 time (n=119)	More than 1 time (n=60)		
Age (years)	18-25	71 (59.7)	37 (61.7)		
	26-30	25 (21)	4 (6.7)	3	**0.017***
	31-35	8 (6.7)	11 (18.3)		
	36-40	15 (12.6)	8 (13.3)		
Sex	Female	61 (51.3)	23 (38.3)	1	0.102
	Male	58 (48.7)	37 (61.7)		
Marital status	Single	82 (68.9)	41 (68.3)		
	Married	37 (31.1)	19 (31.7)	1	0.938
Educational level	School	36 (30.3)	18 (30)		
	Diploma	43 (36.1)	20 (33.3)		
	Bachelors	28 (23.)	15 (25)	4	0.993
	Masters	10 (8.4)	6 (10)		
	Doctoral (PhD)	2 (1.7)	1 (1.7)		
BMI	Underweight (<18.5)	2 (1.7)	3 (5)		
	Normal (18.5-22.99)	48 (40.3)	25 (41.7)		

	Overweight (23-24.99)	37 (31.1)	12 (20)	4	0.309
	Pre-obese (25-29.99)	22 (18.5)	16 (26.7)		
	Obese (>30)	10 (8.4)	4 (6.7)		
Dominant leg	Right	96 (80.7)	51 (85)		
	Left	23 (19.3)	9 (15)	1	0.476
Experience playing Basketball	1 to 5 years	29 (24.4)	12 (20)		
	6 to 10 years	54 (45.4)	22 (36.7)	2	0.221
	11+ years	36 (30.3)	26 (43.3)		
Frequency of playing per week	1 time per week	35 (29.4)	12 (20)		
	2 times per week	31 (26.1)	6 (10)	**2**	**0.004***
	More than 2 times per week	53 (44.)	42 (70)		
Duration of playing/ training per session	Less than 30 mins	2 (1.7)	2 (3.3)		
	30 mins – less than 1 hour	15 (12.6)	4 (6.7)		
	More than 1 hour – less than 2 hours	79 (66.4)	44 (73.3)	3	0.523
	More than 2 hours	23 (19.3)	10 (16.7)		
Competitive or Recreational basketball player	Competitive	44 (37)	24 (40)		
	Recreational	7 (63)	36 (60)	1	0.694

Note: Values are in number (percentage). Using chi-square analysis, the association between demographic characteristics and the frequency of ankle sprain was analyzed.

The most frequent causes of one or more ankle sprains in the previous 12 months were jumps and landings, where basket-ball skills involve this type of movement that is very common and may be prone to an inversion ankle sprain in the ankle joint. These findings are comparable to those of McKay et al. (2001), which discovered that jumping and landing were the mechanisms of damage in 45% of ankle injuries. This was expected given that jumping and landing are typical basketball skills and essential to the sport (Kofotolis & Kellis, 2007), and that they may cause significant musculoskeletal and joint stress (Sitler et al., 1994; McKay et al., 2001). Additionally, similar conclusions are supported by studies by Pillay & Fratz (2012) and Ferreira & Spanner (2010). To help athletes avoid ankle sprains, Steele (1990) and McKay et al. (2001) suggested finding the proper body movements and landing techniques. However, Kofotolis & Kellis (2007) and Cumps et al. (2007) found that the majority of injuries happened when a player collided with another, with contact sprains having a substantially higher injury rate.

The Chi-squared test did not reveal any significant relationships between any of the demographic factors (sex, marital status, education level, BMI, dominant leg, years of experience playing basketball, frequency of play, duration of play per session, competitive or recreational) and the likelihood of suffering an ankle sprain (Table 4). 36.7% (n = 54) of individuals with right-leg dominance (sprained ankles) did so with their dominant right leg, whereas 31.3% (n = 10) of

people with left-leg dominance (sprained ankles) did so with their dominant left leg. However, there is no evidence of a substantial relationship between the participant's dominant limb and the injured leg (side).

Table 4. Sports-related risk factors for ankle sprain (n=179)

Risk Factors	Incidence of Ankle Sprain		*df* value	*p* value
	1 time (n=119)	More than 1 time (n=60)		
History of previous ankle injury				
Yes	95 (79.8)	50 (83.3)	1	0.573
No	24 (20.2)	10 (16.7)		
Type of ankle sprain				
Eversion	14 (11.8)	9 (15)		
Inversion	87 (73.1)	48 (80)	2	0.131
Syndesmotic	18 (15.1)	3 (5)		
Injury mechanism				
Bump into another player	27 (22.7)	9 (15)		
Fell down	19 (16)	2 (3.3)	**4**	**0.032***
Jump and land	47 (39.5)	35 (58.3)		
Quick stop	7 (5.9)	2 (3.3)		
Twisting	19 (16)	12 (20)		
Time of injury				
During a match in a tournament	58 (48.7)	33 (55)	1	0.429
During practice	61 (51.3)	27 (45)		
Protective Equipment				
Guard	25 (21)	11 (18.3)		
Tape	18 (15.1)	13 (21.7)	3	0.563
Brace	8 (6.7)	6 (10)		
No	68 (57.1)	30 (50)		
Playing surface				
Cement surface	69 (58)	34 (56.7)	2	0.616
Indoor synthetic flooring	31 (26.1)	19 (31.7)		
Timber flooring	19 (16)	7 (11.7)		
Type of shoe				
Cushioned column shoes	155 (96.6)	54 (90)	1	0.068
Non-cushioned column shoes	4 (3.4)	6 (10)		
Warm up before playing				
Yes	59 (49.6)	22 (36.7)	1	0.101

No	60 (50.4)	38 (63.3)		
Stretching before playing				
Yes	42 (35.3)	22 (36.7)	1	0.856
No	77 (64.7)	38 (63.3)		
Perform strengthening				
Yes	28 (23.5)	20 (33.3)	1	0.162
No	91 (76.5)	40 (66.7)		
Playing position				
Center (pivot)	26 (21.8)	19 (31.7)		
Guard	17 (14.3)	16 (26.7)	4	**0.007***
Point guard	26 (21.8)	16 (26.7)		
Power forward	27 (22.7)	5 (8.3)		
Small forward	23 (19.3)	4 (6.7)		

Note: Values are in number (percentage). Using chi-square analysis, the association between demographic characteristics and the frequency of ankle sprain was analysed.

The important sports-related risk factors for ankle sprain in Maldivian basketball players included playing position and injury mechanism. Center (pivot) players made up the bulk of those who sustained multiple ankle sprains (31.7%), while power forward players made up 22.7% (n = 27) of those who only sustained one. Finally, it was found that a significant risk factor for ankle injuries in basketball players was their location on the court. The most common positions for ankle sprains were found to be centre and power forward, with respective rates of 30% and 22.7%. Due to the fact that both of these places are close to the crucial part of the court (around the hoop), they would have to jump higher and make more player-to-player contact, which would increase their risk (Kofotolis & Kellis, 2007; Kofotolis et al., 2007; Meeuwisse et al., 2003).

A study by Moré-Pacheco et al. (2019) discovered significance in a player's position as a risk factor that influences the player's likelihood of suffering injuries. In terms of the injury mechanism associated with leaping and landing, 39.5% of participants reported having an ankle sprain once, and 58.3% had had it more than once in the previous year, as shown in Table 5. On the other hand, Al Amer & Mohamed (2020) and Sitler et al. (1994) found no evidence of a connection between the players positions and ankle sprains from their research, which again is contrary to the previous and present study findings. This recommends more studies be explored on the players position and injury prevalence.

Further, the RICE approach (Rest, Ice, Compression, Elevation) was chosen by the participants to treat their ankle sprains (622.2%, n=112), followed by visits to physiotherapy clinics (14.5%, n=26), and hospitals (22.9%, n=41). The remaining play-related risk factors (history of a prior ankle injury, type of ankle sprain, time of injury, treatment for an ankle sprain, protective gear, playing surface, type of shoe, warm-up, stretching or strengthening, and education about injury prevention), as shown in Table 4, did not significantly affect the incidence of ankle sprain. The participants were also questioned regarding their preferred post-ankle sprain treatments in addition to the risk variables.

Since injuries are frequently not taken seriously in the Maldives, the RICE (Rest, Ice, Compression, Elevation) technique was chosen by the majority of participants. Only a tiny portion of the participants elected to receive physiotherapy due to the limited availability of the practise in the Maldives. Patients in the Maldives must always be referred by a doctor, so there is no direct access to physiotherapists through the health care system. All athletes in the Maldives, not only basketball players, have a limited understanding of physiotherapy. 72.6% of the participants responded "no" when asked if they had any prior knowledge of injury prevention education. This may help to explain why ankle sprains are so common among basketball players in the Maldives.

Conclusions

Finally, it was discovered that Maldivian basketball players, both amateur and professional, frequently suffer from ankle sprains. The results of this study made it possible to identify a number of risk variables, including age, playing frequency, position played by the player, and injury mechanism. These results can be used to create injury prevention strategies, many of which were found to be lacking among the participants. Further intervention studies to reduce the frequency and severity of ankle ligament injuries in basketball players may be possible if the risk variables for ankle ligament sprain have been identified.

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Conflict of interest

The author(s) declare(s) that there is no conflict of interest.

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