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Original Article

Comparison of the prevalence and mechanism of sports injuries among elite male basketball players

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Abstract

Background: Basketball is a team-oriented and contact sport and participation in this sport entails accepting the risk of injury. The purpose of this study was to determine the causes and prevalence of sports injuries among male basketball players in the country. The aim of this study was to determine the causes and prevalence of sport injuries**.**

Methods: This cross-sectional study employed a retrospective method and utilized a questionnaire on basketball injuries as documented by Marcus et al. The study surveyed 82 players from the Premier League and Division I, belonging to the 1401 basketball season. Data were analyzed by descriptive statistics and chi-square test ($\chi 2$).

Results: The results of the study showed that the frequency of injuries in the lower extremities (75%) was significantly higher than in the other parts of the body ($p = 0.001$, $\chi 2 = 94.46$). In the lower limbs, knees and wrists had the highest injury rates (48.7%, and 46.2%, respectively) ($p = 0.001$, $\chi 2 = 41.49$). Conversely, in the upper limb, shoulder had the highest injury rate (50%) though the difference was not significant ($p = 0.26$, $\chi 2 = 2.62$). The mechanism of occurrence of damage was related to landing (44.2%), which was statistically significant ($p = 0.001$, $\chi 2 = 58.53$).

Conclusion: The majority of injuries among basketball players affect the lower extremities, particularly the knees and ankles, likely due to frequent jumping and rapid movements during the game.

Keywords: Prevalence, mechanism, sport injury, basketball

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Introduction

Basketball is an aggressive, attractive sport that ranks among the most popular worldwide [1]. With the increasing interest in basketball, accurate diagnosis and treatment of its associated injuries becomes increasingly crucial. In this regard, Kaftolis and Kilis emphasized in 2007 that basketball carries a high prevalence and risk of injury [2]. Their study, encompassing a statistical population of 108 players from teams participating in the 1974 Sports Olympiad, with a sample of 80 individuals, revealed that 49% of the sample experienced injuries to the ankle's collateral ligaments. The primary causes of these injuries were impact (66%), improper footwear (20%), and lack of adequate preparation (5%) [3]. Similarly, in a comprehensive 16-year study within The American Basketball League, Randall Dick and colleagues highlighted that approximately 60% of injuries affected the lower limbs, with ankle sprains being the predominant issue among players. Following ankle injuries, knee disorders stood out as the next most common injuries, often leading to players missing 10 or more matches [4]. McLee et al (2001) showed that the injury ratio was 18.3 per 1000 participating players (equivalent to 24.7 per 1000 hours of play) during official matches and gameplay [5]. Common injuries in basketball are ankle and foot injuries, knee injuries, hamstring strains, thigh contusions, trunk and spine injuries, eye injuries, wrist and palm injuries, finger joints, palm joints, and hand and wrist fractures and sprains [6].

Flood and colleagues (2009) conducted a study on the epidemiology of basketball injuries in Australia from 2000 to 2004 and found fractures (49.4%) followed by dislocations (10.9%) and stated sprain and strain (10.6%) as the most common types of injuries. Their findings led to the conclusion that basketball-related injuries have a significant correlation with the athlete's age [6]. In a separate study by Barani et al (2008) focused on female basketball players, the most common types of injuries were sprain (36.8%), strain (26.3%) and fracture (21%). Regarding player positions, centers (42.1%) suffered the highest rate of injuries, followed by guards (31.6%) and forwards (26.3%) [7].

Van Mechelen in 1992 introduced a theoretical framework for the prevention of sports injuries involving a four-step process that includes recognition, identification of injury causes and mechanisms, assessment of their frequency and severity, implementation of preventive strategies, and evaluation of the efficacy of these preventative measures [8].

Given that injuries are a significant concern in sports, and sports-related injuries are a pivotal topic encompassing prevention and treatment across all sporting domains, addressing

the realm of sports injuries remains vital. Nowadays, the focal point has shifted towards effective injury prevention and management, particularly pertinent within team sports like basketball. Clubs, driven by substantial investments, especially within basketball, bear considerable recruitment costs. Consequently, the necessity arises for devising strategies to proactively mitigate and curtail injuries. Basketball is one of the most injury-prone sports among Olympic sports [9].

Given this overarching context and the evident gap in current and comprehensive insights into the prevalence and causal factors of sports injuries in male basketball players in Iran, this research endeavors to shed light on the mechanisms and prevalence of injuries within the realm of Iranian male basketball players.

Material and methods

This research was descriptive and retrospective. The male athletes of 13 teams participating in the Premier League and first division of Iran's 1401 basketball season (number=82/ Division I=45/ Premier=37) were investigated in this research. Within this cohort, a sample of 52 athletes who had sustained injuries (was selected for the study. The average age of the subjects was 24.68 years, their height was 192.50 cm and their weight was 88.77 kg.

Data collection and measurement were done using the basketball injury questionnaire of Marcus et al. (2013 edition) [9]. This questionnaire, endorsed by experts within the sports injury and corrective exercise domain, was completed through interviews. The form encompassed several sections, including initial information such as player background, playing position, game history, dominant side, and weekly training sessions. Additionally, it covered injury characteristics like the injured anatomical site, injury nature, and injury severity.

SPSS version 19 statistical software was used for data analysis, and non-parametric descriptive and inferential statistics were used for data analysis. The chi-square test ($\chi 2$) was applied to determine significant intergroup differences, considering p-values below 0.05 as indicative of significance. Graphs were generated utilizing Microsoft Excel software.

Results

The results of this research showed that 62.2% of the 82 players had sustained injuries. The average experience of the players was 10.9 years with a standard deviation of 5.3. Among

them, 55 individuals were engaged in the First Division, while 27 were affiliated with the Premier League.

Based on the rate of injury per 1000 hours of play, Division I players were exposed to 44.02 and Premier League players are exposed to 41.34 injuries per 1000 hours of play. The frequency of injuries that occurred in the lower limbs (75%) was significantly higher than in other parts of the body ($p=0.001$, $\chi2=94.56$). Within the lower limb category, injuries to the knee and ankle regions were most prevalent, constituting 48.7% and 46.2%, respectively ($p=0.001$, $\chi2=41.94$). In contrast, within the upper limb domain, the shoulder bore the brunt of injuries (50%), though this disparity lacked statistical significance ($p=0.26$, $\chi2=2.62$) (Tables 1, 2, and 3).

Nonetheless, no significant distinctions emerged between the Premier League and Division I concerning the location of injury, injury mechanism, injury nature, injury severity, and playing positions.

Table 1. The number and percentage of injuries that occurred in the five areas of the body by league of play

location	Premier		Division I		total	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
Lower extremity	11	21.2	28	53.8	39	75
Upper extremity	2	3.8	6	11.5	8	15.38
trunk	0	0	3	5.8	3	5.76
Head and neck	0	0	2	3.8	2	3.84
total	13	25	39	75	52	100

Table 2. The number and percentage of lower extremity injuries by league

location	Premier		Division I		total	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
knee	5	12.8	14	35.9	19	48.7
ankle	5	12.8	13	33.3	18	46.2
tight	0	0	1	2.6	1	2.6
calf	1	2.6	0	0	1	2.6
total	11	28.2	28	71.8	39	100

Table 3. The number and percentage of upper extremity injuries by league

location	Premier		Division I		Total	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
shoulder	1	12.5	3	37.5	4	50
wrist	1	12.5	2	25	3	37.5
elbow	0	0	1	12.5	2	12.5
total	2	25	6	75	8	100

Furthermore, the findings indicated that damage to the dominant side accounted for 40% (n=16), while damage to the non-dominant side constituted 60% (n=24). The statistical analysis revealed a lack of significant difference in the extent of damage between the dominant and non-dominant sides($p=0.074$, $\chi2=3.2$).

The results also showed that the most important mechanism of injury was related to landing (44.2 %), and their statistical test showed a significant difference ($p=0.001$, $\chi2=58.73$) (Table 4).

Table 4. Mechanisms of incidence of injuries by league of play

Mechanism of injury	Premier		Division I		total	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
landing	6	11.5	17	32.7	23	44.2
cutting	1	1.9	4	7.7	5	99.6
Rotation	2	3.8	3	5.8	5	9.6
Contact with ball	0	0	3	5.8	3	5.8
Pushing	0	0	5	9.6	5	9.6
Running	0	0	2	3.8	2	3.8
Diving	0	0	2	3.8	2	3.8
other	4	7.7	3	5.8	7	13.5
total	13	25	39	75	52	100

The results further demonstrated that the most prevalent mechanism of injury was associated with landing (44.2%), and the corresponding statistical analysis substantiated a significant distinction. ($p=0.409$, $\chi2=1.78$).

Table 5. The nature of the injuries by league

nature	Premier		Division I		Total	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
Non-contact	4	7.7	12	23.1	16	30.8
contact	8	15.4	13	25	21	40.4
Over use	1	1.9	14	26.9	15	28.8
total	13	25	39	75	52	100

Also, the results of the statistical test showed that there was a significant difference in the severity of the injury (p=0.02, $\chi 2$=3.86) (Table 6).

Table 6. The severity of the injuries by league

severity	Premier		Division I		Total	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
mild	4	7.7	9	17.3	13	25
middle	2	3.8	12	23.1	14	26.9
sever	7	13.5	18	34.6	25	48.1
total	13	25	39	75	52	100

Regarding the return to normal activity, 21 injuries displayed no signs of injury recovery (40.4%), while 29 injuries exhibited signs of recuperation (55.8%), and 2 injuries fell into option 3 (3.8%). The observed differences are statistically significant (p=0.001 and $\chi 2$=33.28). Additionally, in terms of injury timing, 42.3% (22) of injuries occurred during training, while 57.7% (30) transpired during competitions. The analysis indicated that there was no noteworthy disparity concerning injury timing (p=0.117, $\chi 2$=2.46). Furthermore, among the total athletes surveyed, 25% (13 individuals) encountered re-injury after resuming sports activities, while 75% (39 individuals) did not experience re-injury. The statistical assessment revealed no significant distinction regarding re-injury (p=0.116, $\chi 2$=2.46).

Moreover, the statistical evaluation of game positions unveiled no substantial variance in injury occurrence (p=0.14, $\chi 2$=3.86) (Table 6).

Table 7. The number and percentage of injuries of athletes by playing position and playing league

post	Premier		Division I		Total	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
center	5	9.6	14	26.9	19	36.5
forward	5	9.6	16	30.8	21	40.4
guard	3	5.8	9	17.3	12	23.1
total	13	25	39	75	52	100

Discussion

Based on the outcomes of the research, the majority of injuries were observed in the lower limbs, with ankle injuries being the predominant issue among male basketball players.These results are consistent with the results of Dich et al. [2] and Drakos et al. Nelson and colleagues documented basketball as a sport where ankle injuries are particularly prevalent [9]. Drakus et al also highlighted ankle injuries as the most common type among basketball players. In basketball, ankle injuries often stem from abrupt and rapid cutting movements while evading defenders and from imbalanced landings during throwing and rebounding actions. During these dynamic motions, players primarily concentrate on the ball or their opponents' movements, potentially compromising their execution precision [10].

The results of the research also showed that knee injuries are one of the most common injuries in basketball. The results of previous research in the field of knee injuries of basketball players have shown that imbalanced landings, particularly those involving valgus positions, sudden and rapid directional shifts, and player collisions can contribute to knee injuries [11, 12]. The results of this research showed a higher incidence of collision-related injuries. Agel et al. also reported that most of the injuries during the game in female basketball players were of the collision type and most of the knee injuries were of the non-collision type [12]. Kofotoulis and Klis further supported this trend, revealing that the majority of basketball-related ankle injuries resulted from collisions [13].

According to research results, the most traumatic injury mechanism in basketball is landing after jumping. Most ankle injuries in basketball are due to improper landing after jumping. In their research, Cooley and his colleagues identified landing after jumping as the most dangerous movement in basketball and suggested neuromuscular improvement and preparation programs for these movements [14]. McKay et al also reported that almost half of ankle injuries occurred during landing, with only 3% arising from twisting and shearing movements. Although basketball players frequently engage in actions involving jumping, twisting, and cutting, not all of these movements culminate in injuries [15].

The injury incidence was notably higher among center and forward players. The results of the study by Miovis et al also show that the damage rate is high in these posts [17]. Center players are prone to experiencing higher rates of ankle and knee injuries, while forwards exhibit a greater prevalence of ankle injuries, and guards are more susceptible to head and neck injuries [15]. Center players, whose primary role involves rebounding within the

trapezius area, are exposed to an elevated risk of ankle and knee injuries due to the frequent landings accompanied by collisions that are inherent to their position. Forward players are also susceptible to injuries during offensive and counter-attacking plays, characterized by rapid rotations and cutting movements. As a result of these factors, the incidence of injuries tends to be higher among center and forward positions [18]. Likely due to their positioning near the basket, guard players are susceptible to neck injuries when engaged in defensive actions on their home court, often colliding with both opposing players and the ball [10]. he elevated injury rate observed among first-league players can be attributed to several factors, including inadequate athlete preparation, subpar quality of training and game environments, players' insufficient skills, and a lack of utilization of high-quality equipment, such as proper footwear. Each of these factors independently contributes to the heightened risk of injuries.

Conclusion

Based on the research findings, the most prevalent injuries among basketball players occur in the lower extremities, particularly affecting the knees and ankles. These injuries are likely attributed to the frequent jumping and sudden movements inherent in the game. Landing emerged as the leading mechanism responsible for injuries. Notably, no statistically significant disparities were found between the Premier League and Division I in terms of injury location, mechanism, nature, severity, and player positions.

Declaration

Competing interests

There is no competing of interest to disclose.

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References:

Belali Jafar. Video analysis of basketball injuries in the Premier League of Iranian clubs. [MSc Thesis]. Place of publication: Physical education and sport science faculty. Esfahan University. 1388. [Farsi]

Deitch JR, Starkey C, Walters SL, Moseley JB. Injury risk in professional basketball players: a comparison of Women's National Basketball Association and National Basketball Association athletes. The American journal of sports medicine. 2006 Jul; 34(7):1077-83.

Khosro Zadeh Jahanbakhsh, Golpayegani Masud, Bani talebi Ebrahim, Esmi Behnam. The Prevalence and Causes of Physical Injuries among Basketball Players. Journal of Applied Exercise Physiology 1387; 4(8):45-52. [Farsi]

Jakson D and Mannarino. Prevention and rehabilitation. Medicine sport. 2002; 342- 363.

Dick, R., Hertel, J., Agel, J., Grossman, J., & Marshall, S. W. Descriptive Epidemiology of Collegiate Men's Basketball Injuries: National Collegiate Athletic Association Injury Surveillance System, 1988–1989 Through 2003–2004. Journal of Athletic Training, 2007; 42(2), 194–201.

Flood, L.,Harrison, JE. Flood L, Harrison JE. Epidemiology of basketball and netball injuries that resulted in hospital admission in Australia, 2000–2004. Medical Journal of Australia. 2009; 190(2):87-90.

Barani Azam, Bambaei chi Efat, Rahnema Nader. Prevalence and injury mechanisms in female basketball athletes. Researrch in Sport Science. 1388; 23(3): 59-68. [Farsi]

Nelson AJ, Collins CL, Yard EE, Fields SK, Comstock RD. Ankle injuries among United States high school sports athletes, 2005–2006. Journal of athletic training. 2007; 42 (3):381.

Vanderlei FM, Bastos FN, de Lemes ÍR, Vanderlei LC, Júnior JN, Pastre CM. Sports injuries among adolescent basketball players according to position on the court. International archives of medicine. 2013; 6 (1):1-4.

Bahr R, Engebretsen L. Handbook of Sports Medicine and Science, Sports Injury Prevention. Chicester, United Kingdom. 2009: 7-17.

Hewett TE, Myer GD, Ford KR. Anterior cruciate ligament injuries in female athletes: Part 1, mechanisms and risk factors. The American journal of sports medicine. 2006; 34(2):299-311.

Agel J, Arendt EA, Bershadsky B. Anterior cruciate ligament injury in national collegiate athletic association basketball and soccer: a 13-year review. The American journal of sports medicine. 2005; 33(4):524-531.

Kofotolis N, Kellis E. Ankle sprain injuries: a 2-year prospective cohort study in female Greek professional basketball players. Journal of Athletic Training (National Athletic Trainers' Association). 2007 1; 42(3).

Cowley HR, Ford KR, Myer GD, Kernozek TW, Hewett TE. Differences in neuromuscular strategies between landing and cutting tasks in female basketball and soccer athletes. Journal of athletic training. 2006; 41(1):67.

McKay GD, Goldie PA, Payne WR, Oakes BW. Ankle injuries in basketball: injury rate and risk factors. British journal of sports medicine. 2001 Apr 1; 35(2):103-108.

Krosshaug T, Slauterbeck JR, Engebretsen L, Bahr R. Biomechanical analysis of anterior cruciate ligament injury mechanisms: three-dimensional motion reconstruction from video sequences. Scandinavian journal of medicine & science in sports. 2007; 17(5):508-519.

Meeuwisse WH, Sellmer R, Hagel BE. Rates and risks of injury during intercollegiate basketball. The American journal of sports medicine. 2003; 31(3):379-385.

Olsen OE, Myklebust G, Engebretsen L, Bahr R. Injury mechanisms for anterior cruciate ligament injuries in team handball: a systematic video analysis. The American journal of sports medicine. 2004; 32(4):1002-1012.