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ORIGINAL RESEARCH

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Characteristics and incidence of injuries in male Korean professional basketball players in pre- and regular seasons of practice and competitions

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Abstract

Basketball players are prone to injury. Advanced sporting nations have systematic injury monitoring systems for managing player's health. The epidemiology of injuries occurring during practice and competitions were investigated for the male professional basketball players (n = 60) in South Korea. The data were prospectively collected which covered the pre- and regular seasons of 2019–2020, 2020–2021 and 2021–2022. The calculated injury rate ratios (IRRs) assessed the injuries based on number of athletes involved in games and practice. The pre-season injury rate (IR) was ~1.6 times higher compared to the regular season IR (IRR = 1.55, 95% CI (confidence interval) = 1.11–2.17, $p = 0.008$). The competition IR was ~4.3 times higher compared to the practice IR (IRR = 4.33, 95% CI = 3.90–6.04, $p < 0.001$). Ankle was the most frequently injured wherein lateral ankle sprains were highly prevalent. Practice injuries were mostly of non-contact nature, while those of competition were contact related ($p < 0.001$). In conclusion, overuse injuries such as muscle strains/spasms and inflammatory conditions were prevalent in practice, whereas acute injuries like sprains and contusions occurred in competitions. These findings demonstrated that injury characteristics of Korean Basketball League players varied by season and event type, which emphasized the significance of season- and event-specific injury prevention programs.

Keywords

Basketball; Injury; Practice; Competition; Injury rate ratio

1. Introduction

The movements in basketball include jumps, landings, pivots, side and back steps, quick fakes, short sprints, and turns [1]. Basketball has the highest frequency of lateral movements and jumping compared to other sports like soccer and volleyball [2]. These movements occur on hard courts which cause stress on lower extremities. Collisions with opponents are avoided to maximum extent in basketball, however contacts are inevitable [3]. Basketball players are at high risk of orthopedic injuries in lower body because of the demands and dynamic movements [4–7]. The National Collegiate Athletic Association (NCAA) in United States has reported that the most frequent injuries are ankle (22.18%), knee (12.96%), wrist (10.11%), and face or head (11.32%) among the male basketball players [4].

A study analyzing the data from NCAA Injury Surveillance Program (ISP) has found that the predicted annual injury rate (IR) for NCAA men basketball is 8.5 per 1000 athlete exposures (AEs) which exceeds the average of 6.0 per 1000 AEs across 25 NCAA sports [8]. Furthermore, the IR for National Basketball Association (NBA) featuring world's best basketball players is 19.3 injuries per 1000 AEs [9]. It suggests that the IR increases in competitive environments [9]. Basketball injuries to head, shoulders, and ankles are mainly because of the direct contact as inferred from video analysis [3]. More than two-thirds of thigh injuries are non-contact and one-third of knee injuries are because of the indirect contact [3].

The Korean Basketball League (KBL), introduced in 1997, attracted 400,000 spectators in the first year. The KBL has become one of South Korea's most popular professional sports [10]. There were 21 games for 8 teams initially, however it had grown to 10 teams playing 54 games each season [11]. The D-League featuring second-tier players from each team is also introduced since 2014. The increased number of players and games in KBL demonstrates its progress, however league lacks the effective injury monitoring system. In contrast, NBA and NCAA have injury surveillance systems reporting player injury data such as injured body part, mechanism, type of injury, and time-loss (TL) [4, 12]. In Korea, each team manages player injury data with no centralized system. Stats are never released despite the professional basketball has been established for 26 years. While a pilot study analyzing injuries in 19 KBL players over one season exists [13], further investigation is needed to understand the KBL's injury epidemiology.

Epidemiological studies of injury data would improve the understanding of injuries occurring in each league and provide

scientific evidence for developing injury prevention system and player safety protocols. Collecting and analyzing sports injury data is essential for understanding injury patterns in specific sports and leagues, and develop injury prevention strategies [14]. For instance, data on injury mechanisms, causes, diagnosis, treatment, time-loss, injury patterns, and injury site can be vital for athletic health management guidelines [14]. Moreover, such a data can assist in preventing injuries to athletes and improve performance [15]. Until now, few studies have prospectively reported injuries during practice and competitions in KBL players [13, 16], particularly the details of injuries based on diagnoses over multiple seasons. Thus, the purpose of this study was to identify the overall injury patterns in professional basketball players by prospectively collecting and analyzing injuries during practice and competitions, covering both pre- and regular seasons.

2. Materials and methods

2.1 Study design

The sample size was calculated using G*power software, version 3.1.9.7 (Universität Düsseldorf, Düsseldorf, Germany): z tests and logistic regression, α err prob = 0.05, power ($1 - \beta$ err prob) = 0.80 and odds ratio = 2.0. The result was 64. Our study was conducted on the first 64 athletes, but reports from 4 athletes were not submitted due to personal reasons. Therefore, the final analysis was conducted on 60 players.

The KBL pre-season begins in mid-June, and regular season starts in mid-October and ends in early April. Each team competes in 54 official games of KBL during the regular season. D-League being the second tier of KBL consists of reserve players from each team and competes in 14 games per team. The data in this study were prospectively collected from 60 players played in the seasons of 2019–2020 to 2021–2022, covering pre-season and regular season. There were variations in the player pool over three collected seasons because of military service, transfers, and new signings. Players included in the study spent average of 2.0 ± 0.8 seasons with single team. Player's injury data was provided by athletic trainer of each team. Purpose of study, survey content, and publication were explained to the trainer at research planning stage. The benefits of participation were highlighted. Players' personal information was anonymized using codes and numbers.

The demographic characteristics of participants are: mean age (28.1 ± 4.5 years), height (193.6 ± 7.8 cm), weight (92.6 ± 12.4 kg), and professional career span (5.7 ± 3.7 years) (Table 1).

2.2 Data acquisition

Injury and exposure data were collected after each game and training session by the athletic trainer certified by Korean Athletic Trainer Association. A reportable injury was defined according to the latest NCAA injury surveillance program criteria, *i.e.*, "an injury that occurs during official team practices and competitive games and requires medical attention by certified athletic trainers or physicians, regardless of time-loss (TL)" [4]. This definition encompassed the TL and non-TL (NTL) injuries. The injury data included injury date, injured body part(s), mechanism, injury type, and specific diagnoses. TL days because of the injury were meticulously tracked and documented. The physical characteristics of each player including height, weight, age, professional career, and position were retrieved from team's official website.

The data collection period of pre-season extended from mid-June and coincided with the start of team training to the day preceding first game of regular season [17]. Data collection for regular season encompassed the first game of season to the last, *i.e.*, extending from mid-October to early April. Event types were categorized into practice and competition. Practice included physical training, weight training, conditioning, and tactical training. Competitions covered scrimmages against professional teams as well as the basketball regular season and D-League games. This study only considered the musculoskeletal injuries during official basketball practice and competitions and excluded daily life injuries.

2.3 Definitions

Athlete exposure (AE) is defined as an athlete participating in organized practice or competition with the potential of injury [4, 17]. Each session is counted as one exposure unit regardless of the actual playing time [5]. This standardized methodology for counting exposure allows calculation of IRs. It is widely used in epidemiological studies of sports injuries [5, 6, 17, 18]. The return-to-play criteria are established as the level of performance at which player can participate in team's tactical training sessions. TL indicates number of days in the return to play from the injury date. Severe injury is defined as an injury resulting in TL of ≥3 weeks [6, 19]. Player contact is defined as the injuries occurring in practice and competition because of the physical contact or collision with opponent or teammate. Strain/spasm was combined to represent muscle

TABLE 1. Player general information.

Variable	Total (n = 60)	2019–20 season (n = 20)	2020–21 season (n = 19)	2021–22 season (n = 21)
Age (yr)	28.1 ± 4.5	27.7 ± 4.9	26.8 ± 4.6	27.9 ± 4.4
Height (cm)	193.6 ± 7.8	192.8 ± 6.3	192.2 ± 8.1	193.2 ± 8.4
Weight (kg)	92.6 ± 12.4	92.1 ± 13.0	89.0 ± 13.7	89.9 ± 12.3
Body mass index (kg/m^2)	24.6 ± 2.1	24.7 ± 2.5	24.0 ± 2.3	25.3 ± 6.4
Professional experience (yr)	5.7 ± 3.7	5.9 ± 3.7	5.5 ± 4.2	6.2 ± 4.3
Play position, center/forward/guard (n)	13/26/21	4/9/7	4/9/6	6/8/7

injuries in this study.

2.4 Statistical analysis

Continuous variables were presented as means and standard deviations, and categorical as frequencies and percentages. TL days were given as means and medians. An IR was calculated as the number of injuries per 1000 AEs. Confidence intervals were not calculated with fewer than 10 injury cases because of decreased reliability. A linear regression model tested the significant differences in monthly IRs over time. April was excluded from the analysis because of low practice or competition exposure. An injury rate ratio (IRR) calculator computed the IRR and 95% confidence intervals (CIs). An independent *t*-test and chi-square test compared the differences in injury mechanisms and TL of practice and competition injuries. Injuries from player contact and contact with surface, ball or other objects were classified as the "Contact" mechanisms. Non-contact and overuse injuries such as tendinopathy, muscle strain, plantar fasciitis, iliotibial band syndrome, and inflammation were classified as the "No contact" mechanisms. Statistical significance was set at $p < 0.05$. Statistical analyses were made by SPSS software (version 25.0; IBM Corp., Armonk, NY, USA) and STATA (version 18.0; StataCorp, College Station, TX, USA).

3. Results

3.1 Monthly IRs

Fig. 1 shows the monthly IR trends. The overall IR decreased as the season progressed ($\beta = -0.963$, $p < 0.001$). The IR peaked in July, gradually declined, rose slightly in November before falling again, and reaching the lowest in March.

3.2 Comparison of IRs by season segment

Table 2 presents injury counts, AEs, IRs and an IRR by season segment. A total of 151 injuries were reported in 16,255 AEs during the study period, with an overall IR of 9.30. The pre-season IR was 12.15 and the regular season was 7.82, showing that the pre-season IR was 1.55 times higher than the regular season.

3.3 Comparison of IR and the number of days missed per injury by event type

Table 3 presents injury counts and proportions, IRs, IRRs and TL days by event type and TL category. IR for practice injuries was 6.12, and for competition injuries was 26.48. IR for competition injuries was 4.33 times that of practice injuries. IR for severe injuries during competition was 5.42 times higher compared to during practice. Overall, the mean (median) number of time-loss days per injury was 10 (3) days. For competition injuries, the mean (median) was 12 (2) days, and for practice injuries, it was 8 (3) days.

3.4 Injured body parts, mechanisms, and injury types

Table 4 presents the injured body parts, injury mechanisms, and injury types. The most common overall injuries were lower extremities in the major category, and ankle injuries (29.1%) stood out among them. Upper extremity injuries were more frequent in competition than in practice. The rate of sprains and strains/spasms was high in the form of injuries, while sprains and bruises were frequent during competitions. Non-contact injuries were 38.4% of all injuries followed by player contact (34.4%) and overuse (19.9%). Fig. 2 shows a comparison of contact versus non-contact injuries during practice and competition. Non-contact injuries were more common in practice, while contact injuries in competition ($\chi^2 = 21.77$, $p < 0.001$).

3.5 Ten common injuries in basketball players

Table 5 lists the top 10 injuries based on specific diagnoses. Lateral ankle sprains (LAS) were 21.9% of all injuries followed by lumbar sprains/strains (11.3%), patellofemoral inflammations (5.3%), and hamstring strains/spasms (5.3%). IR for LAS was more common in competition, while IRs for hamstring strains/spasms and foot inflammations were prevalent in practice.

4. Discussion

This study examined the injuries of male KBL professional basketball players from 2019 to 2022 (three seasons), covering both practice and competitions. This was the largest and first study on 60 KBL players. It was observed that the pre-season IR was higher compared to regular season IR (IRR: 1.55), and the competition IR was higher than practice IR (IRR: 4.33). Ankle was the most injured body part with LAS (21.9%, IR = 2.03) as the most prevalent. Injuries in practice primarily resulted from non-contact mechanisms, whereas contact injuries occurred in competition. Acute injuries like LAS and quadriceps contusions were more common in competition, whereas overuse injuries like hamstring strains, spasms, and foot inflammation happened frequently in practice.

The result attained herein that pre-season IR was higher than that of regular season was consistent with the previous studies using NCAA injury surveillance program data [4, 5, 18]. Monthly IR trends analysis revealed that the injuries occurred frequently at the early stages of pre-season (June–July) and regular season (October–November). Previous studies on basketball injuries did not observe the monthly IR trends [4–6, 18, 19]. It was thus difficult to make direct comparisons. However, current results were in agreement with the injury patterns of other sports where most injuries occurred early in the season [20, 21]. Findings of current and previous studies [20, 21] suggested that countermeasures like gradual increase in pre-season training intensity, adequate rest, and adjusting game schedules at the early stages of regular season were required to counteract the injury trends.

The higher IR in competition than in practice observed in current study was consistent with the findings of previous

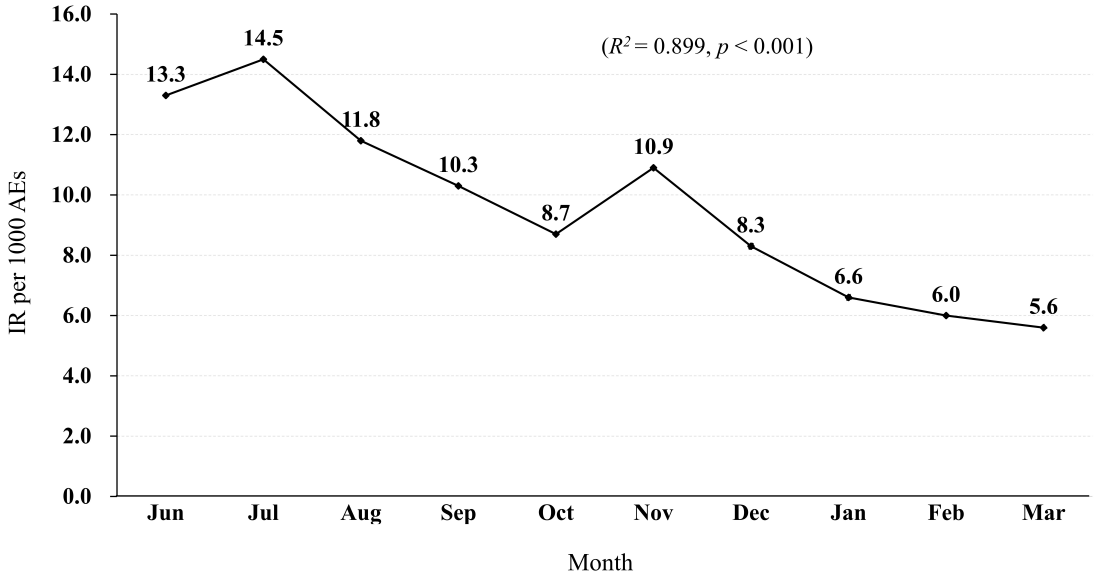

FIGURE 1. Monthly injury rate trends in Korean basketball league. Abbreviation: IR: injury rate; AEs: athlete exposures.

TABLE 2. Injury counts, athlete exposures, injury rates, and an injury rate ratio by season segment.

Injury time	Injury incidence and exposure		IR per 1000 AEs (95% CI)	IRR (95% CI)
Pre-season				
	Injuries (%)	67 (44.4)	12.15 (9.24–15.06)	
	AEs	5512		
Regular season				1.55 (1.11–2.17)*
	Injuries (%)	84 (55.6)	7.82 (6.15–9.49)	
	AEs	10,743		
Overall				
	Injuries (%)	151 (100.0)	9.30 (7.81–10.77)	
	AEs	16,225		

**p value below the significance level of 0.05.*
Abbreviation: IR: injury rate; AEs: athlete exposures; CI: confidence interval; IRR: injury rate ratio.
IRR (95% CI) represents the ratio of pre-season to regular season injury rate.

TABLE 3. Injury counts and proportions, injury rates, injury rate ratios and time loss days by event type and TL category.

Variables	Overall injuries (Injuries, %)	Practice (AEs, 13,725)		Competition (AEs, 2530)		IRR (95% CI)
		(Injuries, %)	IR per 1000 AEs (95% CI)	(Injuries, %)	IR per 1000 AEs (95% CI)	
Total injury	151 (100.0)	84 (55.6)	6.12 (4.81–7.43)	67 (44.4)	26.48 (20.14–32.82)	4.33 (3.09–6.04)*
Non-time-loss	14 (9.3)	2 (2.4)	0.15 (-)	12 (17.9)	4.74 (2.06–7.42)	32.50 (-)
1 d to <1 wk	93 (61.6)	57 (67.9)	4.15 (3.07–5.23)	36 (53.7)	14.23 (9.58–18.88)	3.43 (2.19–5.29)*
1 wk to <3 wk	26 (17.2)	16 (19.0)	1.17 (0.60–1.74)	10 (14.9)	3.95 (1.50–6.40)	3.39 (1.38–7.95)*
≥3 wk	18 (11.9)	9 (10.7)	0.66 (-)	9 (13.4)	3.56 (-)	5.42 (1.91–5.42)*
TL, mean/median	10/3 d	8/3 d	–	12/2 d	$t = -1.16/df = 149$	$p = 0.247$

**p values below the significance level of 0.05.*
IR: injury rate; AEs: athlete exposures; CI: confidence interval; IRR: injury rate ratio; TL: time-loss.
IRRs (95% CI) represent the ratio of competition to practice injury rates.

TABLE 4. Injured body parts, injury mechanisms and injury types in Korean basketball league.

Injury site	Overall injuries (Injuries, %)	Practice		Competition		IRR (95% CI)
		(Injuries, %)	IR (95% CI)	(Injuries, %)	IR (95% CI)	
Injured body part ($p = 0.442$; $\chi^2 = 2.692$)						
Head/Neck	8 (5.3)	4 (4.8)	0.25 (-)	4 (6.0)	1.19 (-)	3.31 (-)
Head	6 (4.0)	3 (3.6)		3 (4.5)		
Neck	2 (1.3)	1 (1.2)		1 (1.5)		
Torso	22 (14.5)	13 (15.5)	0.87 (0.38–1.36)	9 (13.4)	3.56 (-)	4.09 (-)
Lumbar	20 (13.2)	13 (15.5)		7 (10.4)		
Rib/chest	2 (1.3)	0		2 (3.0)		
Upper extremity	14 (9.3)	5 (6.0)	0.36 (-)	9 (13.4)	3.56 (-)	9.88 (-)
Shoulder	6 (4.0)	2 (2.4)		4 (6.0)		
Arm/elbow	2 (1.3)	0		2 (3.0)		
Hand/wrist	2 (1.3)	0		2 (3.0)		
Finger	4 (2.7)	3 (3.6)		1 (1.5)		
Lower extremity	107 (70.8)	63 (73.8)	4.59 (3.46–5.72)	45 (67.2)	17.78 (12.60–22.97)	3.87 (2.58–5.77)*
Hip/groin	7 (4.6)	5 (6.0)		2 (3.0)		
Upper leg	14 (9.3)	8 (9.5)		6 (9.0)		
Knee	21 (13.9)	14 (16.7)		7 (10.4)		
Lower leg	10 (6.6)	7 (8.3)		3 (4.5)		
Ankle	44 (29.1)	19 (22.6)		25 (37.3)		
Foot	11 (7.3)	9 (10.7)		2 (3.0)		
Injury mechanism ($p < 0.001$; $\chi^2 = 22.025$)						
Non-contact	58 (38.4)	41 (48.8)	2.99 (2.07–3.90)	17 (25.4)	6.72 (3.53–9.91)	2.25 (1.19–4.04)*
Overuse	30 (19.9)	22 (26.2)	1.60 (0.93–2.27)	8 (11.9)	3.16 (-)	1.98 (-)
Player contact	52 (34.4)	18 (21.4)	1.31 (0.71–1.92)	34 (50.7)	13.44 (8.92–17.91)	10.25 (5.63–19.27)*
Other contact	11 (7.3)	3 (3.6)	0.22 (-)	8 (11.9)	3.16 (-)	14.36 (-)
Injury type ($p = 0.011$; $\chi^2 = 19.830$)						
Sprain	51 (33.8)	24 (28.6)	1.75 (1.05–2.45)	27 (40.3)	10.67 (6.65–14.69)	6.10 (3.39–11.05)*
Strain/spasm	40 (26.5)	28 (33.3)	2.04 (1.28–2.80)	12 (17.9)	4.74 (2.06–7.42)	2.32 (1.07–4.72)*
Inflammatory	25 (16.6)	17 (20.2)	1.24 (0.65–1.83)	8 (11.9)	3.16 (-)	2.55 (-)
Contusion	14 (9.3)	2 (2.4)	0.15 (-)	12 (17.9)	4.74 (2.06–7.42)	31.60 (-)
Fracture	6 (4.0)	5 (6.0)	0.36 (-)	1 (1.5)	0.40 (-)	1.11(-)
Meniscal tear	5 (3.3)	3 (3.6)	0.22 (-)	2 (3.0)	0.79 (-)	3.59 (-)
Dislocation	4 (2.6)	1 (1.2)	0.07 (-)	3 (4.5)	1.19 (-)	17.00 (-)
Skin wound	3 (2.0)	2 (2.4)	0.15 (-)	1 (1.5)	0.40 (-)	2.66 (-)
Other	3 (2.0)	2 (2.4)	0.15 (-)	1 (1.5)	0.40 (-)	2.66 (-)

**p values below the significance level of 0.05.*
IR: injury rate; CI: confidence interval; IRR: injury rate ratio.
IRRs (95% CI) represent the ratio of competition to practice injury rates.

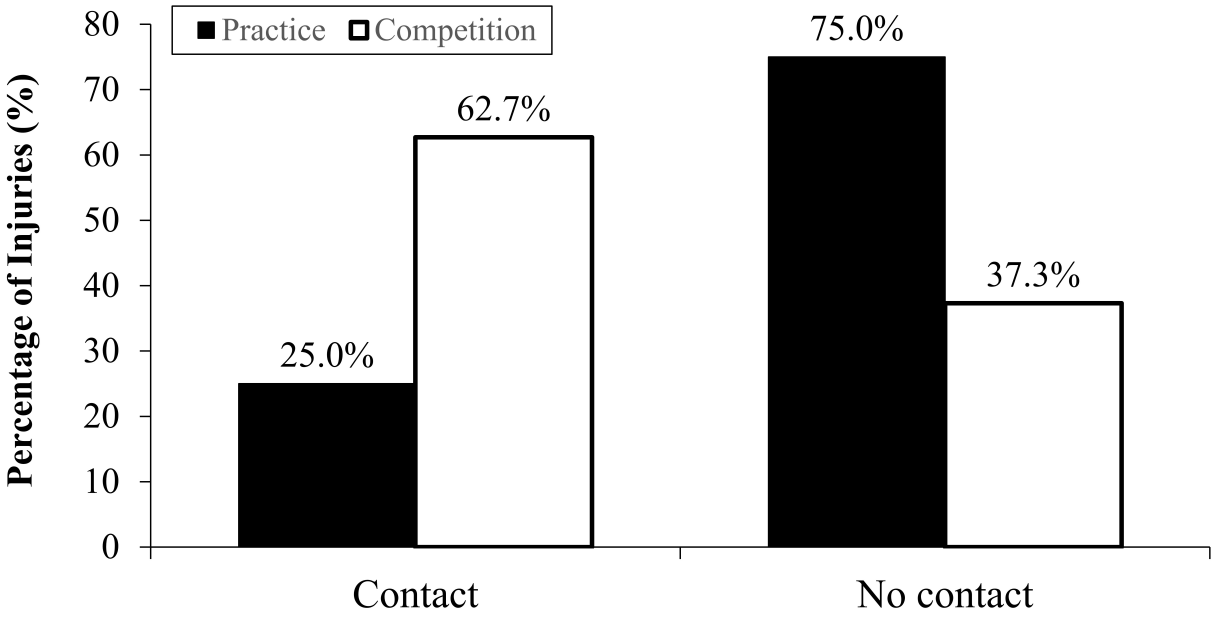

FIGURE 2. Comparison of contact and non-contact injuries during practice and competition.

TABLE 5. Ten common injuries in Korean basketball league.

Pathology	Overall		Practice		Competition	
	(Injuries, %)	IR (95% CI)	(Injuries, %)	IR (95% CI)	(Injuries, %)	IR (95% CI)
Lateral ankle sprain	33 (21.9)	2.03 (1.34–2.72)	13 (15.5)	0.95 (0.44–1.46)	20 (29.9)	7.91 (4.45–11.37)
Lumbar sprain/strain	17 (11.3)	1.05 (-)	12 (14.3)	0.87 (0.38–1.36)	5 (7.5)	1.98 (-)
Patellofemoral inflammation	8 (5.3)	0.49 (-)	5 (6.0)	0.36 (-)	3 (4.5)	1.19 (-)
Hamstring strain/spasm	8 (5.3)	0.49 (-)	7 (8.3)	0.51 (-)	1 (1.5)	0.40 (-)
Foot inflammation	7 (4.6)	0.43 (-)	6 (7.1)	0.44 (-)	1 (1.5)	0.40 (-)
Quadriceps contusion	6 (4.0)	0.37 (-)	1 (1.2)	0.07 (-)	5 (7.5)	1.98 (-)
Calf strain/spasm	6 (4.0)	0.37 (-)	4 (4.8)	0.29 (-)	2 (3.0)	0.79 (-)
Knee sprain	5 (3.3)	0.31 (-)	4 (4.8)	0.29 (-)	1 (1.5)	0.40 (-)
Hip flexor strain	5 (3.3)	0.31 (-)	3 (3.6)	0.22 (-)	2 (3.0)	0.79 (-)
Ankle inflammation	4 (2.6)	0.25 (-)	1 (1.2)	0.07 (-)	3 (4.5)	1.19 (-)

IR: injury rate; CI: confidence interval.

studies [4, 6]. A previous report depicted that the competition IR in NCAA men's basketball was twice as high as the practice IR [4]. It was found herein that injuries with TL of one day to one week were frequent (61.6%) followed by with TL of one week to three weeks (17.2%), with TL (three weeks (11.9%), and NTL injuries (9.3%). These findings were consistent with the earlier research on NCAA injury surveillance program data [5, 17]. The relatively higher competition in IR in players could be because of the scheduling of many games on weekends, frequent back-to-back games, and a small pool of players. Furthermore, these outcomes might also be linked with the intensity of play and contact with players from opposing team than teammates. The mean time-loss due to injury was longer during competitions than during practice. This finding suggests that injuries sustained during competitions may be more severe than those sustained during practice.

The lower extremity was most commonly injured in current study, being consistent with the previous studies of NBA and NCAA men's basketball data [4, 9, 18, 22]. The lower extremities including ankle, knee, and thigh were most commonly injured among NBA and NCAA men's basketball players, which accounted for over 60% of all injuries [22]. In particular, ankle injuries were the most common for NBA players, while knee injuries resulted in the most significant amount of time lost [9, 23].

Event-specific analysis exhibited that injuries in competitions were likely caused by the contact mechanisms. Morris *et al.* [4] and Clifton *et al.* [5] depicted that player contact was leading the basketball injuries regardless of event

type, followed by non-contact, surface contact and overuse. However, non-contact injuries were more prevalent in practice sessions as found in this study. No clear explanations could be provided for the differences in injury mechanisms between current and previous research [4, 5]. Speculations were made on possible causes. Differences in the scope of injury data collection, training methods, and competition levels could contribute toward these discrepancies.

It was observed herein that sprains (33.8%), strains/spasms (26.5%), inflammatory conditions (16.6%), and contusions (9.3%) were the most prevalent injury types, which were in accordance with the previous studies [5, 22, 24]. Injuries like muscle strains or spasms, inflammatory conditions, and stress fractures were common in practice than in competitions. However, there was higher proportion of traumatic injuries like sprains, contusions, and dislocations/subluxations in competitions than in practice. These outcomes were consistent with the study by Sekine *et al*. [6] involving Asian athletes. Sekine *et al*. [6] analyzed injuries in Japanese men's college basketball from 2013/2014 to 2019/2020 seasons and found that rate of traumatic injuries such as sprains, contusions, and dislocations was higher in competitions than in practice.

The top ten injuries in this study matched those with NBA epidemiological studies including patellofemoral inflammation, lumbar sprains or strains, hamstring strains, adductor strains, and knee sprains [9, 23]. Acute injuries like LAS and quadriceps contusions were common in competitions, while overuse injuries like hamstring strains or spasms and foot inflammation were prevalent in training sessions. LAS was the most common specific diagnosis in present study which accounted for ~30% of all competitive injuries. LAS was also the most common in previous NBA epidemiologic studies which accounted for 16.1%–17.9% of game-related injuries with IR of 3.2 to 3.5 per 1000 AEs [9, 23]. IR for foot in men's basketball was 10.71 which was higher compared to other men's collegiate sports (indoor track IR = 7.2, football IR = 7.1) [25]. Ankle injuries analysis provided variety of information. Tummala *et al*. [26] examining the ankle injury data of NBA players from 2015–2016 through 2020–2021 seasons found that sprains/strains were the most prevalent injury type with IR of 3.7 per 1000 game exposures. The possibility of ankle injury was higher in players with previous history of hip, hamstring, or quadriceps injuries [26]. A program to prevent ankle injuries should thus be preemptively applied to athletes with history of lower extremity injuries.

This study had certain limitations. First, only injuries that occurred to 60 players over three seasons were investigated. This is still a small number compared to the large professional scale of the US and Europe, where analysis data from hundreds of players is generated. Furthermore, this study may not provide a comprehensive understanding of the overall injury dynamics in KBL due to the small sample size and short study period. Second, the study period also included COVID-19 pandemic. KBL experienced slight decrease in the number of games and playing without spectators during 2019–2020 season. There were fewer injuries in the early-terminated season, however the decrease in AEs resulted in no difference of IR compared to other two seasons. Finally, it was revealed that injury patterns in basketball players differed by position [3]. However, a position-specific analysis could not be performed in this study and it must be addressed in future studies to provide detailed information to the reader. Nevertheless, this study was clinically significant as it investigated overall injury patterns in KBL in the absence of injury surveillance system.

5. Conclusions

The current study examined injuries in KBL players from 2019–2020 through 2021–2022 seasons. It was found that IR was higher in the pre-season than in regular season, and in competition than in practice. Ankle was the most prevalent injury and LAS was the common specific diagnosis. Injuries in competitions differed from those in practice regarding the injury mechanisms and types. A comprehensive and long-term epidemiological study with larger sample size would improve the understanding of injuries in KBL players.

AVAILABILITY OF DATA AND MATERIALS

The data presented in this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

AUTHOR CONTRIBUTIONS

JCW and MS—conceptualization; original draft writing. YC and MS—methodology; formal analysis; review and editing; supervision. JCW—investigation. All authors contributed to editorial changes in the manuscript. All authors read and approved the final manuscript.

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

The study was conducted in accordance with the Declaration of Helsinki, and was approved by the Research Ethics Committee of the Institutional Review Board of Sungkyunkwan University (No. 2020-06-012-003). Informed consent was obtained from all subjects involved in the study.

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

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