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Profile of Sports Injuries: Retrospective Analysis from a Single Centre

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Learning Point of the Article:

Most sports injuries appear to be sports-specific and knee injuries are common across many sports, especially football.

Abstract

Introduction: Participation in sports has increased across North-East India, bringing important physical and psychological benefits. However, region-specific data on sports-related injuries remain limited, making it difficult to develop targeted prevention strategies.

Materials and Methods: This retrospective descriptive study analysed data from sportspersons presenting with sports-related injuries between January 2020 and December 2023. The aim was to describe the demographic characteristics, patterns, and modes of sports-related musculoskeletal injuries presenting to a regional tertiary-care teaching hospital. Information on age, sex, type of sport, anatomical site of injury, and mode of injury (contact vs. non-contact) was collected and analysed using descriptive statistics and Chi-square tests.

Results: A total of 156 sportspersons were included, with a marked male predominance (134 males, 22 females; male-to-female ratio ≈6:1). Most injuries occurred in the 20–29-year age group (56.4%). Football was the most commonly associated sport (36.5%), followed by cricket and basketball. The knee was the most frequently injured anatomical site, particularly among football players. Contact sports accounted for 62% of all injuries. Significant associations were observed between the type of sport and anatomical site of injury, as well as between sport and mode of injury ($P < 0.001$).

Conclusion: Sports-related injuries in this region predominantly affect young adult males, with football-related knee injuries being the most common. The findings highlight the importance of sport-specific injury prevention strategies, particularly in contact sports such as football.

Keywords: Sports injury, football, knee injury, contact sports, musculoskeletal injury, injury prevention.

Introduction

Participation in sports provides clear physical, psychological, and social health benefits, but it also comes with an inherent risk of injury. In everyday orthopedic practice, sports-related musculoskeletal injuries form a significant proportion of cases and can lead to considerable morbidity, time away from sport, and financial burden for athletes, especially in competitive settings [1,2]. Accurate injury surveillance, therefore, plays an important role in developing effective prevention strategies [3].

The epidemiology of sports injuries varies widely depending on geographic region, type of sport, level of participation, and availability of training infrastructure [4,5]. Previous studies have also demonstrated differences in injury patterns between male and female athletes and across sporting disciplines [6,7]. Sports

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Author's Photo Gallery

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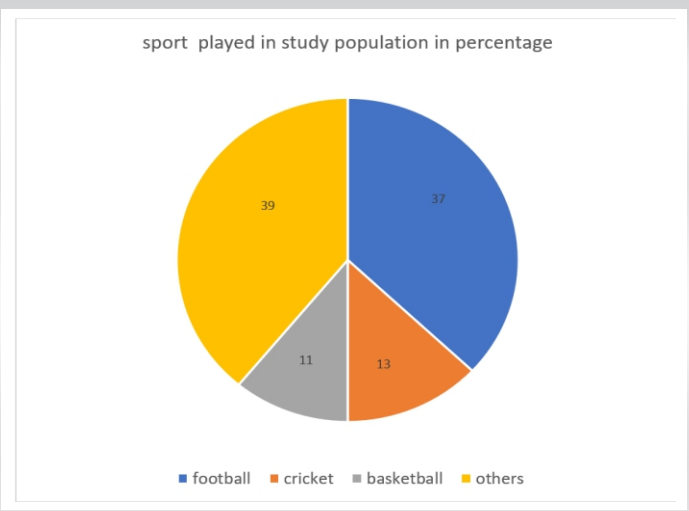

Figure 1: Distribution of sports associated with injuries in percentage.

injuries are common among children and young athletes and may influence long-term participation in sports [8]. Adolescent athletes represent a vulnerable group with characteristic injury profiles that warrant focused attention [9]. While several studies from different parts of India have described patterns of sports-related injuries, data from North-East India remain limited [2,3]. This region has a distinct sporting culture, with widespread participation in football alongside other activities such as basketball, badminton, cricket, and martial arts. Environmental factors, including prolonged monsoon seasons and variability in training conditions, may further influence injury patterns in this population.

Understanding region-specific injury profiles is essential for identifying high-risk sports, commonly affected anatomical sites, and vulnerable demographic groups. Such information is crucial for developing targeted injury-prevention strategies, optimizing resource allocation, and improving clinical management of injured athletes

The present study aims to describe the demographic characteristics, distribution, anatomical patterns, and modes of sports-related injuries presenting to a regional tertiary-care teaching hospital in North-East India over a 4-year period. In addition, the study evaluates the association between the type of sport, anatomical site of injury, and mode of injury to provide clinically relevant insights for prevention strategies.

Materials and Methods

Study design and setting

This was a retrospective descriptive observational study conducted at a regional tertiary-care teaching hospital in North-East India. Institutional Ethics Committee approval was obtained before data collection, vide approval letter no. NEIGR/IEC/M5/F5/2024. The study was conducted in accordance with the Declaration of Helsinki and Good Clinical Practice guidelines. Records from January 2020 to December 2023 were reviewed. Data were obtained from a dedicated sports injury and arthroscopy clinic functioning under the Department of Orthopedics. All sportspersons presenting with injuries sustained during sporting activities were included.

Injuries sustained during organized or recreational sporting activity, training or competition were included involving all age groups. Injuries unrelated to sports activity and any incomplete or inadequate medical records in the register were excluded. Data were extracted from a standardized sports injury registry maintained at the sports injury clinic. Variables collected included age, sex, type of sport, anatomical site of injury, and mode of injury (contact or non-contact). Patients were further categorized into age groups (<10 years, 10–19 years, 20–29 years, 30–39 years, 40–49 years, 50–59 years, and ≥60 years). The primary outcomes were the distribution of injuries by sport, anatomical site, age group, sex, and mode of injury. Associations between categorical variables were also evaluated.

Statistical analysis

Data were analysed using descriptive statistics. Categorical variables were summarized as frequencies and percentages. Associations between categorical variables were assessed using the Chi-square test. A $P < 0.05$ was considered statistically significant. Statistical analysis was performed using Microsoft Excel and Python-based statistical tools.

Results

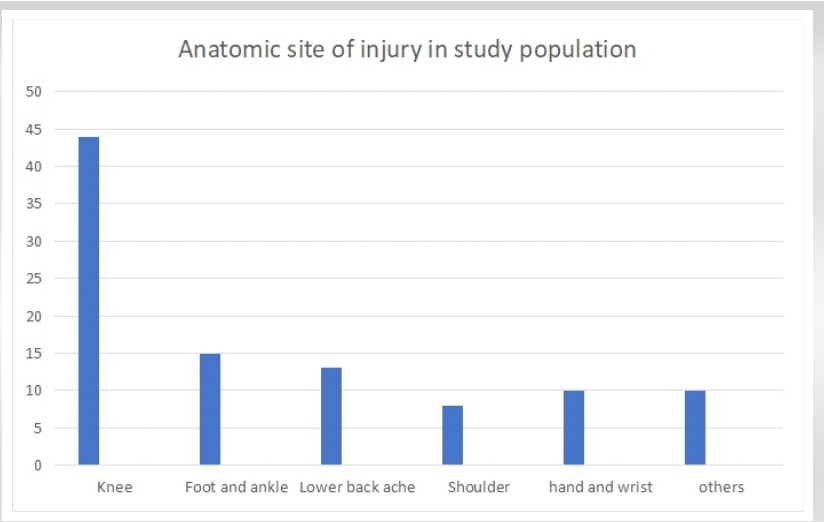

Figure 2: Sport injury anatomical sites.

Table 1: Age and sex distribution of injured sportspersons				
Age group (years)	Male	Female	Total	Percentage
<10	0	0	0	0
10–19	22	6	28	17.9
20–29	75	13	88	56.4
30–39	24	3	27	17.3
40–49	7	0	7	4.5
50–59	4	0	4	2.6
≥60	2	0	2	1.3
Total	134	22	156	100

Age and sex distribution

A total of 156 sportspersons presenting with sports-related injuries were included in the study. Most injured sportspersons were aged 20–29 years (88 cases, 56.4%), followed by 10–19 years (28 cases, 17.9%) and 30–39 years (27 cases, 17.3%). Injuries were less frequent in older age groups, with only 13 cases (8.4%) occurring in individuals aged over 40 years (Table 1). A marked male predominance was observed across all age groups, with 134 males (85.9%) and 22 females (14.1%). Female athletes were predominantly represented in younger age groups, with no injuries recorded above 40 years. No statistically significant association was observed between age group and sex ($\chi2 = 3.38$, $P = 0.185$).

Sex distribution

The study population showed a clear male predominance, with a male-to-female ratio of approximately 6:1 (Table 2). A Chi-square test, however, showed no statistically significant association between age group and sex ($\chi2 = 3.38$, $P = 0.185$).

Sport-specific injury distribution

A total of 22 different types of sports (both contact and non-contact) were associated with injuries. Football was the most common sport (57 cases, 36.5%), followed by cricket (20 cases, 12.8%) and basketball (18 cases, 11.5%) to incur injuries (Fig. 1). Other sports included badminton (12 cases), running/trekking (12 cases), mixed martial arts (8 cases), and volleyball (6 cases), with the remaining sports contributing to a smaller proportion of injuries. Sex distribution varied significantly across different sports as depicted (Table 3 and Fig. 1), and this was statistically significant ($\chi2 = 61.87$, $P < 0.001$).

Mode of injury

Contact sports accounted for most injuries (96 cases, 62%), while non-contact mechanisms accounted for 60 cases (38%), as tabulated (Table 4). A significant

association was observed between the type of sport and mode of injury ($\chi2 = 156.0$, $P < 0.001$).

Anatomical distribution of injuries

The knee was the most frequently injured anatomical site (70 cases, 44%), followed by foot and ankle injuries (24 cases, 15%), lower back injuries (20 cases, 13%), and injuries involving the wrist and hand (15 cases, 10%). Shoulder injuries accounted for 12 cases (8%), while other anatomical sites contributed a smaller proportion of injuries (Table 5).

Sport-specific anatomical distribution of injury patterns

Distinct sport-specific injury patterns were observed. Football injuries predominantly involved the knee joint (41 cases), while running was associated mainly with knee and ankle injuries. Basketball injuries were more frequently seen in the wrist and hand (7 cases), whereas cricket showed a mixed pattern involving the shoulder (5 cases), wrist/hand (3 cases), and lower limb (Table 6). A highly significant association was observed between the type of sport and anatomical site of injury ($\chi^2 = 712.59$, $P < 0.001$).

Association between injury site and mode of injury

Mode of injury was categorized as contact or non-contact based on the nature of the sport and mechanism of injury, with sports involving physical player-to-player interaction classified as contact sports. We categorized injuries into contact and non-contact based on the nature of the sport, and used Chi-square to assess whether the distribution of anatomical injury sites differed between these two groups. Table 5 and Fig. 2 present the overall distribution of injuries by anatomical site, whereas Table 6 provides a detailed cross-tabulation of injury sites according to the type of sport, allowing identification of sport-specific injury patterns. A statistically significant association was found between anatomical site of injury and mode of injury ($\chi2 = 11.58$, $P = 0.021$). However, no significant association was

Table 2: Sex distribution of study population		
Sex	Frequency	Percentage
Male	134	85.9
Female	22	14.1

Table 3: Distribution of sports-specific injuries (Frequency+Male/Female)				
No.	Sports	Frequency	Male	Female
1	Football	57	57	0
2	Cricket	20	20	0
3	Basketball	18	13	5
4	Badminton	12	10	2
5	Running/Trekking	12	5	7
6	Mixed martial arts (Mma)	8	5	3
7	Volleyball	6	4	2
8	Weight lifting	2	2	0
9	Kabaddi	2	2	0
10	Hockey	1	1	0
11	Horse riding	1	1	0
12	Archery	1	1	0
13	Arm wrestling	2	2	0
14	Paragliding	2	2	0
15	High Jump	3	3	0
16	Golf	1	1	0
17	Table tennis	1	1	0
18	Tennis	1	1	0
19	Cycling	1	1	0
20	gymnastics	2	0	2
21	Kayaking	1	0	1
22	Boxing	2	2	0

observed between sex and anatomical site of injury in our study ($\chi 2 = 2.62, P = 0.623$).

Discussion

This study provides an overview of sports-related musculoskeletal injuries presenting to a tertiary care center in North-East India, a region where published data remain limited. The findings show that injuries are predominantly seen in young adult males, with football-related knee injuries forming the bulk of cases.

A clear male predominance was observed in our cohort, with a male-to-female ratio of approximately 6:1. This likely reflects higher participation of males in competitive and contact sports in our setting, a trend that has been reported in previous studies [5,6]. However, it is important to recognize that generally injury patterns are more closely related to the type of sport and level of exposure rather than sex alone [7].

Most injuries occurred in the 20–29-year age group, which represents the most active and physically engaged segment of the population engaged in sports activities. Similar age distributions have been reported in earlier studies [9,10]. The conspicuous absence of females with sport injuries in older age groups in our study may be related to lower participation rates, as well as sociocultural factors that influence their long-term involvement in sports.

Football was the most commonly associated sport, accounting for more than one-third of injuries. This differs from reports from other parts of India, where cricket is often the leading cause of sports-related injuries [3]. The predominance of football in our study likely reflects the sporting culture of North-East India, where football is widely played at both recreational and semi-professional levels [11]. In many cases, this participation occurs without structured training, adequate supervision, or protective measures, which may contribute to the higher injury burden [11].

The knee was the most frequently injured anatomical site, particularly among football players. This is consistent with existing literature, where the knee is recognised as a vulnerable joint due to its complex biomechanics and exposure to rotational and impact forces [3,9,10].

We also observed a clear sport-specific injury pattern. Football injuries were predominantly knee-related, basketball injuries were more commonly seen in the wrist and hand, and cricket showed a mixed pattern involving the shoulder and upper limb. These patterns are in keeping with the biomechanical demands of each sport and have been described in previous studies [11,12].

Contact mechanisms accounted for most injuries, and there was a significant association between the type of sport and mode of injury. Contact sports such as football, basketball, and mixed martial arts contributed disproportionately to the injury burden. In addition, the association between anatomical site and mode of injury suggests that the mechanism of injury may influence the pattern and location of injury [13].

Interestingly, we did not find a significant association between sex and anatomical site of injury. This suggests that injury patterns are largely determined by the sport itself rather than by sex. Similar observations have been reported in earlier studies [5,6].

Table 4: Mode of injury of study population		
Mode of injury	Frequency	Percentage
Contact	96	62
Non-contact	60	38

Table 5: Distribution of injuries by anatomical site

Anatomic site of injury	Frequency	Percentage
Knee	70	44
Foot and ankle	24	15
Lower back ache	20	13
Shoulder	12	8
Elbow	6	4
Leg	3	2
Hand/wrist	15	10
Others	6	4

The findings of this study have practical implications. Given the high burden of football-related knee injuries, there is a clear need for targeted injury-prevention strategies in this region. Introducing structured training programs, promoting awareness about injury prevention, and encouraging supervised play may help reduce the incidence of avoidable injuries [14]. From a clinical perspective, this highlights the importance of preventive strategies such as neuromuscular training, proprioceptive exercises, and structured warm-up programs like the FIFA 11+ protocol [15].

Overall, this study provides baseline epidemiological data from a previously underreported region, known for producing sports talents. While the findings are clinically relevant, further prospective studies incorporating injury severity, exposure data, and long-term outcomes would help build a more comprehensive understanding of sports injuries in this population.

Limitations

This study has several limitations. First, its retrospective design restricts the ability to establish direct cause-and-effect relationships between risk factors and injury occurrence. It also relies on the accuracy and completeness of existing medical records, which can introduce potential information bias. Second, the study was carried out at a single tertiary-care center.

Table 6: Distribution of anatomical site of injury according to sport

Sport	Knee	Ankle	Thigh	Leg	Shoulder	Wrist/Hand	Arm	Back	Other
Archery	0	0	0	0	1	0	0	0	0
Arm wrestling	0	0	0	0	0	0	2	0	0
Badminton	4	2	0	0	1	0	0	4	1
Basketball	4	5	0	0	0	7	0	2	0
Boxing	0	0	0	0	2	0	0	0	0
Cricket	3	3	1	0	5	3	0	4	1
Cycling	0	0	0	0	1	0	0	0	0
Football	41	6	0	2	0	3	0	5	0
Golf	0	0	0	0	0	0	0	0	1
Gymnastics	1	0	0	0	0	0	0	0	1
High Jump	2	0	0	1	0	0	0	0	0
Hockey	1	0	0	0	0	0	0	0	0
Horse riding	0	0	0	0	0	1	0	0	0
Kabaddi	2	0	0	0	0	0	0	0	0
Kayaking	0	0	0	0	1	0	0	0	0
Mma	4	0	0	0	0	1	0	2	1
Paragliding	1	0	0	0	0	1	0	0	0
Running	6	6	0	0	0	0	0	0	0
Table tennis	0	1	0	0	0	0	0	0	0
Tennis	0	0	0	0	0	0	0	0	1
Volleyball	1	2	0	0	2	0	0	1	0
Weight lifting	0	0	0	0	0	0	0	2	0

This may limit how well the findings apply to the broader population, especially athletes who do not seek hospital-based care.

Third, the study likely undercounts minor injuries and overcounts more severe cases since it included only patients who went to a specialized sports injury clinic. This introduces selection bias. Fourth, data on injury severity grading, detailed diagnostic categories (like ligamentous vs. muscular injuries), and functional outcomes were not available. This limits the ability to assess the clinical impact and prognosis of injuries.

Fifth, the study did not record exposure data, such as the duration and intensity of sports participation. This prevents calculating injury incidence rates and limits comparisons with other epidemiological studies. Sixth, the relatively small number of female athletes made it difficult to conduct meaningful sex-specific analysis and limits conclusions about gender differences in injury patterns.

Finally, potential confounding factors like training level, body mass index, use of protective equipment, playing surface, and previous injury history were not evaluated due to a lack of relevant data. These could influence injury risk and patterns. Despite these limitations, the study offers valuable baseline epidemiological data from an area that has been underreported. It also provides important insights for future research and targeted injury prevention strategies.

Conclusion

In this study, sports-related injuries were seen predominantly in young adult males, with football emerging as the most common contributing sport. Knee injuries, particularly in football players, accounted for the majority of cases. We also found that injury patterns varied according to the type of sport, and contact sports were responsible for a larger share of injuries. These findings highlight the need for practical, sport-specific injury prevention strategies in this region. Simple measures such as structured training, supervised play, and basic injury-prevention programs could make a meaningful difference, especially in commonly played sports like football. Further prospective studies with more detailed data on injury severity and exposure would help in better understanding and preventing these injuries.

Clinical Message

In this single-center, retrospective study on sports injuries, we found that sports-related injuries were seen predominantly in young adult males; football emerging as the most common contributing sport. Knee injuries, particularly in football players, accounted for most injuries. While football injuries were predominantly knee-related, basketball injuries were more commonly seen in the wrist and hand, and cricket showed a mixed pattern involving the shoulder and upper limb. We also found that injury patterns varied according to the type of sport, and contact sports were responsible for a larger share of injuries. These findings highlight the need for injury surveillance and practical, sport-specific injury prevention strategies, especially in the high-risk group identified.

Declaration of patient consent: The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient has given the consent for his/ her images and other clinical information to be reported in the journal. The patient understands that his/ her names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

Conflict of interest: Nil **Source of support:** None

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