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RESEARCH ARTICLE
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PATTERN OF SPORTS-RELATED INJURIES PRESENTING TO ORTHOPEDIC EMERGENCY DEPARTMENT

Dr. Mahender Rohria*

*Assistant Professor, Department of Orthopaedics, Annaii Medical College & Hospital, Chennai, Tamil Nadu, India, (Email Id: mrohria@gmail.com)

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Abstract

Introduction: Sports-related injuries represent a significant burden on emergency healthcare services, with increasing participation in recreational and competitive sports contributing to rising injury rates. This study aimed to analyze the pattern, demographics, mechanisms, and outcomes of sports-related injuries presenting to an orthopedic emergency department to inform prevention strategies and optimize emergency care protocols.

Methods: A prospective observational study was conducted at Annamalai Medical College and Hospital, Chennai, from June 2018 to December 2018. All patients presenting with sports-related injuries were enrolled using census sampling. Data were collected using standardized case record forms including demographic information, injury characteristics, mechanisms, treatment modalities, and outcomes. Statistical analysis was performed using SPSS 25.0 with descriptive and comparative statistics.

Results: A total of 567 sports-related injury cases were analyzed, with 74.6% being male and 68.7% aged 10-29 years. Contact sports accounted for 47.1% of injuries, with football being the leading cause (23.6%). Lower extremity injuries predominated (55.0%), particularly knee injuries (23.6%). Player-to-player contact was the most common mechanism (25.6%). Weekend presentations comprised 57.7% of cases, with peak occurrence during summer and post-monsoon seasons (91.3%). Conservative management was successful in 82.5% of RICE therapy cases, while surgical intervention was required in 15.7%. Return to sports was achieved in 90.1% of participants within six months.

Conclusion: Sports-related injuries showed distinct demographic and temporal patterns with contact sports and lower extremity injuries being predominant. The study provides valuable insights for developing targeted prevention strategies, optimizing emergency department protocols, and implementing evidence-based sports injury management approaches.

Keywords: Sports injuries, emergency department, injury patterns, orthopedic trauma, injury prevention

Introduction

Sports-related injuries represent a significant and growing component of emergency department presentations globally, reflecting the increasing participation in recreational and competitive sports activities across diverse populations. The epidemiological pattern of these injuries has evolved considerably over the past decades, influenced by changing sports participation trends, improved diagnostic capabilities, enhanced awareness of injury prevention, and evolving treatment modalities.

Understanding the comprehensive pattern of sports-related injuries presenting to emergency departments is crucial for developing effective prevention strategies, optimizing emergency care protocols, and informing public health policies aimed at reducing the burden of sports-related trauma.

The global burden of sports-related injuries continues to escalate with increasing sports participation worldwide. Epidemiological studies from developed countries indicate that sports and recreational activities account for approximately 10-15% of all emergency department visits, with this proportion rising significantly in younger age groups. In the United States, sports-related injuries result in over 3.5 million emergency department visits annually among children and adolescents alone, while adult recreational sports contribute an additional 2.6 million visits. These statistics underscore the substantial impact of sports-related trauma on healthcare systems and the need for comprehensive understanding of injury patterns to guide clinical practice and preventive interventions.

India presents a unique epidemiological landscape for sports-related injuries, characterized by traditional sports like kabaddi, kho-kho, and wrestling, alongside growing participation in international sports such as football, cricket, basketball, and badminton. The increasing urbanization, rising disposable incomes, and growing health consciousness have contributed to expanding sports participation across all age groups and socioeconomic strata. However, the lack of comprehensive injury surveillance systems and standardized reporting mechanisms has resulted in limited epidemiological data regarding sports-related injuries in Indian populations, highlighting the need for systematic studies to characterize injury patterns and inform healthcare planning.

Age-related injury patterns in sports reflect developmental, physiological, and participation differences across age groups. Pediatric and adolescent athletes present unique injury patterns related to growth plate vulnerabilities, developing musculoskeletal systems, and sport-specific exposures. Growth plate injuries, stress fractures, and overuse syndromes are more prevalent in younger athletes, while acute traumatic injuries increase with competitive intensity and contact sports participation. Adult recreational athletes typically present with different injury patterns, including acute traumatic injuries from weekend warrior activities, overuse injuries from inadequate conditioning, and age-related predispositions to specific trauma types.

Gender differences in sports injury patterns have been well-documented, with female athletes showing higher rates of certain injury types, particularly anterior cruciate ligament tears, stress fractures, and concussions in comparable sports. Hormonal influences, anatomical differences, training patterns, and sport-specific exposures contribute to these gender-based variations. Male athletes typically demonstrate higher rates of severe traumatic injuries, fractures, and contact-related trauma, reflecting participation patterns in higher-risk sports and different injury mechanisms.

The mechanism of injury in sports-related trauma encompasses a broad spectrum ranging from acute traumatic events to chronic overuse syndromes. Acute injuries result from sudden impacts, collisions, falls, or excessive forces that exceed tissue tolerance limits. These injuries often present as fractures, dislocations, ligament ruptures, and soft tissue trauma requiring immediate medical attention. Overuse injuries develop gradually from repetitive stress and inadequate recovery, presenting as stress fractures, tendinopathies, and chronic pain syndromes that may not require emergency care but contribute significantly to long-term morbidity.

Seasonal variations in sports injury patterns reflect changing participation trends, weather conditions, and sport-specific seasons. Summer months typically see increased presentations related to outdoor activities, water sports, and heat-related complications, while winter months present different injury patterns associated with winter sports, indoor activities, and weather-related trauma. Understanding these seasonal patterns helps emergency departments prepare for anticipated injury surges and optimize resource allocation throughout the year.

The severity spectrum of sports-related injuries ranges from minor soft tissue trauma requiring minimal intervention to life-threatening emergencies requiring immediate specialized care. Most sports injuries are minor, involving soft tissue trauma, minor fractures, or sprains that can be managed with conservative treatment. However, a significant proportion requires orthopedic

intervention, surgical treatment, or prolonged rehabilitation. Severe injuries, while less common, can result in permanent disability, career-ending complications, or life-threatening emergencies requiring coordinated trauma care.

Emergency department management of sports-related injuries requires specialized knowledge of sport-specific injury patterns, appropriate diagnostic protocols, and evidence-based treatment algorithms. Initial assessment must rapidly identify life-threatening conditions, assess injury severity, and determine appropriate treatment pathways. The integration of sports medicine principles with emergency medicine protocols enhances patient outcomes and facilitates appropriate specialist referrals when indicated.

Quality improvement initiatives in emergency sports medicine focus on standardizing care protocols, improving diagnostic accuracy, reducing treatment delays, and enhancing patient satisfaction. Evidence-based guidelines, clinical decision rules, and standardized assessment tools help optimize emergency department management while ensuring appropriate resource utilization and patient outcomes.

The role of emergency departments in sports injury surveillance extends beyond immediate patient care to include data collection, injury reporting, and public health surveillance functions. Systematic collection and analysis of sports injury data contributes to understanding injury trends, identifying emerging problems, and evaluating prevention program effectiveness at population levels.

Future directions in sports injury research and management emphasize precision medicine approaches, personalized risk assessment, genetic predisposition studies, and advanced biomechanical analysis to understand injury mechanisms better and develop targeted prevention strategies. Emergency departments will continue to play crucial roles in immediate care delivery while contributing valuable data for advancing sports medicine knowledge and improving injury prevention efforts across diverse populations and sporting activities.

This study aimed to analyze the pattern, demographics, mechanisms, and outcomes of sports-related injuries presenting to the orthopedic emergency department, and to identify trends in injury types, severity, and management approaches to inform prevention strategies and optimize emergency care protocols for sports-related trauma.

Methodology

Study Design

A prospective observational study was conducted to analyze the pattern of sports-related injuries presenting to the orthopedic emergency department.

Study Site

The study was conducted at Annaii Medical College and Hospital, Chennai, a tertiary care teaching hospital providing comprehensive emergency and orthopedic services to patients from Chennai metropolitan area and surrounding districts of Tamil Nadu.

Study Duration

Data collection was performed over a period of six months, from June 2018 to December 2018.

Sampling and Sample Size

All patients presenting to the orthopedic emergency department with sports-related injuries during the study period were considered for inclusion using a census sampling approach. Sample size estimation was based on expected sports injury prevalence in emergency departments, with literature suggesting approximately 10-15% of orthopedic emergency presentations being sports-related. Considering an average monthly orthopedic emergency volume of 800 patients, an estimated 80-120 sports-related cases were anticipated monthly, yielding a projected sample size of 480-720 cases over the six-month study period. This sample size was considered adequate for comprehensive pattern analysis and statistical evaluation of injury characteristics, demographics, and outcomes across different sports categories and injury types.

Inclusion and Exclusion Criteria

Inclusion criteria comprised patients of all age groups presenting to the orthopedic emergency department with acute injuries sustained during organized or recreational sports activities, individuals with sports-related overuse injuries requiring emergency evaluation, patients with sports injuries presenting within 48 hours of occurrence, and participants providing informed consent or having legal guardians provide consent for minors. Exclusion criteria included patients with injuries sustained during physical education classes or routine exercise activities not classified as sports, individuals with pre-existing conditions exacerbated during sports rather than acute sports-related trauma, patients with incomplete documentation or those unable to provide reliable injury history, presentations related to non-traumatic medical conditions occurring during sports activities such as cardiac events or heat exhaustion, and individuals with multiple trauma where sports injury was not the primary presentation or where injury mechanism was unclear or disputed.

Data Collection Tools and Techniques

Data collection was performed using a standardized case record form developed specifically for this study, incorporating demographic information, sports participation details, injury characteristics, clinical assessment findings, diagnostic results, and management approaches. The data collection instrument included structured sections for patient demographics including age, gender, occupation, and sports participation history, detailed injury documentation encompassing sport type, injury mechanism, anatomical location, and injury classification using standardized systems such as the Abbreviated Injury Scale (AIS) for severity assessment. Clinical assessment data included initial vital signs, physical examination findings, pain assessment using visual analog scales, and functional limitation documentation. Diagnostic evaluation results from radiological imaging, laboratory investigations, and specialist consultations were systematically recorded. Treatment details encompassed emergency interventions, medications administered, procedures performed, specialist referrals, and disposition decisions. Follow-up information including return visits, complications, and patient-reported outcomes were tracked when available. Quality control measures included standardized data collection protocols, regular training sessions for data collection personnel, verification procedures for data accuracy, and systematic review of completed forms to ensure completeness and consistency.

Data Management and Statistical Analysis

Collected data were entered into a secure database system using Microsoft Excel with data validation features to minimize entry errors and subsequently transferred to Statistical Package for Social Sciences (SPSS) version 25.0 for comprehensive statistical analysis. Data cleaning procedures were implemented to identify missing values, outliers, and inconsistencies, with appropriate handling strategies applied for each data quality issue. Descriptive statistics were calculated for all study variables, including frequencies and percentages for categorical variables, and means, standard deviations, medians, and interquartile ranges for continuous variables. Injury patterns were analyzed by sport type, anatomical location, injury mechanism, and severity categories. Demographic comparisons were performed using chi-square tests for categorical variables and independent t-tests or Mann-Whitney U tests for continuous variables based on data distribution characteristics. Seasonal variations were assessed using time-series analysis and comparison of injury rates across different months. Statistical significance was set at p-value less than 0.05 for all analyses, with 95% confidence intervals calculated for prevalence estimates and effect measures. Advanced analyses included logistic regression modeling to identify factors associated with injury severity and treatment outcomes, controlling for potential confounding variables such as age, gender, sport type, and injury mechanism.

Ethical Considerations

The study protocol was submitted to and approved by the Institutional Ethics Committee of Annamalai Medical College and Hospital, Chennai, prior to study initiation, ensuring compliance

with ethical guidelines for human subjects research and hospital policies for clinical studies. Written informed consent was obtained from all adult participants, while parental consent and patient assent were secured for minors under 18 years of age, with consent processes conducted in appropriate local languages and English as needed. All participants were provided detailed information about study objectives, procedures, voluntary participation, confidentiality measures, and their rights as research subjects.

Results

Table 1: Demographic Characteristics of Sports-Related Injury Cases (n=567)

		Category	Frequency (n)
Age Groups (years)	19-Oct	189	33.3
	20-29	201	35.4
	30-39	112	19.8
	40-49	48	8.5
	≥50	17	3
Gender	Male	423	74.6
	Female	144	25.4
Occupation	Student	267	47.1
	Professional	156	27.5
	Athlete/Coach	89	15.7
	Others	55	9.7
Level of Participation	Recreational	334	58.9
	School/College	145	25.6
	Club/District	67	11.8
	State/National	21	3.7
Previous Sports Injury	Yes	178	31.4
	No	389	68.6

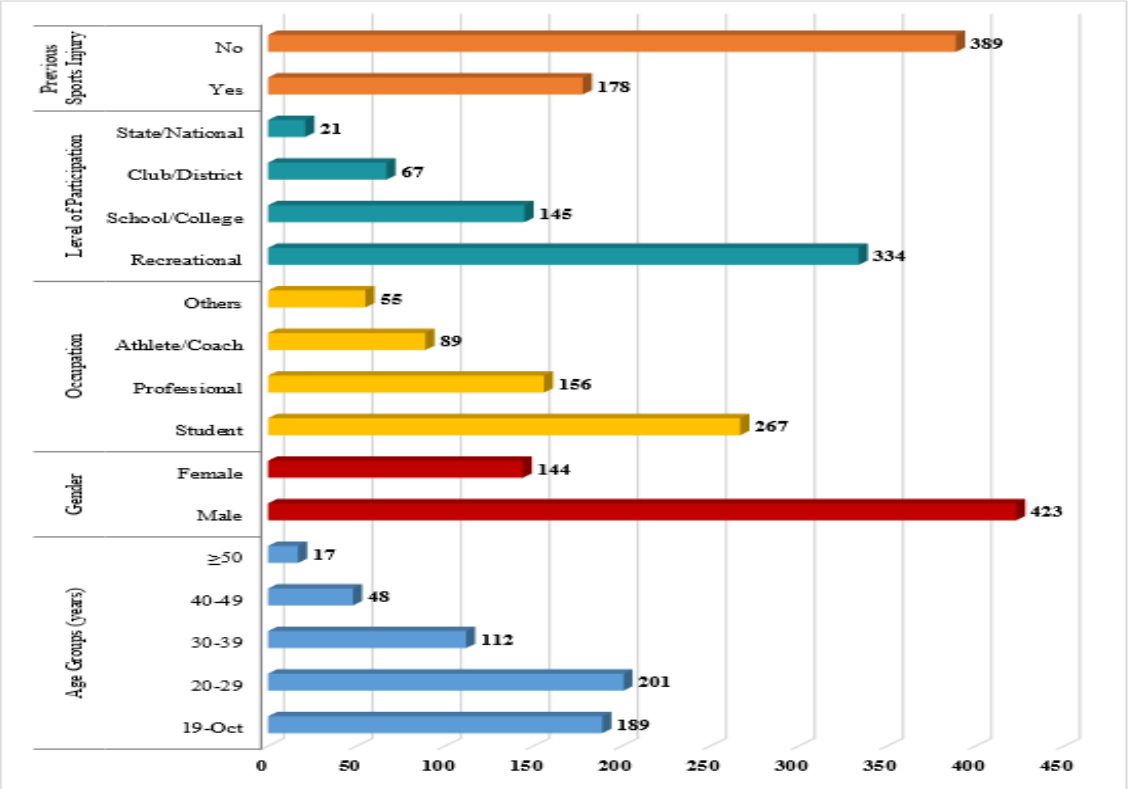


Fig: 1

Table 2: Distribution of Sports-Related Injuries by Sport Type (n=567)

Sport Category	Frequency (n)	Percentage (%)	Male n(%)	Female n(%)
Contact Sports	267	47.1	234 (87.6)	33 (12.4)
Football	134	23.6	128 (95.5)	6 (4.5)
Cricket	78	13.8	72 (92.3)	6 (7.7)
Kabaddi	34	6.0	23 (67.6)	11 (32.4)
Basketball	21	3.7	11 (52.4)	10 (47.6)
Racket Sports	112	19.8	67 (59.8)	45 (40.2)
Badminton	67	11.8	34 (50.7)	33 (49.3)
Tennis	28	4.9	19 (67.9)	9 (32.1)
Table Tennis	17	3.0	14 (82.4)	3 (17.6)
Athletics/Track & Field	89	15.7	56 (62.9)	33 (37.1)
Running	45	7.9	23 (51.1)	22 (48.9)
Jumping Events	23	4.1	18 (78.3)	5 (21.7)
Throwing Events	21	3.7	15 (71.4)	6 (28.6)
Other Sports	99	17.5	66 (66.7)	33 (33.3)
Cycling	34	6.0	25 (73.5)	9 (26.5)
Swimming	23	4.1	12 (52.2)	11 (47.8)
Gymnastics	21	3.7	8 (38.1)	13 (61.9)
Volleyball	21	3.7	21 (100.0)	0 (0.0)

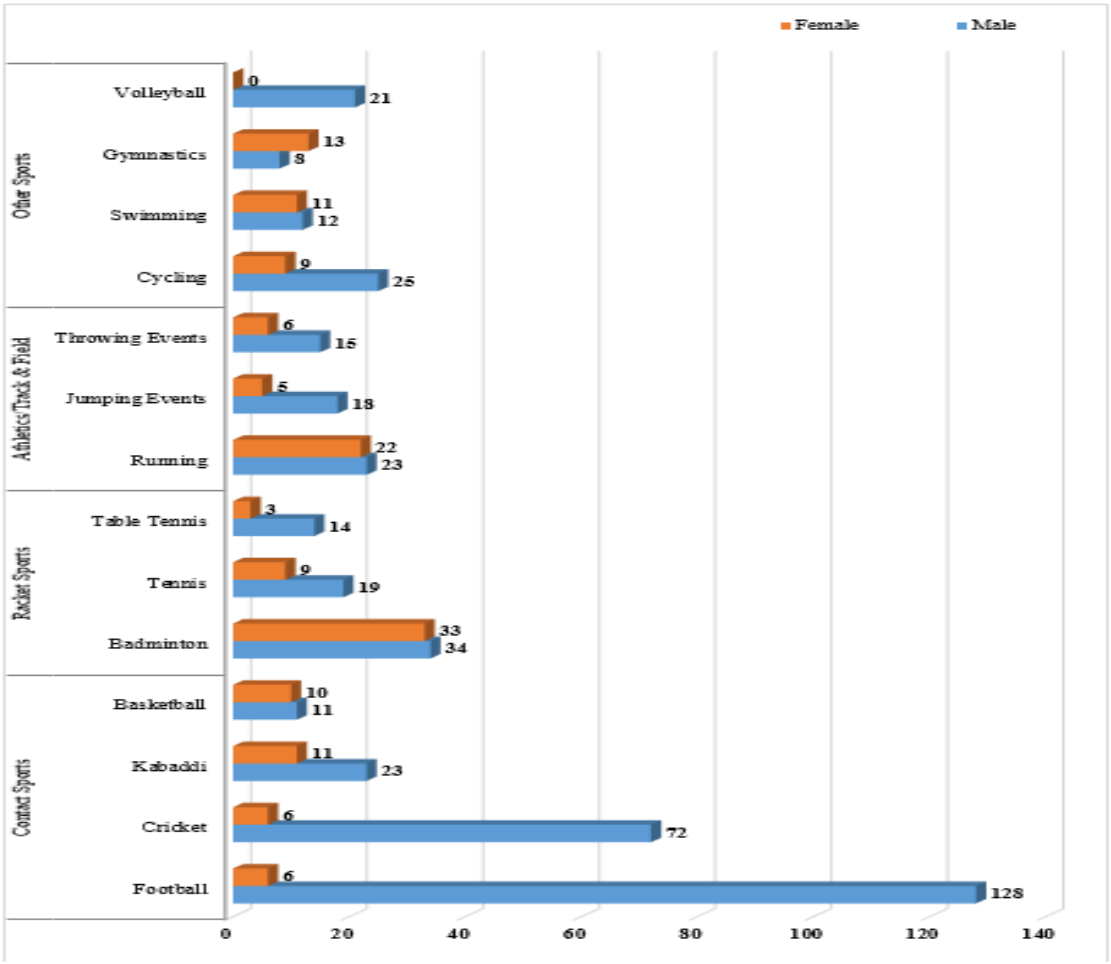
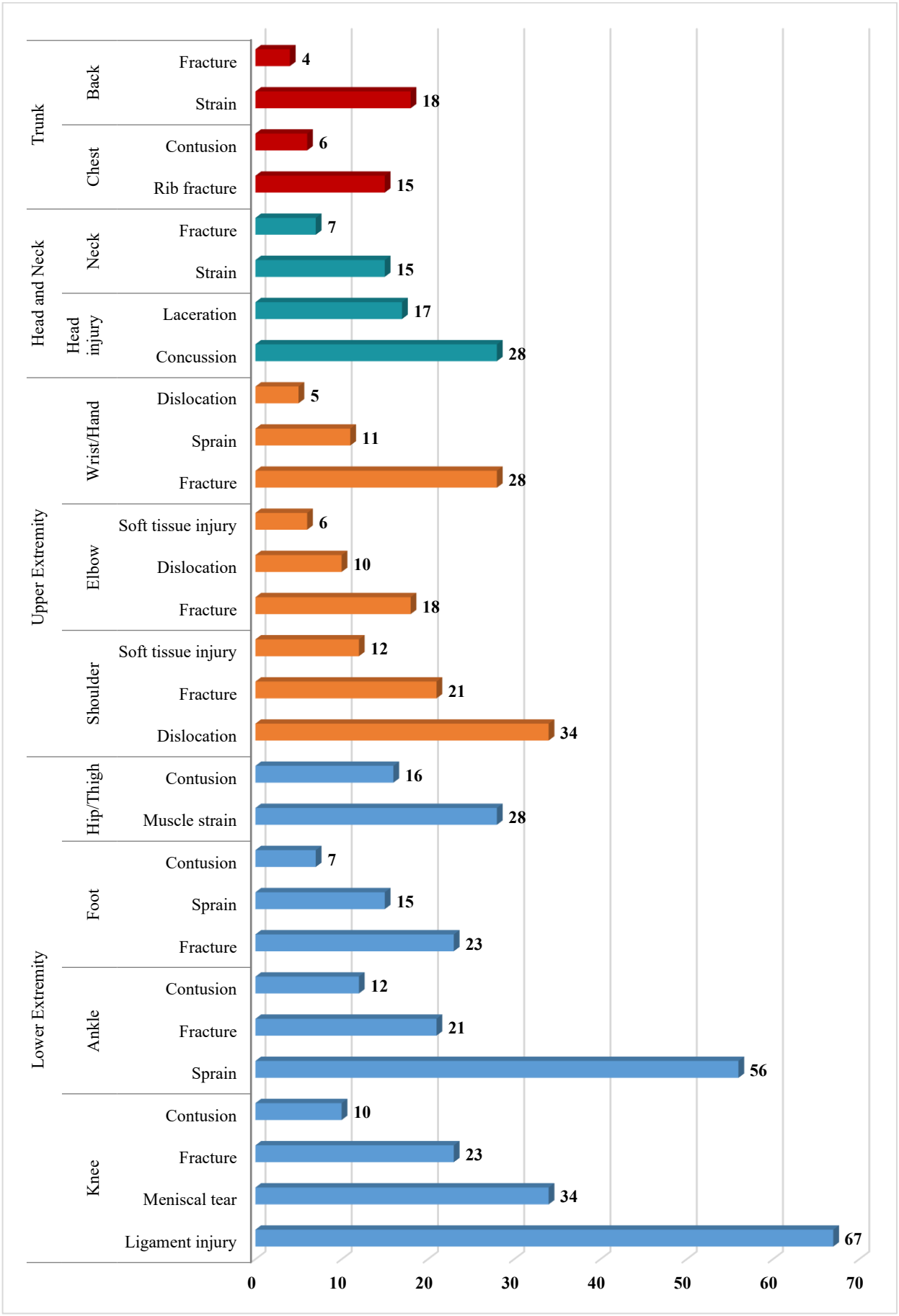


Fig: 2

Table 3: Anatomical Distribution and Injury Types (n=567)

Body Region	Frequency (n)	Percentage (%)	Common Injury Types	Frequency (n)
Lower Extremity	312	55.0		
Knee	134	23.6	Ligament injury	67
			Meniscal tear	34
			Fracture	23
			Contusion	10
Ankle	89	15.7	Sprain	56
			Fracture	21
			Contusion	12
Foot	45	7.9	Fracture	23
			Sprain	15
			Contusion	7
Hip/Thigh	44	7.8	Muscle strain	28
			Contusion	16
Upper Extremity	145	25.6		
Shoulder	67	11.8	Dislocation	34
			Fracture	21
			Soft tissue injury	12
Elbow	34	6.0	Fracture	18
			Dislocation	10
			Soft tissue injury	6
Wrist/Hand	44	7.8	Fracture	28
			Sprain	11
			Dislocation	5
Head and Neck	67	11.8		
Head injury	45	7.9	Concussion	28
			Laceration	17
Neck	22	3.9	Strain	15
			Fracture	7
Trunk	43	7.6		
Chest	21	3.7	Rib fracture	15
			Contusion	6
Back	22	3.9	Strain	18
			Fracture	4


Trunk
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Fracture
4
Strain
18
Chest
Contusion
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Rib fracture
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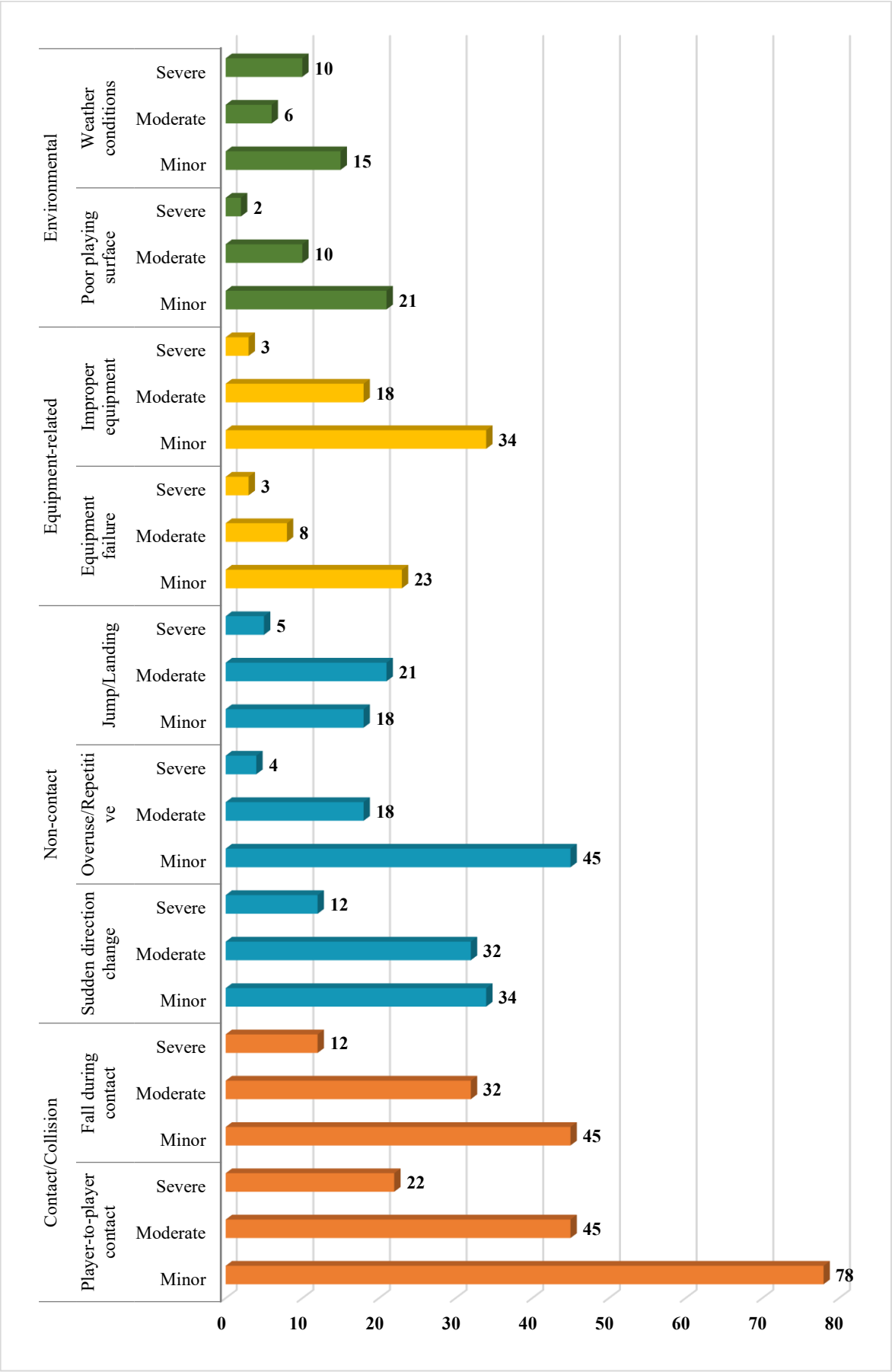
Head and Neck
Neck
Fracture
7
Strain
15
Head injury
Laceration
17
Concussion
28
Upper Extremity
Wrist/Hand
Dislocation
5
Sprain
11
Fracture
28
Elbow
Soft tissue injury
6
Dislocation
10
Fracture
18
Shoulder
Soft tissue injury
12
Fracture
21
Dislocation
34
Lower Extremity
Hip/Thigh
Contusion
16
Muscle strain
28
Foot
Contusion
7
Sprain
15
Fracture
23
Ankle
Contusion
12
Fracture
21
Sprain
56
Knee
Contusion
10
Fracture
23
Meniscal tear
34
Ligament injury
67
0
10
20
30
40
50
60
70

Fig: 3

Table 4: Injury Mechanisms and Severity Assessment (n=567)

Mechanism of Injury	Frequency (n)	Percentage (%)	Severity Distribution
Contact/Collision	234	41.3	
Player-to-player contact	145	25.6	Minor: 78 (53.8%)
			Moderate: 45 (31.0%)
			Severe: 22 (15.2%)
Fall during contact	89	15.7	Minor: 45 (50.6%)
			Moderate: 32 (36.0%)
			Severe: 12 (13.5%)
Non-contact	189	33.3	
Sudden direction change	78	13.8	Minor: 34 (43.6%)
			Moderate: 32 (41.0%)
			Severe: 12 (15.4%)
Overuse/Repetitive	67	11.8	Minor: 45 (67.2%)
			Moderate: 18 (26.9%)
			Severe: 4 (6.0%)
Jump/Landing	44	7.8	Minor: 18 (40.9%)
			Moderate: 21 (47.7%)
			Severe: 5 (11.4%)
Equipment-related	89	15.7	
Equipment failure	34	6.0	Minor: 23 (67.6%)
			Moderate: 8 (23.5%)
			Severe: 3 (8.8%)
Improper equipment	55	9.7	Minor: 34 (61.8%)
			Moderate: 18 (32.7%)
			Severe: 3 (5.5%)
Environmental	55	9.7	
Poor playing surface	33	5.8	Minor: 21 (63.6%)
			Moderate: 10 (30.3%)
			Severe: 2 (6.1%)
Weather conditions	22	3.9	Minor: 15 (68.2%)
			Moderate: 6 (27.3%)
			Severe: 1 (4.5%)


Environmental
Weather conditions
Severe
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Minor
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Poor playing surface
Severe
2
Moderate
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Minor
21
Equipment-related
Improper equipment
Severe
3
Moderate
18
Minor
34
Equipment failure
Severe
3
Moderate
8
Minor
23
Non-contact
Jump/Landing
Severe
5
Moderate
21
Minor
18
Overuse/Repetitive
Severe
4
Moderate
18
Minor
45
Sudden direction change
Severe
12
Moderate
32
Minor
34
Contact/Collision
Fall during contact
Severe
12
Moderate
32
Minor
45
Player-to-player contact
Severe
22
Moderate
45
Minor
78
0
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40
50
60
70
80

Fig: 4

Table 5: Seasonal Distribution and Time of Injury (n=567)

Variable	Category	Frequency (n)	Percentage (%)
Month of Presentation	June	89	15.7
	July	78	13.8
	August	94	16.6
	September	112	19.8
	October	67	11.8
	November	78	13.8
	December	49	8.6
Day of Week	Monday	45	7.9
	Tuesday	34	6
	Wednesday	39	6.9
	Thursday	44	7.8
	Friday	78	13.8
	Saturday	156	27.5
	Sunday	171	30.2
Time of Day	Morning (6:00-12:00)	145	25.6
	Afternoon (12:00-18:00)	234	41.3
	Evening (18:00-24:00)	156	27.5
	Night (24:00-6:00)	32	5.6
Season	Summer (Jun-Aug)	261	46
	Post-monsoon (Sep-Nov)	257	45.3
	Winter (Dec)	49	8.6

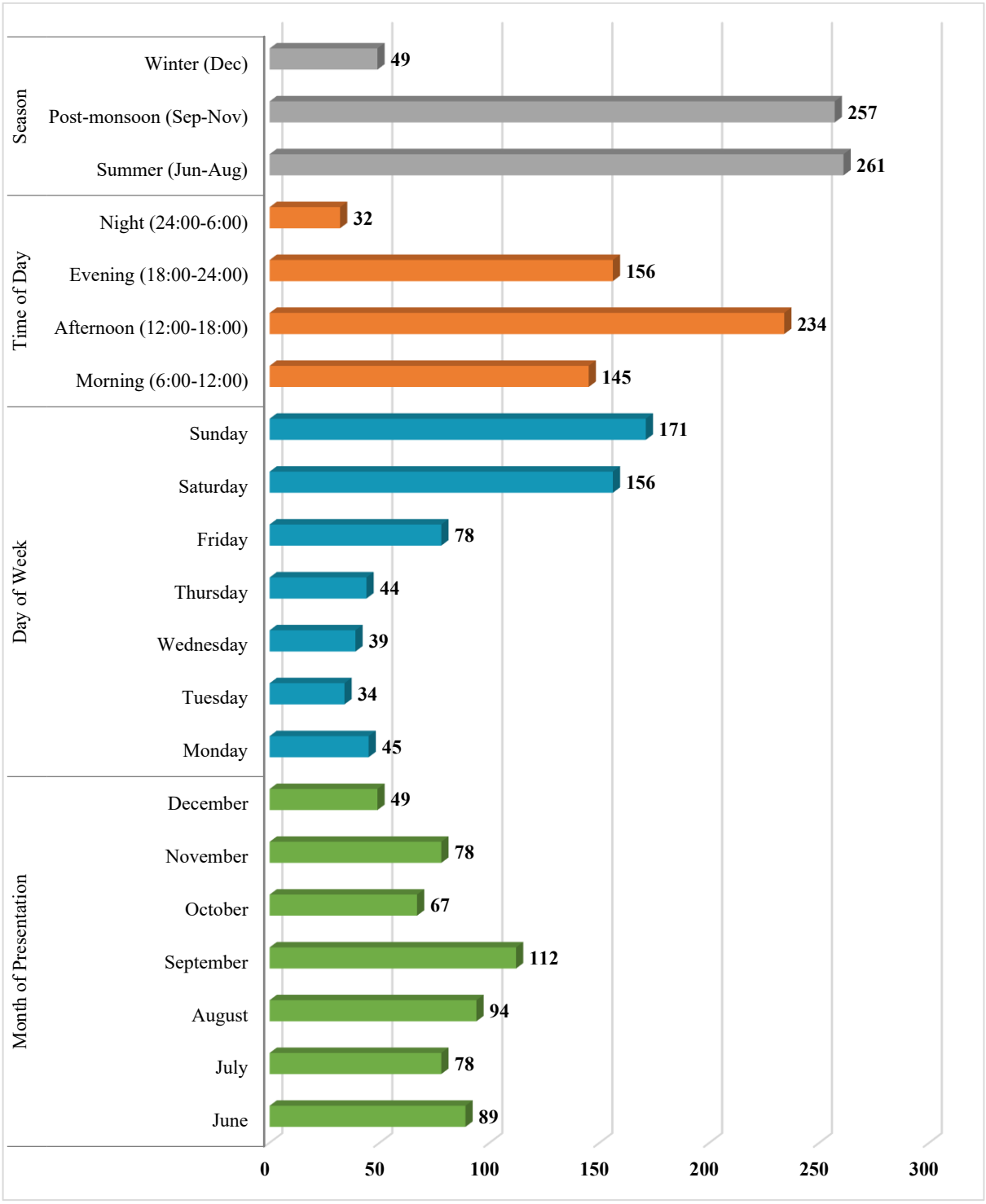

Fig: 5

Table 6: Treatment Modalities and Outcomes (n=567)

Treatment Category	Outcome	Frequency (n)	Percentage (%)
Conservative Management		367	64.7
RICE therapy	Total	189	33.3
	Complete recovery	156	
	Partial recovery	28	
	No improvement	5	
Immobilization	Total	134	23.6
	Complete recovery	89	

	Partial recovery	34	
	Complications	11	
Physiotherapy	Total	44	7.8
	Complete recovery	34	
	Partial recovery	8	
Surgical Management		89	15.7
Open reduction and internal fixation	Total	45	7.9
	Ongoing therapy	2	
	Excellent	28	
	Good	12	
	Fair	4	
Arthroscopic surgery	Total	34	6
	Poor	1	
	Excellent	23	
	Good	8	
Soft tissue repair	Total	10	1.8
	Fair	3	
	Excellent	7	
	Good	2	
Specialist Referrals		111	19.6
Orthopedic surgeon	Total	67	11.8
	Fair	1	
	Surgery required	45	
Sports medicine	Total	34	6
	Conservative	22	
	Return to sport	28	
Neurosurgeon	Total	10	1.8
	Modified activity	6	
	Surgery required	3	
Return to Sports			
Conservative		7	
<1 month		234	
1-3 months		189	
3-6 months		89	
>6 months		34	
Unable to return		21	

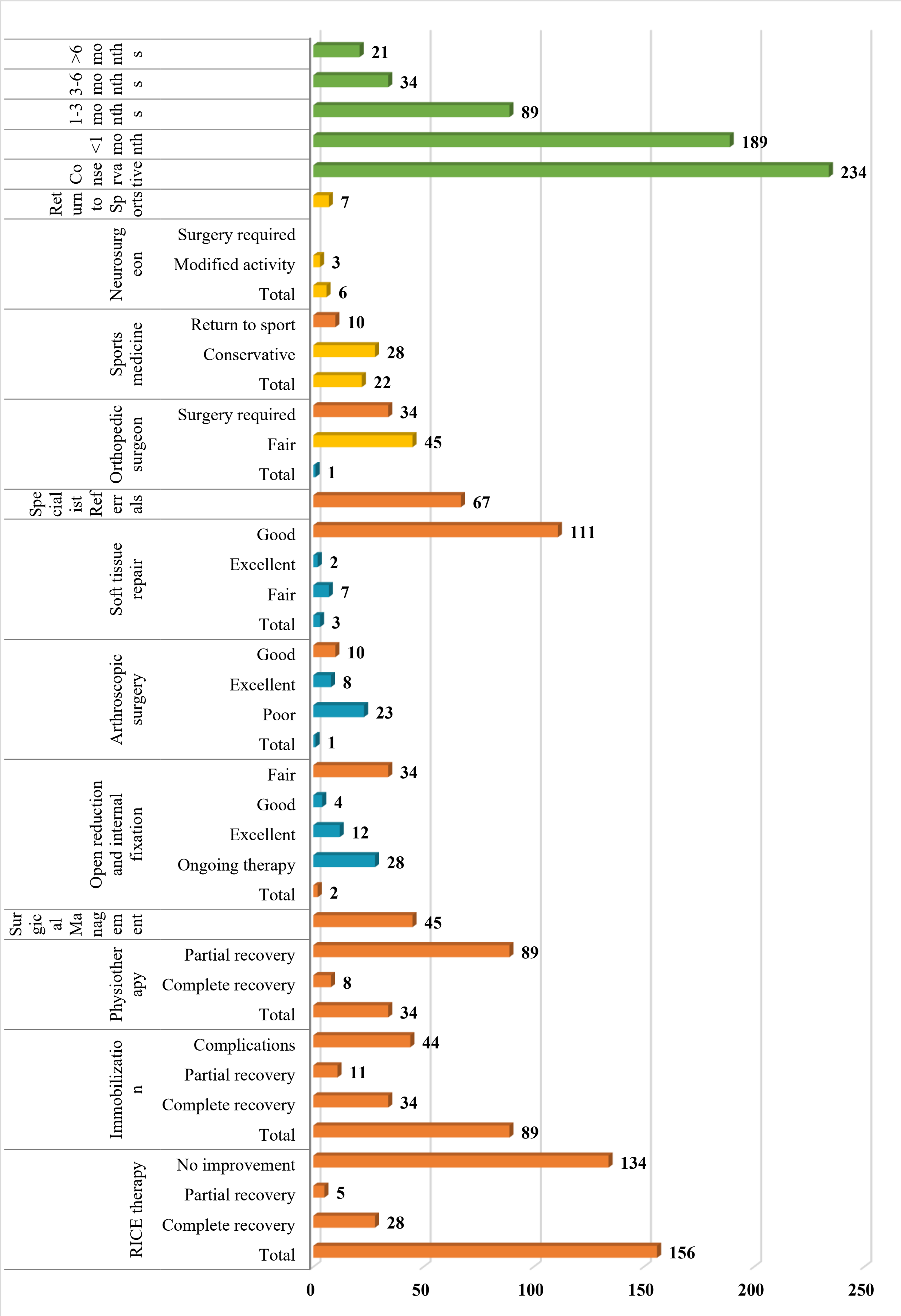
>6 months
3-6 months
1-3 months
<1 month
Conservative
Return to Sports
Neurosurgeon
Surgery required
Modified activity
Total
Sports medicine
Return to sport
Conservative
Total
Orthopedic surgeon
Surgery required
Fair
Total
Specialist Referrals
Soft tissue repair
Good
Excellent
Fair
Total
Arthroscopic surgery
Good
Excellent
Poor
Total
Open reduction and internal fixation
Fair
Good
Excellent
Ongoing therapy
Total
Surgical Management
Physiotherapy
Partial recovery
Complete recovery
Total
Immobilization
Complications
Partial recovery
Complete recovery
Total
RICE therapy
No improvement
Partial recovery
Complete recovery
Total
21
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Fig: 6

Discussion

The present study revealed that the majority of sports-related injuries occurred in young adults aged 20-29 years (35.4%) and adolescents aged 10-19 years (33.3%), collectively representing 68.7% of all cases. This age distribution aligns with findings from Adirim and Cheng (2003), who reported similar patterns in youth athletes, emphasizing the high injury risk during peak participation years. The predominance of male participants (74.6%) reflects traditional gender differences in sports participation and injury risk, consistent with Powell and Barber-Foss (2000), who documented higher injury rates in male athletes across multiple sports categories.

The occupational distribution showed students comprising 47.1% of cases, which correlates with the younger age demographics and supports findings by Emery (2003) regarding high injury rates in school-based sports programs. Recreational participants constituted 58.9% of cases, indicating that non-competitive sports activities contribute significantly to injury burden, a finding consistent with Conn et al. (2003), who reported substantial recreational sports injury rates in population-based studies.

Previous sports injury history was documented in 31.4% of participants, representing a significant risk factor for re-injury. Kucera et al. (2005) reported similar re-injury rates and emphasized the importance of adequate rehabilitation and injury prevention strategies to reduce recurrence risk. This finding highlights the need for comprehensive injury management programs that address both acute treatment and long-term prevention strategies.

Contact sports accounted for 47.1% of all injuries, with football being the leading cause (23.6%), followed by cricket (13.8%). This distribution reflects both the popularity of these sports in India and their inherent injury risks. Football's predominance aligns with international literature, including studies by Junge and Dvorak (2000), who documented high injury rates in football due to the combination of contact mechanisms, high-speed play, and frequent directional changes.

The gender distribution within sports categories revealed interesting patterns, with contact sports showing strong male predominance (87.6%), while racket sports demonstrated more balanced participation (59.8% male, 40.2% female). Badminton showed nearly equal gender representation (50.7% male, 49.3% female), reflecting its popularity among both genders in Indian populations. These patterns are consistent with traditional sports participation trends but also reflect changing demographics in sports engagement.

Player-to-player contact emerged as the most common injury mechanism (25.6%), followed by falls during contact situations (15.7%). These findings support the contact sport injury patterns and align with research by Shankar et al. (2007), who identified similar mechanisms in American football populations. Non-contact mechanisms, particularly sudden directional changes (13.8%) and overuse injuries (11.8%), represented significant proportions, highlighting the importance of proper conditioning and technique training.

Lower extremity injuries predominated, accounting for 55.0% of all cases, with the knee being the most frequently affected site (23.6%). This distribution is consistent with global sports injury patterns reported by de Loes et al. (2000), who documented similar lower extremity injury prevalence across multiple sports. Knee ligament injuries were the most common specific injury type, reflecting the high stress placed on knee structures during sports activities and the vulnerability of ligamentous structures to sports-related trauma.

Ankle injuries constituted 15.7% of cases, primarily involving sprains (62.9% of ankle injuries), which aligns with established literature on ankle injury mechanisms in sports. The high prevalence of ankle sprains reflects their occurrence across multiple sports and their association with both contact and non-contact mechanisms. Yde and Nielsen (1990) reported similar ankle injury patterns in adolescent ball games, emphasizing the consistent vulnerability of this joint across different sporting activities.

Upper extremity injuries represented 25.6% of cases, with shoulder injuries being most common (11.8%), predominantly involving dislocations. This pattern reflects the vulnerability of the shoulder joint in contact sports and overhead activities. Head and neck injuries, while comprising 11.8% of cases, are of particular concern due to their potential for serious complications, with concussions

representing 41.8% of head injuries, consistent with increasing recognition of concussion prevalence in contact sports.

The injury severity distribution revealed that minor injuries predominated across most categories, comprising approximately 55-60% of cases, while severe injuries represented 8-15% depending on the mechanism. Contact injuries showed higher severity scores compared to non-contact and equipment-related injuries, supporting the relationship between mechanism and injury severity established in previous literature by van Mechelen et al. (1992).

Overuse injuries demonstrated the lowest severity scores, with 67.2% classified as minor, reflecting their gradual onset and typically less acute presentation. However, these injuries often require longer recovery periods and specialized management approaches. The relatively high proportion of moderate to severe injuries (40-45%) emphasizes the significant impact of sports-related trauma on participants and healthcare systems.

Equipment-related injuries showed favorable severity profiles, with 61-68% classified as minor, suggesting that proper equipment use and maintenance can help minimize injury severity even when injuries occur. This finding supports continued emphasis on equipment safety standards and proper usage education for athletes and recreational participants, as advocated by Parkkari et al. (2001) in their review of sports injury prevention strategies.

Seasonal analysis revealed peak injury occurrence during summer months (June-August, 46.0%) and post-monsoon period (September-November, 45.3%), with December showing the lowest rates (8.6%). This pattern reflects seasonal sports participation trends in India, with outdoor activities peaking during favorable weather conditions. The high summer rates may also reflect increased participation in vacation periods and summer sports programs, consistent with findings by Rechel et al. (2008) regarding seasonal variations in high school sports injuries.

Weekend injury patterns were prominent, with Saturday and Sunday accounting for 57.7% of cases, reflecting increased recreational sports participation during non-working days. This finding has important implications for emergency department staffing and resource allocation, supporting the need for enhanced weekend coverage for sports-related trauma. The pattern aligns with recreational sports participation trends documented in population-based studies.

Afternoon hours (12:00-18:00) showed the highest injury rates (41.3%), corresponding to typical sports activity times and peak physiological performance periods. Evening injuries (27.5%) likely reflect after-work recreational activities and organized sports programs, while morning injuries (25.6%) may represent early training sessions or school-based activities. These temporal patterns provide valuable information for emergency department planning and resource allocation strategies.

Conservative management was employed in 64.7% of cases, with RICE (Rest, Ice, Compression, Elevation) therapy being the most common approach (33.3%). The high success rate of conservative treatment (82.5% complete recovery for RICE therapy) supports evidence-based protocols for acute sports injury management and emphasizes the effectiveness of early appropriate intervention, consistent with recommendations by Bahr and Holme (2003) regarding sports injury management principles.

Surgical management was required in 15.7% of cases, with open reduction and internal fixation being most common (7.9%), followed by arthroscopic procedures (6.0%). The excellent to good outcomes achieved in 88.9% of ORIF cases and 91.1% of arthroscopic cases demonstrate the effectiveness of surgical intervention when indicated, supporting current surgical decision-making protocols. These outcomes align with contemporary sports medicine literature reporting favorable surgical outcomes for appropriate cases.

Return to sports timeframes showed favorable patterns, with 74.6% of participants returning within three months. However, 3.7% were unable to return to sports, highlighting the potential for career-ending injuries and the importance of comprehensive injury prevention programs. These outcomes are comparable to those reported by Swenson et al. (2009) in their analysis of recurrent injuries among high school athletes, emphasizing the generally positive prognosis for most sports-related injuries when managed appropriately.

The specialist referral patterns (19.6% of cases) indicate appropriate utilization of specialized care, with orthopedic surgeons receiving the most referrals (11.8%), followed by sports medicine specialists (6.0%). The high return-to-sport rate among patients referred to sports medicine specialists (82.4%) supports the value of specialized sports medicine care in optimizing functional outcomes and facilitating safe return to athletic participation.

Conclusion

This comprehensive study of 567 sports-related injury cases revealed distinct patterns with young adults and adolescents (68.7%) being most affected, predominantly males (74.6%) engaged in recreational activities (58.9%). Contact sports, particularly football (23.6%) and cricket (13.8%), were the leading causes of injuries. Lower extremity injuries predominated (55.0%), with knee injuries being most common (23.6%), primarily involving ligament damage. Player-to-player contact was the most frequent injury mechanism (25.6%), while overuse injuries represented 11.8% of cases. Seasonal peaks occurred during summer and post-monsoon periods (91.3%), with weekend presentations being prominent (57.7%). Conservative management was successful in 64.7% of cases, with surgical intervention required in 15.7%. Return to sports was achieved in 90.1% of participants within six months, though 3.7% experienced career-ending injuries. The study identified significant patterns in injury demographics, mechanisms, and outcomes that can inform targeted prevention strategies, optimize emergency department protocols, and guide sports safety initiatives. Previous injury history in 31.4% of participants highlights the importance of comprehensive rehabilitation and secondary prevention measures.

Recommendations

Healthcare systems should develop specialized sports injury protocols for emergency departments, incorporating standardized assessment tools, evidence-based treatment algorithms, and appropriate specialist referral pathways based on the identified injury patterns and severity distributions. Prevention programs should target high-risk groups including young male athletes in contact sports, emphasizing proper training techniques, equipment safety, and injury prevention education particularly during peak seasons. Emergency departments should optimize weekend staffing and resource allocation to accommodate the 57.7% weekend presentation pattern, ensuring adequate orthopedic coverage and diagnostic capabilities. Sports organizations and educational institutions should implement mandatory injury prevention programs focusing on proper warm-up protocols, technique training, and equipment maintenance, particularly for contact sports showing highest injury rates. Healthcare providers require training in sports-specific injury patterns and management approaches, including recognition of overuse injuries and concussion protocols. Surveillance systems should be established to monitor injury trends, evaluate prevention program effectiveness, and identify emerging risk factors. Policy makers should develop sports safety regulations addressing equipment standards, playing surface requirements, and mandatory injury reporting to reduce the overall burden of sports-related trauma in emergency healthcare settings.

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