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Original Article

Prevalence of Soft Tissue Injuries in Upper and Lower Limbs among Professional Racquet Sports Players: A Systematic Review

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ABSTRACT

Background: The purpose of this systematic review was to determine the prevalence of soft tissue injuries in the upper and lower limbs among professional racquet sports players.

Methods: A systematic search was conducted across electronic databases, including Google Scholar, PubMed, and ScienceDirect. Articles published between 2000 and 2025 were considered. A total of 90 full-text articles were initially retrieved, and 11 were included in this systematic review based on predefined selection criteria.

Results: Analysis of the selected studies revealed a high prevalence of soft tissue injuries at the elbow and ankle joints in the upper and lower limbs, respectively. Regarding injury severity, mild injuries were more common, while severe injuries were less frequent. Specifically, mild injuries accounted for approximately 70% and severe injuries for about 10% of soft tissue injuries at the elbow and ankle joints.

Conclusion: This review indicates a high prevalence of mild soft tissue injuries and a relatively low prevalence of severe injuries in both the upper and lower limbs of professional racquet sports players. Furthermore, based on injury grading, there was a high incidence of mild injury (70%) and a low incidence of severe injury (10%) in soft tissues at the elbow and ankle joints, respectively. These findings underscore the importance of targeted preventive strategies to reduce injury risk in these populations.

Introduction

Racquet sports—such as badminton, squash, racquetball, tennis, and paddle tennis—are fast-paced, high-agility activities enjoyed by individuals across a wide age range. The risk of injury in sports generally increases with age, due to factors such as cumulative loading, reduced tissue elasticity, and changes in movement patterns. Racquet sports are characterized by the use of a handheld racquet to strike a ball or shuttle toward the opponent's side of the court or playing area [1,2]. Each sport possesses distinct technical demands and equipment specifications, resulting in considerable variability in racquet design and performance characteristics [3].

These sports require substantial levels of dexterity, core stability, muscular strength, flexibility, and coordination, as players must frequently perform rapid directional changes combined with high-velocity movements of the upper and lower extremities [4].

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Although racquet sports differ in court dimensions, racquet weight, and sport-specific techniques, they share several common biomechanical features. Abnormal mechanics, repetitive loading patterns, improper posture, and suboptimal technique can predispose athletes to soft tissue injuries [5]. Despite structural differences among racquets—for example, badminton racquets are lighter with longer shafts, whereas tennis racquets are heavier and more robust—the underlying movement patterns and injury mechanisms across these sports remain comparable [6].

Badminton is one of the most widely played racquet sports worldwide and is characterized by high agility demands, requiring rapid directional changes combined with coordinated upper limb movements [7]. It is primarily an individual, non-contact sport that involves a variety of dynamic actions, including jumping, lunging, swift changes in direction, and high-velocity arm movements. These repetitive and multidirectional motions place considerable stress on various joints and soft tissues, increasing the risk of injury during play [8].

In contrast to many countries, badminton is the second-most-played sport in India and is considered one of the fastest and most agility-demanding racquet sports, which increases the risk of sport-related injuries. Physical activity often carries a risk of injury, which may be categorized as acute or overuse depending on the mechanism and onset [9]. The most common injuries in racquet sports include sprains and strains, which are typically acute; however, several studies have also reported a high incidence of overuse injuries among badminton players [10]. Although badminton is generally regarded as a low-risk sport, chronic overuse injuries—such as tendinopathies, muscle strains, and stress fractures—constitute a major proportion of musculoskeletal complaints. These injuries commonly result from repetitive trauma and can be attributed to factors such as improper training, inappropriate playing surfaces, faulty equipment, and abnormal biomechanics [11].

Musculoskeletal injuries are the most frequent injury type in badminton, and persistent physical stress often contributes to sport dropout among both amateur and professional athletes [12]. This systematic review aims to provide new insights into the prevalence and patterns of soft-tissue injuries in the upper and lower limbs among racquet-sport players. Moreover, the findings may contribute to the development of more effective preventive strategies, training guidelines, and performance-enhancing recommendations. By identifying common injury mechanisms and risk factors, this review seeks to assist clinicians, coaches, and players in reducing injury occurrence and improving overall athletic performance.

Methods

Search Strategy

This systematic review was conducted using a comprehensive literature search across multiple electronic databases. Following PRISMA guidelines, studies published between **2000 and 2025** were identified through searches of PubMed, Google Scholar, and ScienceDirect. A combination of keywords and Boolean operators was used, including terms such as *racquet sports*, *injuries*, *soft tissue injuries*, *athletes*, *competitive players*, and *age groups*. The keywords were combined using operators such as AND to enhance the precision of the search strategy.

Only articles published in English were considered. An initial pool of studies was identified using the electronic search tools; however, after screening titles, abstracts, and full texts for relevance and methodological quality, only a limited number of articles met the inclusion criteria and were therefore selected for final analysis.

Selection Criteria

All articles included in this systematic review were evaluated in full text. Studies were eligible if they reported the prevalence or frequency of soft tissue injuries in the upper or lower limbs among racquet sports players, and if they met the methodological requirements of this review (Table 1). After detailed screening and assessment, only articles that met the predefined criteria were included.

Inclusion Criteria

Studies were included if they met the following conditions:

- Investigated soft tissue injuries in racquet sports.
- Reported common joint injuries of the upper or lower limb.
- Included both male and female athletes.
- Employed descriptive, observational, or survey-based study designs.

Exclusion Criteria

Articles were excluded if they did not align with the objectives of this systematic review. Reasons for exclusion included:

- Studies involving sports other than racquet sports.
- Articles that focused solely on injury classification without reporting prevalence or frequency.
- Studies limited to a specific age group, restricting generalizability.
- Literature describing treatment protocols rather than injury occurrence.
- Studies focusing on previous or past injuries unrelated to the current prevalence of soft tissue injuries.

Search terminology

A range of related terms and expressions identified from the included studies were used to support and refine the search strategy. Common terminology found across the selected literature included:

- Sport injuries in athletes
- Preventive measures in badminton
- Epidemiology of sports injury
- Sport-specific injuries in competitive youth
- Gender differences in sports injuries (male, female, and children of various age groups)
- Sports-related injuries in recreational activities

Study Quality

The quality of the included studies was assessed using

the Modified Downs and Black Checklist, widely used to evaluate methodological rigor in both randomized and non-randomized studies. The PRISMA guidelines were followed throughout the design and reporting of this systematic review.

Each study that met the inclusion criteria was independently scored using the checklist. A minimum score of 15 (fair quality) on the Modified Downs and Black scale was required for inclusion in the final analysis. All selected articles met or exceeded this threshold. The mean score of the included studies was 15, supporting the overall quality and reliability of the literature used to synthesize the findings of this review (Table 2).

Data Extraction

Following a thorough review and analysis of each research publication, the relevant data were systematically and logically extracted. The predefined criteria aligned with the study's objectives were applied, and any article that did not meet these criteria was excluded.

Surveys and observational studies on soft-tissue injuries in racquet sports were prioritized, as they provided essential information to address the research questions. Some retrieved articles focused on interventions, surgical procedures, or kinematic and kinetic alterations during play; however, only those meeting the inclusion criteria were included in the analysis. The selected articles contributed directly to assessing the prevalence and characteristics of soft tissue injuries, thereby supporting the overall outcomes of this systematic review.

Results

A total of 90 articles were identified and reviewed. Of these, 11 articles met the eligibility criteria and were included in the systematic review, while 79 were excluded (Figure 1). All included studies were assessed for methodological quality using the Modified Downs and Black checklist.

Across the selected studies, the severity of soft tissue injuries was examined. The findings showed that acute injuries were more common than chronic injuries, with mild injuries most frequently reported and severe injuries relatively rare.

Regarding anatomical distribution, the ankle joint in the lower limb and the elbow joint in the upper limb had the highest prevalence of soft-tissue injuries among racquet-sport athletes. Most injuries were classified as mild, and athletes generally returned to play following treatment, indicating minimal long-term impact on sports performance.

Graphs and tables were constructed to present the expected outcome measures, including the prevalence of soft tissue injuries in both upper and lower limbs, as well as the quality assessment scores from the Modified Downs and Black checklist. These data contributed to the overall synthesis and interpretation of findings in this systematic review.

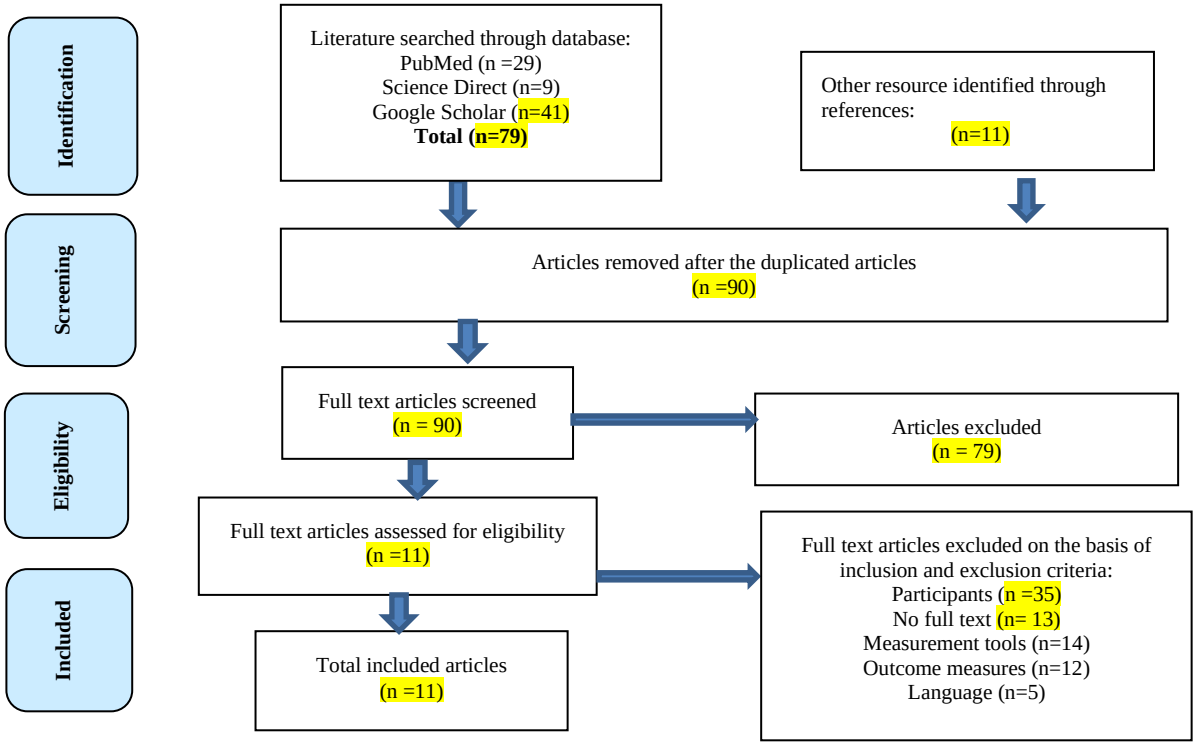

Figure 1: Process of Screening the Articles

Table 1: Summary of Included Studies

Author & Year of Publication	Title	Methods	Results
Alrabaa, et al., 2020[13]	Rotator Cuff Injuries in Tennis Players	Comparison of the types of shoulder injury according to	The most common type of shoulder injury was muscular and ligamentous.

Author & Year of Publication	Title	Methods	Results
		the mechanism of injury	
Guilas et al, 2006[14]	Incidence of chronic lower extremity musculoskeletal injury among badminton players participating in UAAP	Both men and women were included, with a sample size of 114 and a pattern of injury.	Concluded that Ligamentous injuries are common involving the ankle and foot
Shaji John Kachanathu et al., 2014[15]	Relevance and the Incidence of Musculoskeletal Injuries in Indian Tennis Players: an Epidemiological Study	Criteria such as different skill levels, warm-up duration, gender, age group, and tennis experience. A particular age criterion (15 to 50 years)	A common type of injury is an overuse injury that affects both the upper and lower limbs.
Ana Marchena-Rodrigueza et al., 2020[16]	Determine the Incidence of injuries among amateur badminton Players.	Differences in the incidence of injury according to the players' sex and age between 15 to 45 years	Muscular injuries occur most often in the knee, ankle, shoulder, and elbow.
Ang Lin Kang et al, 2018[17]	Risk factors of the lower extremity injuries in young badminton players	group approach and cluster-based study based on age, taking the criteria of age 15 to 30 years	Injuries among badminton players involved the ankle and knee joints of the lower limb.
Vindya Vimani Senadheera et al, 2019[18]	Epidemiological Review of Badminton-Related Injuries Among Competitive Badminton Players	A questionnaire on badminton injuries was used to analyze injury incidence.	Mild injuries were common, and the lower limbs were more affected.
Dhiraj Jhamb et al, 2022 [19]	Injuries In Indian Squash Players: A Retrospective Epidemiological Survey Among Club-Level Players	collected information regarding demographics, distribution, and types of injuries and recovery times	Squash players from Indian clubs have suffered knee injuries more than any other injury.
Mimi Zimwalt et al, 2023 [20]	Prevention and management of common musculoskeletal injuries in adult female athletes	Only female athletes were included, and the focused was on knee injuries	Injury to the knee in general and the anterior cruciate ligament (ACL) in particular is more of an issue for adult female athletes
Aaron C. Llanes, M.S. et al 2023 [21]	Lower-Extremity Injuries Predominate in American High School Tennis Players	Variables of interest between male and female athletes were compared using the Pearson $\chi 2$ test or Fisher's exact test.	The ankles, knees, and wrists were the most commonly injured areas in this population.
Siska Christianingsih et al 2024 [22]	Common Sport Injury in Tennis Players: A Literature Review	This study was conducted through a search of electronic databases and international papers published from 2019 to 2024 on topics related to sports injuries and tennis players.	Most tennis injuries are caused by overuse, while others result from traumatic injuries or acute events. Overuse injuries are most common in the shoulder, wrist, and elbow.
Mahesh Shrestha et al 2025 [23]	Overview of Injuries with Racket Sports in Pediatric and Adolescent Population: A Narrative Review	Using the PubMed database, researchers searched for studies published in the past 10 years that addressed injuries from racket sports in children and adolescents, as well as adult studies that included pediatric and adolescent populations.	The most common injuries reported in the studies were lower extremity injuries, specifically knee and ankle injuries. Upper extremity injuries were the next most common, specifically shoulder injuries.

Table 2: Quality of Studies Based on Downs & Black Checklist (27-point scale)

Item No. ⇩	[15]	[16]	[17]	[18]	[19]	[20]	[21]	[22]	[23]	[24]	[25]
1	1	1	1	1	1	0	1	1	1	1	1
2	0	1	0	0	1	1	1	0	1	1	0
3	1	1	1	1	1	1	0	0	0	0	0
4	0	1	1	0	0	1	1	1	1	1	1
5	1	0	1	0	0	0	0	1	1	1	0
6	0	0	0	1	1	1	1	0	0	0	0
7	1	0	1	1	0	0	0	1	1	1	1
8	1	1	0	0	1	0	1	1	0	0	0
9	1	1	1	1	0	0	1	0	1	0	1

Item No. ⇩	[15]	[16]	[17]	[18]	[19]	[20]	[21]	[22]	[23]	[24]	[25]
10	1	1	1	0	1	1	1	1	1	1	0
11	1	0	1	1	1	0	0	0	0	0	0
12	1	1	1	0	0	1	1	1	0	0	0
13	0	0	1	1	1	1	0	0	0	0	0
14	1	0	0	0	1	1	1	0	1	0	1
15	0	1	1	1	1	0	0	1	0	0	0
16	0	0	1	1	1	1	1	0	1	1	1
17	0	1	1	1	0	0	1	1	1	0	1
18	1	0	0	1	1	1	1	0	1	1	0
19	1	0	1	0	0	0	0	1	1	1	1
20	1	1	0	0	1	1	0	1	0	0	0
21	0	0	1	1	1	0	0	1	1	1	1
22	1	0	0	1	0	1	1	1	0	0	0
23	1	1	1	1	1	0	0	0	1	1	1
24	1	1	0	0	0	1	1	1	0	1	0
25	1	1	1	1	0	0	0	1	1	0	1
26	1	1	0	0	1	1	1	1	0	0	1

Table 3: Grades of Injury

Grades of Injury	Percentage (%)
Mild	70%
Moderate	20%
Severe	10%

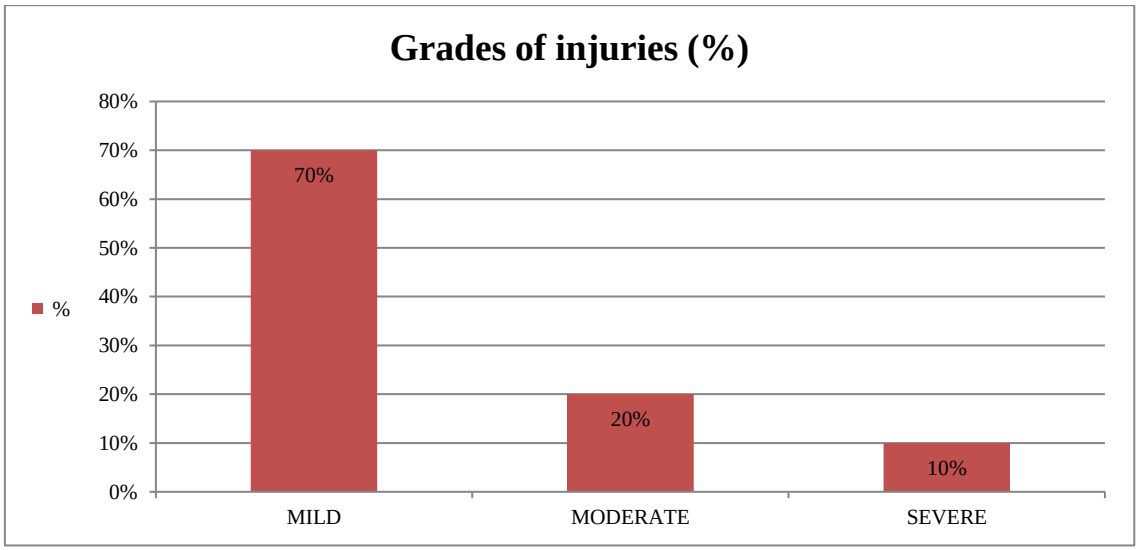

Chart 1: It Depicts that Most of the Types of Injuries in Racquet Sports are Mild Injury in a Total of 70% Mild Injuries and 20% Moderate 10% Severe Injuries

Table 4: Incidence of Injury in Different Parts of the Upper Limb

Incidence	Upper Limb	Percentage (%)
High	Elbow	70%
Moderate	Shoulder	20%
Less	Wrist	8%
Few	Finger	2%

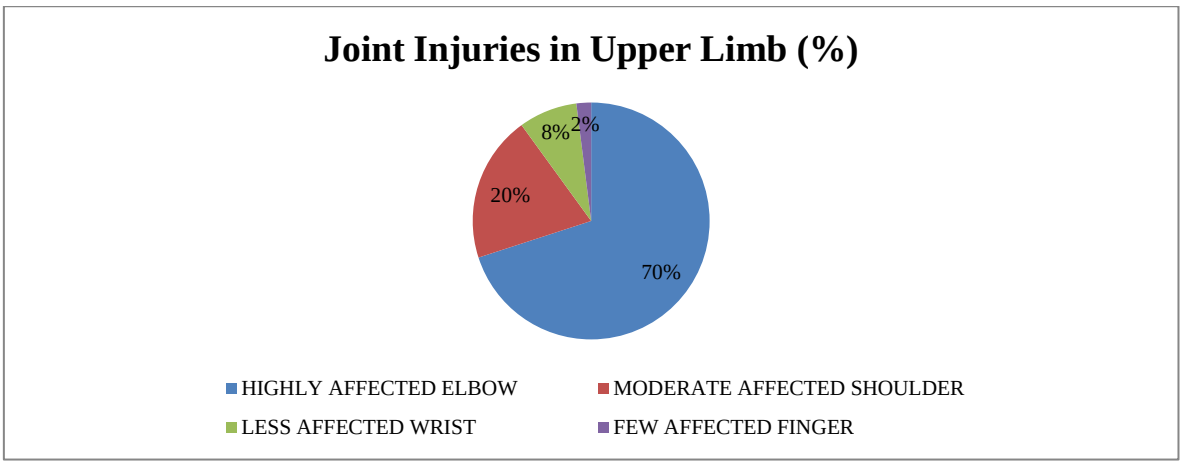

Chart 2: Incidence of Injury in Different Parts of the Upper Limb

Table 5: Incidence of Injury in Different Parts of the Lower Limb

Incidence	Upper Limb	Percentage (%)
High	Ankle	60%
Moderate	Hip	30%
Less	Knee	10%

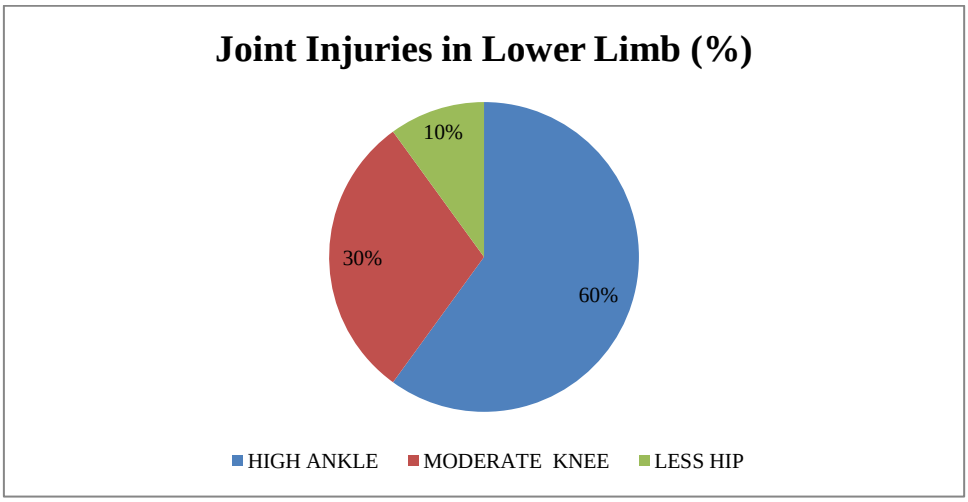

Chart 3: Incidence of Injury in Different Parts of the Lower Limb

Table 6: Scoring of the Modified Downs and Black Scale

Studies (%)	Score
28%	15
22%	12
10%	11
6%	10
2%	9

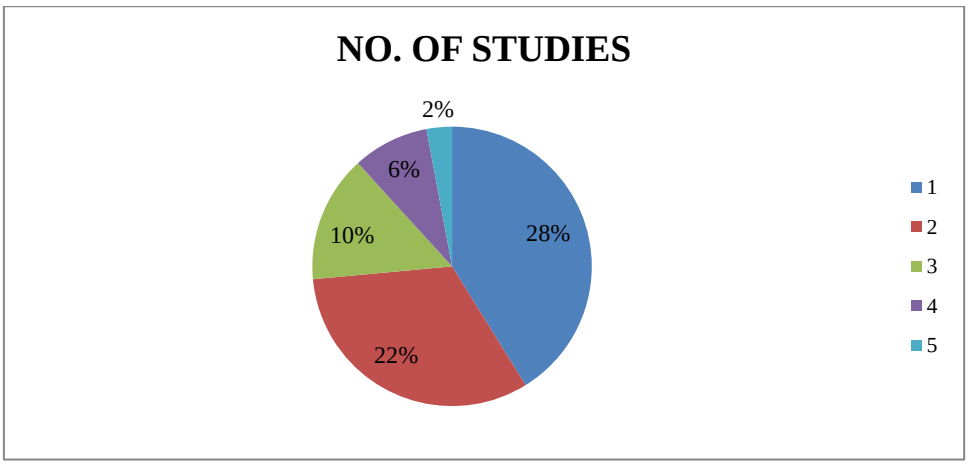

Chart 4: Studies that Depict the High Score According to the Criteria

Discussion

The purpose of this systematic review was to determine the prevalence of soft tissue injuries in the upper and lower limbs among professional racquet sports players. The findings indicate that acute injuries are more common than chronic injuries. Regarding tissue type, soft-tissue injuries were the most common, followed by fractures. Among the joints affected, the ankle in the lower limb and the elbow in the upper limb had the highest injury prevalence.

Based on the extracted data, 70% of injuries were classified as mild, 20% as moderate, and 10% as severe, with these distributions observed predominantly at the elbow and ankle joints in the upper and lower limbs, respectively (see Table 3 and Chart 1). Furthermore, in the upper limb, the prevalence of soft tissue injuries was 70% at the elbow, 20% at the shoulder, 8% at the wrist, and 2% at the fingers (see Table 4 and Chart 2). In the lower limb, soft-tissue injuries were most commonly reported at the ankle (60%), followed by the knee (30%) and the hip (10%) (see Table 5 and Chart 3).

The methodological quality of the included studies was assessed using the Modified Downs and Black checklist. The mean quality score was 15 (fair), with 28% of the studies rated as high quality, 22% as moderate, and 2% as low (see Table 6 and Chart 4). These quality scores support the reliability of the findings while highlighting the need for higher-quality research in this field.

This systematic review followed PRISMA guidelines and was conducted using an electronic search across several databases, including ScienceDirect, PubMed, and Google Scholar. After applying predefined selection criteria, articles published between 2000 and 2025 were screened. A total of 90 full-text publications were initially identified, of which only 11 met the eligibility criteria and were included in the final review.

This review extracted secondary data from the included studies to evaluate the prevalence and characteristics of injuries occurring in racquet sports. The findings indicate that most reported injuries were mild and primarily involved the joints of both upper and lower limbs. Elbow injuries were the most commonly reported in the upper limb, while ankle injuries were the most prevalent in the lower limb. These trends highlight the need for targeted preventive strategies for athletes participating in racquet sports.

Elbow injuries appear to be highly prevalent due to repetitive motions inherent in racquet sports. Contributing factors include abnormal biomechanics, inadequate warm-up, and lack of protective equipment [24]. Another study examining common lower limb injuries reported that ankle sprains were the most frequent injury type, with most cases classified as mild. Overuse injuries were relatively uncommon and affected only a small proportion of players [25].

Previous studies have indicated that injury incidence in racquet sports varies among players, with the majority classified as mild, followed by moderate, and only a small proportion as severe [26]. Some studies reported that the most commonly affected joints in the upper limb were the elbow, followed by the wrist and shoulder, and that injury mechanisms differed among players [27]. These findings highlight the importance of developing structured frameworks and preventive protocols to reduce injury risk among athletes.

Similarly, studies examining lower limb injuries consistently identified the ankle joint as the most frequently affected, with most injuries classified as mild [28]. Although multiple studies have addressed soft tissue injuries in sports, there remains a lack of systematic evidence on the prevalence of upper- and lower-limb soft tissue injuries among elite racquet-sport players. This review provides important insights that may guide researchers, coaches, and clinicians in developing preventive measures for both professional and recreational players before participation in competitive activities.

Conclusion

This systematic review demonstrates a high incidence of soft tissue injuries in racquet sports, with the ankle joint being the most commonly affected in the lower limb and the elbow joint in the upper limb. The findings indicate that mild injuries are highly prevalent, whereas severe injuries are relatively uncommon. Specifically, mild injuries accounted for approximately 70%, and severe injuries for about 10%, at both the elbow and ankle joints. These results highlight the need for targeted preventive strategies for both professional and recreational racquet sport players to reduce injury risk and promote safe participation.

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Conflict of Interest Statement: None declared.

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