

Injury Prevalence and Biomechanical Risk Patterns Kabaddi Players: A Positional Analysis

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Abstract. Kabaddi is a physically demanding contact sport that exposes youth athletes to high biomechanical stress, often resulting in injury. While positional roles in Kabaddi differ in movement patterns and physical demands, their association with injury prevalence among adolescent players remains underexplored. Objectives: This study aimed to investigate the prevalence and distribution of musculoskeletal injuries among youth Kabaddi players in Indonesia and to examine whether playing position, age, and experience contribute to injury risk. Methods: A cross-sectional survey was conducted involving 161 youth Kabaddi players aged 11–18 years across five regions. Injury data from the past 12 months and past 7 days were collected using a modified Oslo Sports Trauma Research Centre (OSTRC) questionnaire. Descriptive statistics and one-way ANOVA were performed to analyse differences in injury patterns based on player demographics and positions (All-rounder, Defender, Raider). Results: The most commonly injured regions were the shoulders, neck, and back, with no statistically significant differences in injury prevalence across playing positions ($p > 0.05$). However, older athletes (15–18 years) showed a significantly higher number of injuries compared to younger players ($p < 0.05$). Raiders reported the highest mean playing experience, while all-rounders were the oldest group. Despite biomechanical differences between roles, injury patterns appeared to be uniformly distributed. Conclusions: Injury prevalence among youth Kabaddi players is high and not confined to specific playing positions. This indicates that sport-wide preventive strategies, emphasizing core stability, neuromuscular control, and fatigue management, may be more effective than role-specific interventions. Findings reinforce the importance of biomechanical screening and integrated injury surveillance in youth Kabaddi development programs.

Keywords: kabaddi; injury prevalence; biomechanical risk; positional analysis



INTRODUCTION

Kabaddi is a high-intensity team sport that demands agility, rapid reaction time, and intense physical contact—often performed within a confined space and under strict time constraints (Gautam, 2023a; Gouda, 2024; Isnandar et al., 2025). Its popularity continues to grow, not only as a competitive sport but also as a cultural tradition in various Asian countries, including India, Iran, Bangladesh, and, more recently, Indonesia (Utama, 2022). Despite its seemingly simple structure, Kabaddi combines functional movements such as short sprints, dynamic jumps, defensive manoeuvres, and offensive engagements, making it biomechanically complex (Hardiansyah et al., 2024).

Kabaddi players routinely perform explosive actions like lunges, dives, and chain tackles, which demand intricate neuromuscular coordination across the upper and lower extremities and the core musculature (Gautam, 2023b; Kumar, 2017). The highest mechanical loads typically occur during acceleration phases, direct physical contact, and defensive stances under time pressure. However, while the sport presents compelling biomechanical challenges, research focusing specifically on Kabaddi from this perspective remains scarce (Hendrawan et al, 2024).

Alongside its unique demands, Kabaddi carries a high risk of musculoskeletal injury (Mondal, 2017; Park & Kim, 2020). Previous studies have identified the knee, ankle, lower back, and shoulder as the most frequently affected areas, particularly during intense competition or training sessions (Dhillon et al., 2016). A synthesis of relevant studies (see Table 1) shows injury prevalence ranging from 65.3% to 72.1% among Kabaddi athletes, with defenders being among the most injury-prone positions, especially during high-intensity gameplay (Hendrawan et al., 2024b).

Table 1. Summary of Injury Prevalence in Kabaddi

Study	Subjects	Common Injuries	Prevalence (%)	Notes
(Dhillon et al., 2016)	86 national players	Knee, ankle, lower back	72.1%	Primarily during competition
(Hendrawan et al., 2024b)	60 elite players	Ankle sprain, ACL, shoulder	65.3%	Fatigue identified as key factor
(K & N, 2024)	40 local league players	Knee, neck, lower back	68.9%	Higher risk observed in defenders

Injuries in Kabaddi result from multiple contributing factors. These can be grouped into intrinsic risk factors, which relate to the athlete’s physical condition (e.g., muscle imbalance, low flexibility, movement asymmetry, and fatigue), and extrinsic factors, which include environmental and contextual influences such as playing surface, training frequency, and the use of protective gear (Pizzari et al., 2020).

Table 2. Classification of Intrinsic and Extrinsic Injury Risk Factors in Kabaddi

Category	Risk Factor	Description	Source
Intrinsic	Muscle imbalance	Increases likelihood of ACL strain	Singh & Yadav (2021)
	Movement asymmetry	Uneven load during pivoting or landing	Sinha & Sinha (2020)
	Low flexibility	Leads to strain during explosive or rotational movement	Sharma & Rajkumar (2016)
	Fatigue	Affects neuromuscular control and movement precision	Ahmed & Raza (2019)
Extrinsic	Hard/uneven surfaces	Leads to ankle/knee injuries during landing	Ahmed & Raza (2019)
	Absence of protective gear	Greater injury risk from direct impact	Sinha & Sinha (2020)
	High training frequency	Associated with increased overuse injuries	Singh & Yadav (2021)

While these factors are increasingly recognized, current literature remains largely descriptive and lacks integration with biomechanical analysis. Most studies stop short of examining the movement patterns, joint loading, or muscle activation strategies that contribute to injury. As shown in Table 3, this leaves a significant gap in understanding how these factors interact within the specific demands of Kabaddi.

Table 3. Research Gap Analysis

Aspect	Current Knowledge	Research Gap	Contribution of This Study
Injury Types	Common sites and prevalence have been described	Biomechanical mechanisms are poorly understood	Provides movement-based biomechanical explanations
Risk Factors	Grouped into intrinsic and extrinsic categories	Not linked to Kabaddi-specific movement demands	Connects risk factors to biomechanics of Kabaddi actions
Prevention Strategy	General advice: strength, technique, equipment	Lacks sport-specific, data-driven recommendations	Offers targeted interventions based on biomechanical risk profiles

In this context, adopting a biomechanical approach is essential. By analysing movement patterns, load distribution, and neuromuscular control during key Kabaddi movements, researchers can more accurately identify injury mechanisms and develop targeted preventive strategies (Ghelich et al, 2025). Such an approach has been widely used in sports like soccer and basketball, but has not yet been applied systematically to Kabaddi—especially in youth populations from developing countries (Ahmed & Raza, 2019).

Therefore, this study aims to fill these gaps by exploring the intrinsic and extrinsic risk factors associated with Kabaddi injuries, using a biomechanical lens to enhance both understanding and practical injury prevention efforts. The findings are intended to inform athlete training, coaching strategies, and safety policy development tailored specifically to the demands of Kabaddi.

METHOD

This study employed a quantitative descriptive approach with inferential analysis to evaluate the prevalence and identify risk factors associated with injuries among adolescent Kabaddi players. Data were collected using an online questionnaire developed through Google Forms, adapted from the *Oslo Sports Trauma Research Centre (OSTRC) Injury Questionnaire* and self-reported injury history survey frameworks. This approach allowed for structured documentation of musculoskeletal injuries from the athlete's perspective and was tailored to the school-level sports context.

The study involved 161 active Kabaddi athletes from secondary schools in the Bali region who were engaged in regular training and competitive play. Participants ranged in age from 11 to 18 years and included both male and female athletes. All three primary Kabaddi playing roles—*raider*, *defender*, and *all-rounder*—were represented, with playing experience ranging from 1 to 9 years.

The questionnaire was structured into three main sections: (1) demographic and basic anthropometric data, including age, gender, playing position, and duration of experience in Kabaddi; (2) injury history, covering injuries sustained in specific body regions (neck, shoulders, upper back, lower back, knees, and ankles) within the past 12 months and/or the past 7 days; and (3) the consequences of injury, including missed training, medical or physiotherapy consultations, and the use of assistive devices. The content validity of the instrument was reviewed by two experts: one sports physiotherapist

and one nationally certified Kabaddi coach, ensuring its suitability and relevance for youth Kabaddi players.

Data collection was carried out in May 2025 through distribution of the questionnaire link via school Kabaddi coaches and athlete networks in Bali. Informed consent was obtained from all participants prior to participation. All data were collected anonymously to preserve confidentiality and data integrity. Data analysis was conducted in two phases. The first phase involved descriptive analysis, including the frequency and percentage of injuries by body region, the distribution of demographic variables (age, gender, playing position, and experience), and total injury counts per athlete. The second phase applied inferential statistical analysis to explore differences in injury prevalence based on age groups and playing positions using one-way ANOVA, and to examine gender differences using independent-sample t-tests. All statistical analyses were performed using *Python* with the *SciPy* library, with significance level set at $\alpha = 0.05$.

RESULT AND DISCUSSION

This table summarizes the demographic profiles of youth Kabaddi players categorized by their playing positions: all-rounders ($n = 72$), defenders ($n = 52$), and raiders ($n = 37$). The all-rounder group had the highest average age (16.08 ± 1.23 years), while raiders reported the longest mean playing experience (2.35 ± 1.55 years). Defenders followed closely with an average of 2.12 ± 1.19 years. The total sample ($N = 161$) showed an overall mean age of 15.68 ± 1.60 years and an average playing experience of 2.09 ± 1.44 years.

Table 4. Descriptive Statistics of Kabaddi Players by Position, Including Sample Size, Average Age, and Playing Experience (in Years)

Position	Sample size(n)	Average Age (yr)	Playing Experience (yr)
all-rounder	72	16.08 ± 1.23	1.94 ± 1.54
defender	52	15.29 ± 1.88	2.12 ± 1.19
raider	37	15.46 ± 1.64	2.35 ± 1.55
total	161	15.68 ± 1.59	2.09 ± 1.44

The descriptive analysis revealed notable differences across player positions. All-rounders were, on average, the oldest group ($M = 16.08$, $SD = 1.23$), followed by raiders ($M = 15.46$, $SD = 1.64$) and defenders ($M = 15.29$, $SD = 1.88$). Regarding playing experience, raiders exhibited the highest mean duration ($M = 2.35$, $SD = 1.55$ years), indicating early specialization and possible exposure to higher training intensity, while

defenders had a slightly lower average ($M = 2.12$, $SD = 1.19$) and all-rounders the shortest experience span ($M = 1.94$, $SD = 1.54$).

Statistical analysis using one-way ANOVA revealed significant differences in both age and playing experience across player positions. Specifically, the average age differed significantly among All-rounders, Defenders, and Raiders ($p = 0.021$), indicating positional variation in player age. Likewise, years of Kabaddi experience also varied significantly by position ($p = 0.006$), suggesting that positional roles are associated with differing levels of experience.

Tabel 5. ANOVA Test for Age and Experience

ANOVA Test	F-Statistic	p-Value
Age	3.95	0.021
Playing Experience	5.23	0.006

Table 6. Injury Prevalence (%) by Body Part, Playing Position, and Time Period 12 Month

	All-rounder	Defender	Raider	p-value
Neck	3.91	2.56	5.03	0.16
Right-Shoulder	5.23	6.91	2.72	0.75
Left-Shoulder	3.91	4.98	5.61	0.30
Upper Back	5.23	5.94	5.61	0.58
Lower Back	5.89	3.53	5.61	0.15
Knee	2.25	3.04	2.72	0.71
Ankle	3.58	3.04	2.72	0.76

This study found a relatively high prevalence of injuries among youth Kabaddi athletes, particularly in the shoulders (both right and left), upper and lower back, and neck. These findings are partially aligned with existing biomechanical literature, although they differ slightly from previous reports, such as Kumar & Anbazhagan (2021), who emphasized knee and ankle injuries as the most prevalent. The observed discrepancy could stem from differences in sample age, level of competition, or data collection methods.

Injury prevalence analysis over the past 12 months revealed relatively consistent patterns across playing positions, with no statistically significant differences for any body part (all $p > 0.05$). Although defenders are traditionally associated with higher impact and

collision frequency, the absence of inter-positional significance suggests that injury mechanisms in Kabaddi may be governed more by shared biomechanical exposures than by specific roles.

The shoulder complex, especially the right shoulder (15.23%–16.91%), emerged as the most commonly injured site. This is consistent with dominant arm use during raiding maneuvers and physical engagements. Neck and lower back injuries were also notable and likely attributed to the crouched postures, rotational stress, and dynamic head movements during gameplay. These patterns support the biomechanical explanation presented by Ekhtator et al., (2024) and Menzer et al., (2015) who stated that sports involving rapid movement transitions and collisions impose significant strain on the spine and upper torso.

While positional roles such as raiders and all-rounders reported numerically higher injury rates, these differences did not reach statistical significance. Nevertheless, their complex movement demands and explosive maneuvers may contribute to greater cumulative fatigue and impaired motor coordination, increasing injury risk—especially when technique or conditioning is inadequate (Behan et al, 2018; Nasrabadi & Sadeghi, 2021; Zhao, 2025).

Furthermore, age was found to be a significant predictor of injury frequency, with older athletes (15–18 years) experiencing more injuries. This may be explained by increased training loads and competitive intensity with age, leading to higher biomechanical stress accumulation. Physiological changes in adolescence, including hormonal fluctuations and musculoskeletal growth, can also affect joint stability and neuromuscular control, especially in the absence of targeted strengthening programs (Faienza et al, 2023; Henriques-Neto et al, 2023).

These findings underscore the importance of comprehensive and universal injury prevention strategies. Given the absence of positional disparities in injury distribution, sport-wide approaches—rather than role-specific protocols—may be more effective. Preventive measures should include: training programs that focus on neuromuscular control, core stabilization, and deceleration mechanics; regular biomechanical screenings, such as functional movement assessments, and monitoring for neuromuscular fatigue, particularly during tournaments or high-intensity sessions.

This model illustrates the interaction between playing role, biomechanical stress, movement demands, and injury risk. While playing position may influence movement exposure, common biomechanical loads, such as jumping, crouching, and physical collisions, affect all players similarly—explaining the uniform injury distribution across roles.

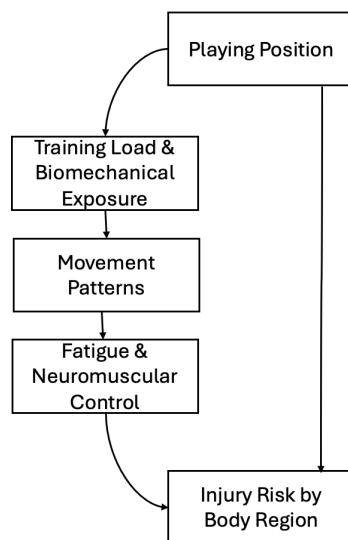


Figure 1. Conceptual model linking playing position, biomechanical load, and injury outcomes.

CONCLUSION

In conclusion, although players' demographic and experience profiles vary significantly by position, the relatively uniform injury prevalence across roles highlights the need for integrated conditioning and preventive frameworks. Such strategies should target shared biomechanical vulnerabilities inherent in the sport, ultimately promoting athlete longevity and performance sustainability.

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