

Original articles

Pattern of injuries and associated factors among boxers: A cross-sectional study during a National Boxing Tournament in Sri LankaWijesinghe W.U.K.D.¹, Vajira Dharmawardene²¹District General Hospital Gampaha, Sri Lanka²Faculty of Medicine, Sabaragamuwa University of Sri Lanka*Corresponding author: kavin80@yahoo.com**Abstract**

Background: Boxing exposes athletes to acute injuries, particularly to the head/face and upper extremities. Local epidemiological data are required to guide prevention and ringside medical care in Sri Lanka.

Objective: To describe tournament-related injury patterns and examine associated factors among national-level boxers in Sri Lanka.

Methods: A descriptive cross-sectional study was conducted among 150 eligible boxers participating in a national boxing competition. Data were collected using a structured questionnaire based on the Australian Sports Injury Data Dictionary⁶, supported by face-to-face interviews and direct injury observation. Descriptive statistics and chi-square/Fisher's exact tests were used, with $p < 0.05$ considered statistically significant.

Results: Fifteen of 150 boxers sustained an injury during the tournament, giving a participant-level injury proportion of 10.0%. Lacerations were the predominant injury type (9/15, 60.0%), followed by sprains (3/15, 20.0%), strains (2/15, 13.3%) and one head injury (6.7%). Ten of 15 injuries (66.7%) involved the head/face; three involved the wrist/hand, one the index finger and one the neck. Eleven injuries (73.3%) resulted from a received punch, three (20.0%) from a delivered punch and one (6.7%) from collision with an opponent. Seven injuries were minor and eight moderate; no severe tournament injury was recorded. Nearly half of the boxers (69/150, 46.0%) reported a history of previous injury. 11 (15.9%) of them had suffered severe injuries requiring surgery or prolonged rest. A previous history of boxing injury was associated with current tournament injury (Pearson $\chi^2 = 5.013$, $p = 0.025$; Fisher's exact $p = 0.030$). Previous medical treatment and rehabilitation history were also associated with tournament injury, although these variables likely reflect the burden of previous injury rather than independent causal risk.

Conclusion: Nearly half of the boxers (69/150, 46.0%) reported a history of previous injury and one in ten participating boxers sustained an injury during the studied competition, with lacerations and head/face injuries predominating. The findings support structured injury surveillance, targeted facial and upper-limb prevention, systematic rehabilitation, and consistent ringside medical support. Larger prospective exposure-based studies are required.

Keywords: combat sports, boxing, injury surveillance, sports injury, injury prevention, Sri Lanka

Introduction

Boxing is a combat sport in which intentional blows are delivered within a regulated competitive environment. Although modern amateur boxing has undergone repeated changes in rules, scoring and protective equipment, injury remains an inherent occupational and sporting risk. The clinical importance of boxing injury extends beyond event interruption: trauma to the head and face can produce

laceration, concussion and, rarely, catastrophic neurological injury, while repeated upper-extremity loading exposes the hand and wrist to acute and cumulative injury. Medical establishment has long been having generally a negative stance towards this sport, mainly due to the risks it poses to the brain¹.

Contemporary epidemiological evidence confirms that boxing injuries remain clinically important. Mao et al. (2023), in a systematic review and meta-

analysis of 14 epidemiological studies, reported a pooled overall injury incidence of 223.9 per 1,000 boxers and found that professional boxing had higher injury rates than amateur and female boxing. Across included studies, soft-tissue contusion was the most frequent pathology, followed by skin laceration, sprain/muscle-ligament injury, concussion and fracture. These findings demonstrate that injury profiles vary with boxing format, exposure definition, and surveillance method². Though uncommon among amateur boxers, chronic traumatic brain injury is the most severe form of neurological sequelae described among professional boxers³.

Competition-specific surveillance is particularly useful because it identifies the anatomical sites, mechanisms, and immediate consequences of injuries under actual bout conditions. In an Indian elite women's national championship, Dande et al. (2023) reported 43.98 injuries per 1,000 athlete-bout exposures and identified the head, face, and neck as the most frequently injured regions, with bruises/contusions and cuts prominent⁴. Retrospective work among competitive Indian boxers similarly found a substantial burden of head/face soft-tissue injury⁵.

Despite international evidence, the proposal for the present study identified an absence of a Sri Lankan database describing boxing injury patterns at the national level. Such information is important for coaches, trainers, referees and ringside physicians because prevention and medical preparedness should be adapted to the injury profile of the population being served. The present study therefore aimed to assess the pattern of injuries and determine factors associated with injury among national boxers participating in a national boxing competition in Sri Lanka.

Materials and Methods

Study design, setting and population

A descriptive cross-sectional study was conducted during the 97th National Boxing Championship at Galle Face Green, Colombo, Sri Lanka. The study population comprised national-level boxers participating in the championship. Data collection was done from January 23rd to 26th, 2025. All eligible competitors were targeted because the championship population was approximately 150; the completed dataset contained 150 participants.

Eligibility and sampling

Registered national-level boxers participating in the championship and providing informed written consent were eligible. Boxers who did not complete the tournament and participants with pre-existing injuries not related to boxing were excluded. Purposive total-population sampling of the eligible tournament participants was used.

Instrument and data collection

Data were collected using a structured questionnaire based on the Australian Sports Injury Data Dictionary.⁶ It captured demographic and boxing characteristics, training and preventive practices, previous injury history, tournament injury type, anatomical location, mechanism, severity, protective equipment, immediate management, recovery, nutrition, hydration, injury-prevention education, medical check-ups and access to tournament medical support. The principal investigator collected data during and immediately after competition through face-to-face interviews and direct observation of injuries.

Statistical analysis

Data were analysed using IBM SPSS Statistics version 27. Categorical variables were summarized as frequencies and percentages. Associations between tournament injury occurrence and categorical variables were examined using Pearson chi-square tests; Fisher's exact results were considered where appropriate for sparse 2×2 tables. Statistical significance was set at $p < 0.05$. Because many multi-category cross-tabulations contained expected cell counts below five, those chi-square results were interpreted cautiously and were not treated as robust evidence of association.

Ethical considerations

Ethical approval was obtained from the Ethics Review Committee of the Postgraduate Institute of Medicine, University of Colombo (ERC/PGIM/2025/021). The approved protocol required voluntary informed written consent, confidentiality and anonymized data, the right to withdraw, and safeguards to prevent data collection from interfering with athlete safety or performance. Administrative approval was planned through the relevant postgraduate and boxing authorities.

Results

Participant characteristics

All 150 records contained valid data for the variables included in the SPSS frequency analysis. Participants ranged from 18 to 55 years; 124 (82.7%) were male and 26 (17.3%) were female. Most competitors were national-level boxers (145/150, 96.7%), with five classified at the international level. Right-handed/orthodox boxers comprised 91 (60.7%), left-handed boxers 42 (28.0%), and ambidextrous boxers 17 (11.3%).

The most frequently represented weight category was bantamweight 52- 54 kg (n = 20, 13%), followed by minimum weight 45- 48 kg (n = 18, 12%) and both lightweight 57- 60 kg and light welterweight comprised similar numbers (n = 15, 10%). Boxing experience ranged from 1 to 20 years, with 2 years being the most common duration of experience (n = 26, 17.3%), followed by 6 years (n = 20, 13.3%) and 7 and 8 years (n = 19 each, 12.7%). The largest affiliations were the Sri Lanka Armed Forces, with the Sri Lanka Navy (n = 43, 28.7%) leading, followed by Army (n = 37, 24.7%), Air Force (n =

29, 19.3%), and Sri Lanka Police (n = 18, 12.0%). Weekly training duration ranged from 6 to 45 hours, with 28 hours per week most frequently reported (n = 40, 26.7%), followed by 22 hours (n = 38, 25.3%) and 33 hours (n = 23, 15.3%).

Tournament injury occurrence and pattern

Fifteen participants sustained at least one injury during the tournament (10.0%), whereas 135 (90.0%) reported no tournament injury. All 15 recorded tournament injuries occurred during a match.

Injury mechanism, severity and management

Punches received from an opponent accounted for 11 of the 15 injuries (73.3%), making direct opponent impact the dominant recorded mechanism. Three injuries (20.0%) occurred while delivering a punch, and one (6.7%) followed collision with an opponent. Seven injuries (46.7%) were classified as minor, and eight (53.3%) as moderate; no severe injury was recorded (Table 1). Immediate management included the ice method, rest, and medical attention, with suturing in one case.

Table 1. Pattern of injuries sustained during the tournament.

Characteristic	Category	n	% among injured (n=15)
Injury type	Laceration	9	60.0
	Sprain	3	20.0
	Strain	2	13.3
	Head injury	1	6.7
Location	Head/face (combined)	10	66.7
	Wrist/hand	3	20.0
	Index finger trauma	1	6.7
	Neck	1	6.7
Cause	Punch received	11	73.3
	Punch delivered	3	20.0
	Collision with opponent	1	6.7
Severity	Minor	7	46.7
	Moderate	8	53.3
	Severe	0	0.0

Previous injury and associated factors

Sixty-nine participants (46.0%) reported a previous injury and 81 (54.0%) did not. 11 (15.9%) of them had suffered severe injuries requiring surgery or prolonged rest. Nearly half of the boxers (69/150,

46.0%) reported a history of previous injury. Among those with a previous injury, 11/69 (15.9%) sustained a tournament injury. This association was statistically significant (Pearson $\chi^2=5.013$, df=1, p=0.025; Fisher's exact two-sided p=0.030) (Table 2).

Table 2. Selected associations with tournament injury.

Factor	Injured n/N (%)	Test	p value	Interpretation
Previous injury: yes vs no	11/69 (15.9) vs 4/81 (4.9)	Pearson $\chi^2=5.013$	0.025	Significant
Gender: male vs female	14/124 (11.3) vs 1/26 (3.8)	Fisher exact	0.470	Not significant
Handedness	15/150	Pearson $\chi^2=2.933$	0.231	Not significant
Boxing experience	15/150	Pearson $\chi^2=16.692$	0.406	Not significant
Experience level	15/150	Fisher exact	1.000	Not significant
Sparring frequency	15/150	Pearson $\chi^2=1.852$	0.869	Not significant
Protective gear during training	15/150	Pearson $\chi^2=4.297$	0.117	Not significant
Cool-down routine	15/150	Fisher exact	1.000	Not significant
Sleep duration	15/150	Pearson $\chi^2=4.209$	0.648	Not significant
Hydration	15/150	Fisher exact	1.000	Not significant
Injury-prevention education	15/150	Fisher exact	0.776	Not significant
Regular medical check-ups	15/150	Fisher exact	1.000	Not significant

Previous medical treatment was associated with current tournament injury (11/53 among those reporting treatment versus 4/97 among those not reporting treatment; Pearson $\chi^2=10.533$, $p=0.001$; Fisher's exact $p=0.003$). Previous rehabilitation was also associated with tournament injury (9/35 vs 6/115; Pearson $\chi^2=12.526$, $p<0.001$; Fisher's exact $p=0.001$). These findings should not be interpreted as evidence that treatment or rehabilitation increases injury risk; both are likely markers of prior injury severity/exposure and therefore are susceptible to confounding and reverse interpretation.

Discussion

The principal finding was that 10.0% of the 150 national-level boxers sustained an injury during the observed tournament. The injury pattern was concentrated in lacerations and trauma to the head/face, and nearly three-quarters of injuries were attributed to a punch received. Although the study was not designed to calculate exposure-based incidence per bout or per competition-hour, the participant-level proportion provides the first local tournament-specific estimate in a Sri Lankan sample.

The predominance of head/face injury is consistent with international boxing surveillance. Dande et al. (2023) identified the head, face, and neck as the most frequently injured region during an elite women's

national championship in India⁴. The present Sri Lankan dataset similarly recorded 10 of 15 injuries in the head/face region when the specific head/face subcategories were combined. This anatomical concentration is expected in a sport where scoring and tactical success commonly involve striking the opponent's head. Still, it has practical implications for ringside inspection, wound care, neurological assessment and long-term sequelae.

Lacerations accounted for 60.0% of tournament injuries. This proportion is higher than the pooled 21.4% frequency for laceration/abrasion/skin lesions reported by Mao et al. (2023)², although direct comparison is limited by differences in injury definitions, boxing populations and denominators. The same meta-analysis identified soft-tissue contusion as the most common pooled pathology, whereas the current SPSS dataset did not identify contusion as a tournament-injury category. Adkitte et al. (2016), in a retrospective study of competitive boxers, also described substantial contusion and head/face injury burdens⁵. Together, these comparisons suggest that superficial facial trauma remains a recurring feature of boxing even when the relative proportions differ across settings.

The observed mechanism reinforces the importance of opponent-delivered impacts: 11 of 15 injuries

followed a received punch. Three occurred in association with a delivered punch, illustrating that the striking hand and wrist also remain vulnerable. The recorded wrist/hand and index-finger injuries are clinically coherent with the repetitive high-force loading imposed during punching. Prevention therefore cannot focus exclusively on the head; hand wrapping, glove condition, punching mechanics, conditioning, and prompt assessment of hand/wrist symptoms are also relevant.

A previous history of injury was significantly associated with tournament injury. This finding is epidemiologically plausible because previous injury may indicate persistent tissue vulnerability, incomplete rehabilitation, higher cumulative exposure, or an athlete profile characterised by greater competitive intensity or vulnerability. However, the cross-sectional design of this study does not establish causation. The associations between tournament injury and previous medical treatment or rehabilitation should be interpreted even more cautiously: treatment and rehabilitation are consequences or markers of previous injury and cannot reasonably be considered harmful exposures on the basis of these data.

Previous injuries most frequently involved the head and face, followed by the shoulder/upper arm, elbow/forearm, and wrist/hand regions. Of the 69 boxers reporting previous injuries, 53 (76.8%) had received medical treatment, whereas only 35 (50.7%) had undergone a formal rehabilitation programme.

During the current tournament, 15 (10.0%) boxers sustained a new injury. Of these, 10 occurred among boxers with a history of previous injury, while 5 occurred among those without a previous injury. Among the 10 boxers with previous injury who sustained a new injury during the tournament, 8 (80.0%) sustained minor injuries and 2 (20.0%) sustained moderate injuries. Overall, these findings demonstrate a substantial burden of previous injury among competitive boxers and highlight that a considerable proportion of previously injured athletes had not undergone formal rehabilitation. The occurrence of new injuries among previously injured boxers, predominantly minor in severity, further emphasizes the importance of appropriate rehabilitation and injury prevention strategies in competitive boxing.

Most measured training and preventive-practice variables were not significantly associated with tournament injury. However, this should not be interpreted as proof that protective gear, sparring practices, hydration, recovery, education, or medical surveillance are ineffective. Warm-up could not be tested because all 150 participants reported following a regular warm-up routine.

The absence of severe injuries is reassuring but should not reduce clinical vigilance. Boxing injury prevention must account for low-frequency, high-consequence outcomes, particularly neurological trauma. Nakamura et al. (2021) emphasized that active, scientifically informed prevention is necessary in boxing and reported that video-based quantitative analysis followed by training modification reduced the percentage of hits received within an intervention group⁷. Such approaches illustrate how technical coaching, medical surveillance, and performance analysis can be integrated rather than treated as separate domains.

Conclusion

Among 150 national-level boxers participating in the studied Sri Lankan tournament, 15 (10.0%) sustained an injury. Lacerations were the predominant injury type, and the head/face was the principal anatomical region affected. Most injuries resulted from punches received, and all occurred during matches. No severe tournament injury was recorded. Previous injury history was significantly associated with injury during the tournament, while most demographic, training, and preventive-practice variables showed no statistically demonstrable association with the injury in this dataset. The findings support systematic national boxing injury surveillance, strengthened ringside assessment and wound care, attention to head/face and hand/wrist prevention, and complete rehabilitation of previous injuries before competition.

Limitations

The study was conducted at a single national tournament and therefore may not represent injuries across an entire season, training periods, other competition levels, or all Sri Lankan boxers. The participant-level injury proportion cannot be directly compared with studies reporting injuries per 1,000 bouts or athlete-hours because bout-level exposure data were not supplied in the analysed output. Only 15 tournament injuries occurred, reducing power for

risk-factor analysis. The cross-sectional design also prevents causal inference, particularly for previous treatment and rehabilitation variables.

Recommendations and Future Research

A standardized prospective injury-surveillance system should be introduced across Sri Lankan national boxing competitions using internationally comparable injury definitions and exposure denominators. Future studies should record athlete-bouts and competition/training hours, distinguish new from recurrent injuries, and use clinically verified diagnoses. Multi-tournament or season-long cohorts would provide sufficient injury events for multivariable modelling. Prevention programs should prioritize facial laceration reduction, neurological screening, hand/wrist protection and technique, return-to-boxing criteria after injury, and systematic rehabilitation. Coach and athlete education should be linked with ringside medical protocols and periodic audit of injury patterns.

Declarations

Ethics approval and consent to participate

Ethical approval was obtained from the Ethics Review Committee of the Postgraduate Institute of Medicine, University of Colombo (ERC/PGIM/2025/021) and the study protocol required written informed consent.

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Not applicable

Conflict of interest

The authors declare that they have no competing interests.

Data availability

All data generated or analyzed during this study are included in this published article.

Author contributions

W.U.K.D. Wijesinghe was involved in data collection, analysis, statistical interpretation, and manuscript drafting. Vajira Dharmawadene contributed to the critical revision of the manuscript.

All authors reviewed and approved the final manuscript.

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