



Original Research Article

Comparison of Injury Severity and Weapon Type in Assault Cases Presenting for Medico-Legal Examination

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Abstract: Background: Assault-related injuries constitute a major medico-legal and public health concern worldwide. The severity and pattern of injuries sustained during assault incidents are influenced by various factors, particularly the type of weapon used. Understanding the association between weapon type and injury severity is important for forensic evaluation, trauma management, and legal investigations.

Objectives: To compare injury severity according to weapon type among assault cases presenting for medico-legal examination. **Study Design & Setting:** This cross-sectional analytical study was conducted at Medicolegal Section (MLS), Liaquat University Hospital (LUH), Hyderabad from January 2025 to July 2025. **Methodology:** A total of 166 assault victims aged 18 years and above who presented for medico-legal examination were enrolled through consecutive non-probability sampling. Demographic characteristics, weapon type, injury location, number of injuries, and injury severity were recorded using a structured proforma. Weapon types were categorized as blunt weapons, sharp weapons, firearms, and others. Injury severity was classified as minor, grievous, or life-threatening. Data were analyzed using SPSS version 26.0. Associations between categorical variables were assessed using the Chi-square test, with $p \leq 0.05$ considered statistically significant. **Results:** The mean age of participants was 33.7 ± 11.2 years, and 78.9% were male. Blunt weapons were the most commonly used weapons (49.4%), followed by sharp weapons (28.9%) and firearms (12.7%). Minor injuries were observed in 52.4% of cases, grievous injuries in 35.5%, and life-threatening injuries in 12.1%. A statistically significant association was found between weapon type and injury severity ($p < 0.001$). Firearm injuries demonstrated the highest proportion of life-threatening injuries (47.6%), whereas blunt weapons were predominantly associated with minor injuries (64.6%). Injury severity also showed a significant association with anatomical site of injury ($p = 0.002$). **Conclusion:** Weapon type was significantly associated with injury severity among assault victims. Firearm-related assaults resulted in more severe injuries, while blunt weapons were more frequently associated with minor trauma.

Keywords: Assault, Firearms, Injury Severity, Medico-Legal Examination, Sharp Weapons, Violence, Weapons.

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INTRODUCTION

Assault refers to the intentional infliction of physical harm by one individual upon another through the use of bodily force or weapons. Victims of assault frequently present to emergency departments and medico-legal centers for assessment, treatment, and legal documentation.^{1,2} Medico-legal examination serves a crucial role in objectively recording injury characteristics, determining the severity of trauma, and correlating wounds with the alleged mechanism of injury.³ Among the various factors influencing injury patterns, the type of weapon used during an assault is particularly important because it directly affects the extent of tissue damage and the resulting clinical outcomes.⁴

The etiology of assault is multifactorial and involves a complex interaction of individual, social, economic, and environmental factors. Young adult males are disproportionately affected due to increased exposure to high-risk social environments and aggressive behaviors. Poverty, unemployment, low educational attainment, substance abuse, domestic conflicts, gang-related activities, and inadequate conflict resolution mechanisms have all been identified as important contributors to violent encounters.⁵ Alcohol and illicit drug use are particularly significant risk factors, as they impair judgment and increase impulsive and aggressive behavior. Access to weapons further influences both the occurrence and severity of assault-related injuries. Firearms, knives, sharp-edged instruments, sticks, iron rods, and other blunt objects are commonly used in assaults, with each weapon type producing distinct injury patterns.⁶

The pathophysiological effects of assault injuries depend largely on the mechanism of force transfer and the nature of the weapon involved. Blunt force trauma results from impact with hard objects or bodily force and may produce abrasions, contusions, hematomas, fractures, and internal organ damage through compression and

crushing mechanisms.⁷ Sharp-force trauma, caused by knives, blades, or pointed instruments, produces incised wounds, stab wounds, and penetrating injuries that can disrupt blood vessels, nerves, and internal organs. Firearm injuries are associated with high-energy transfer, causing extensive tissue destruction, cavitation, hemorrhage, and multi-organ damage.⁸

Clinical manifestations of assault-related injuries vary considerably, ranging from minor superficial wounds to severe life-threatening trauma. Victims commonly present with pain, swelling, bruising, lacerations, bleeding, fractures, and neurological deficits. Injuries involving the head, neck, chest, and abdomen are of particular concern because of the potential involvement of vital structures.⁹ Severe assaults may result in hemorrhagic shock, traumatic brain injury, respiratory compromise, visceral organ damage, and permanent disability. In addition to physical consequences, assault victims often experience significant psychological distress, including anxiety, depression, fear, and post-traumatic stress disorder. These psychological effects may persist long after physical wounds have healed and can adversely affect social functioning and quality of life. The overall burden of assault therefore extends beyond immediate injury and encompasses long-term medical, psychological, social, and economic consequences.¹⁰

Previous studies have demonstrated a clear association between weapon type and the pattern as well as severity of injuries sustained during assaults. Firearm-related injuries are generally associated with higher rates of severe trauma and mortality, whereas sharp weapons commonly produce penetrating injuries with potentially serious consequences depending on the anatomical site involved.^{11,12} Blunt weapons may appear less lethal but can nevertheless cause substantial morbidity and fatal outcomes when significant force is applied or vital organs are affected. Despite these observations, variations in weapon availability, sociocultural factors, healthcare infrastructure, and injury classification

systems have resulted in differing findings across regions and populations. Consequently, continued evaluation of injury severity in relation to weapon type remains important for enhancing medico-legal assessments, improving trauma care planning, and strengthening evidence-based approaches to violence prevention and forensic practice.

MATERIAL AND METHODS

This cross-sectional analytical study was conducted at Medicolegal Section (MLS), Liaquat University Hospital (LUH), Hyderabad from January 2025 to July 2025. The sample size was calculated using the WHO sample size calculator by taking an anticipated proportion of severe injuries among assault victims of 11%, a confidence level of 95%, and an absolute precision of 5%. The calculated sample size was 151 patients, which was increased to 166 patients to account for incomplete records and improve study power.

A total of 166 assault victims presenting for medico-legal examination during the study period were enrolled through consecutive non-probability sampling. Patients of either gender aged 18 years and above who presented with a history of physical assault and underwent complete medico-legal examination were included in the study. Patients with self-inflicted injuries, accidental trauma, animal-related injuries, burn injuries, cases with incomplete medico-legal records, and patients who refused participation were excluded.

After obtaining informed consent, demographic information including age and gender was recorded on a structured proforma. Detailed information regarding the assault incident, including the alleged weapon type, was obtained from the patient and medico-legal records. Weapon types were categorized as blunt weapons, sharp weapons, firearms, and others. A comprehensive medico-legal examination was performed by the designated medico-legal officer, and all injuries were documented according to standard medico-legal protocols.

Injury severity was assessed based on medico-legal classification. Injuries were categorized as minor, grievous, or life-threatening according to the extent of tissue damage, involvement of vital organs, presence of fractures, permanent disability, or risk to life. The anatomical location and number of injuries were also recorded. Where required, radiological investigations and specialist consultations were reviewed to confirm the extent and severity of injuries.

All collected data were entered and analyzed using Statistical Package for Social Sciences (SPSS) version 26.0. Quantitative variables such as age were presented as mean $\pm$ standard deviation, whereas qualitative variables including gender, weapon type, injury location, and injury severity were presented as frequencies and percentages. The association between weapon type and injury severity was assessed using the Chi-square test. A p-value of ≤ 0.05 was considered statistically significant.

RESULTS

A total of 166 assault victims were included in the study. The mean age of the participants was 33.7 ± 11.2 years. The most common age group was 18–30 years comprising 78 (47.0%) patients, followed by 31–40 years with 42 (25.3%) patients. Males constituted the majority of the study population with 131 (78.9%) cases, while females accounted for 35 (21.1%) cases. Blunt weapons were the most frequently used weapons in assault incidents, reported in 82 (49.4%) cases, followed by sharp weapons in 48 (28.9%) cases, firearms in 21 (12.7%) cases, and other weapons in 15 (9.0%) cases. Regarding injury severity, minor injuries were observed in 87 (52.4%) patients, grievous injuries in 59 (35.5%) patients, and life-threatening injuries in 20 (12.1%) patients, as given in Table 1.

Life-Threatening	Grievous	59 (35.5)		
	Life-Threatening	20 (12.1)		
		Table 1: Baseline Characteristics of Assault Victims Undergoing Medico-Legal Examination (n = 166)		
		Variable	Type	n (%)
		Age Group (Years)	Mean $\pm$ SD	33.7 $\pm$ 11.2
			18–30	78 (47.0)
			31–40	42 (25.3)
			41–50	28 (16.9)
			>50	18 (10.8)
		Gender	Male	131 (78.9)
			Female	35 (21.1)

	Weapon Type	Blunt Weapon	82 (49.4)
		Sharp Weapon	48 (28.9)
		Firearm	21 (12.7)
		Other Weapons	15 (9.0)
	Injury Severity	Minor	87 (52.4)

Head and neck injuries were the most commonly affected anatomical site, observed in 57 (34.3%) patients, followed by upper limb injuries in 39 (23.5%) patients and lower limb injuries in 28 (16.9%) patients. Chest and abdominal injuries were reported in 17 (10.2%) and 12 (7.2%) patients, respectively, while multiple-site injuries were present in 13 (7.9%) patients. Regarding the number of injuries sustained, single injuries were the most frequent, occurring in 61 (36.7%) patients, followed by two injuries in 52 (31.3%) patients, three injuries in 31 (18.7%) patients, and four or more injuries in 22 (13.3%) patients, as given in Table 2.

Table 2: Anatomical Distribution and Number of Injuries Among Assault Victims (n = 166)

Variable	Type	n (%)
Site of Injury	Head and Neck	57 (34.3)
	Upper Limb	39 (23.5)
	Lower Limb	28 (16.9)
	Chest	17 (10.2)
	Abdomen	12 (7.2)
	Multiple Sites	13 (7.9)
Number of Injuries	Single Injury	61 (36.7)
	Two Injuries	52 (31.3)
	Three Injuries	31 (18.7)
	Four or More Injuries	22 (13.3)

Among male victims, minor injuries were reported in 65 (49.6%) cases, grievous injuries in 48 (36.6%) cases, and life-threatening injuries in 18 (13.7%) cases. Among female victims, minor injuries were observed in 22 (62.9%) cases, grievous injuries in 11 (31.4%) cases, and life-threatening injuries in 2 (5.7%) cases. The association between gender and injury severity was not statistically significant ($p=0.321$). Regarding weapon type, blunt weapons were predominantly associated with minor injuries, accounting for 53 (64.6%) cases. Sharp weapons resulted in minor, grievous, and life-threatening injuries in 22 (45.8%), 20 (41.7%), and 6 (12.5%) cases, respectively. Firearms showed the highest proportion of life-threatening injuries, observed in 10 (47.6%) cases. A statistically significant association was found between weapon type and injury severity ($p<0.001$), as given in Table 3.

Table 3: Association of Injury Severity with Gender and Weapon Type Among Assault Victims (n = 166) presented as n (%)

	Variable	Minor	Grievous	Life-Threatening	Total	p-value
Gender	Male	65 (49.6)	48 (36.6)	18 (13.7)	131 (100)	0.321
	Female	22 (62.9)	11 (31.4)	2 (5.7)	35 (100)	
Weapon Type	Blunt Weapon	53 (64.6)	24 (29.3)	5 (6.1)	82 (100)	<0.001
	Sharp Weapon	22 (45.8)	20 (41.7)	6 (12.5)	48 (100)	
	Firearm	3 (14.3)	8 (38.1)	10 (47.6)	21 (100)	
	Other Weapons	9 (60.0)	5 (33.3)	1 (6.7)	15 (100)	

The distribution of injury severity varied according to the anatomical site of injury. Among patients with head and neck injuries, 22 (38.6%) had minor injuries, 25 (43.9%) had grievous injuries, and 10 (17.5%) had life-threatening injuries. Upper limb injuries were predominantly minor, accounting for 29 (74.4%) cases. Life-threatening injuries were most frequently observed in patients with abdominal injuries, where 4 (33.3%) cases fell into this category. A statistically significant association was observed between anatomical site of injury and injury severity ($p=0.002$), as given in Table 4.

Table 4: Association of Anatomical Site of Injury with Injury Severity Among Assault Victims (n = 166) presented

as n (%)					
Site of Injury	Minor	Grievous	Life-Threatening	Total	p-value
Head and Neck	22 (38.6)	25 (43.9)	10 (17.5)	57 (100)	0.002
Upper Limb	29 (74.4)	9 (23.1)	1 (2.5)	39 (100)	
Lower Limb	17 (60.7)	10 (35.7)	1 (3.6)	28 (100)	
Chest	6 (35.3)	7 (41.2)	4 (23.5)	17 (100)	
Abdomen	4 (33.3)	4 (33.3)	4 (33.3)	12 (100)	
Multiple Sites	9 (69.2)	4 (30.8)	0 (0.0)	13 (100)	

DISCUSSION

Assault-related injuries are a major cause of morbidity and mortality worldwide and represent a substantial burden on healthcare and medico-legal systems. The severity and pattern of injuries sustained during assaults are influenced by multiple factors, including the type of weapon used. Different weapons produce distinct injury mechanisms, ranging from superficial wounds to life-threatening trauma. Accurate assessment of injury severity is essential for clinical management, forensic evaluation, and legal proceedings. Understanding the relationship between weapon type and injury severity can improve medico-legal documentation and trauma care. Therefore, evaluation of assault cases remains important for both public health and forensic practice.

In the present study, males constituted 78.9% of assault victims. Similar findings were reported by Aggarwal et al. (2008), who observed that 92% of victims with sharp weapon injuries were male and that the highest frequency occurred in the 21–40-year age group.¹⁸ Likewise, Brennan et al. (2007) found that 74.5% of assault victims were male, while Iqbal et al. (2024) reported male predominance in 83.63% (189/226) of fabricated injury cases. These findings collectively support the observation that younger males represent the group most commonly involved in assault-related incidents.²⁰

With respect to weapon type, blunt weapons accounted for 49.4% of assault cases in the present study. Comparable findings were reported by Bhatti et al. (2013), who found that blunt weapons were responsible for 43.19% of medico-legal trauma cases, compared with 26.76% for firearms and 10.80% for sharp-edged weapons.¹⁶ Similarly, Ahmad et al. (2011) reported that blunt weapons constituted 67.3% of assault-related injuries, whereas sharp weapons and firearms accounted for 9.1% and 5.5% of cases, respectively. These studies, along with our findings, indicate that blunt force trauma remains the predominant mechanism of assault-related injury.¹⁷

In our study, minor injuries were observed in 52.4% of patients, while blunt weapons were associated with minor injuries in 64.6% of cases. Comparable observations were made by Aggarwal et al. (2008), who reported that 80% of sharp weapon injuries were

simple in nature. Although the study specifically evaluated sharp weapon injuries, both studies demonstrated a predominance of less severe injury patterns among assault victims.¹⁸

Head and neck injuries represented the most common anatomical site in our study, accounting for 34.3% of cases. A similar pattern was reported by Iqbal et al. (2024), who found that the scalp was involved in 51.3% of fabricated injuries.²⁰ The predominance of injuries involving exposed regions of the head and neck in both studies may reflect common assault mechanisms and victim-defense behaviors.

Regarding the number of injuries sustained, single injuries were observed in 36.7% of cases in the present study. Similar findings were reported by Brennan et al. (2007), who found that 81% of assault victims sustained a single injury. Although the proportion was higher in their study, both investigations identified isolated injuries as the most frequent presentation among assault victims.

The present study demonstrated a statistically significant association between weapon type and injury severity ($p < 0.001$), whereas no significant association was observed between gender and injury severity ($p = 0.321$). In contrast, Bangash et al. (2024) reported a significant association between gender and medico-legal case type ($p < 0.001$).²¹ Furthermore, Bangash et al. observed that physical assault accounted for 20.8% of medico-legal cases, sharp injuries for 19.0%, and firearm incidents for 4.0%. The differences between the two studies may be explained by variations in study design, study population, and outcome measures evaluated.²¹

Study Limitations

This study was conducted at a single tertiary care center, which may limit the generalizability of the findings. The cross-sectional design precluded assessment of long-term outcomes and causal relationships. Additionally, information regarding weapon type was partially dependent on victim-reported history, which may have introduced reporting bias.

CONCLUSION

Weapon type demonstrated a significant

association with injury severity among assault victims presenting for medico-legal examination. Firearm-related assaults were associated with a higher proportion of life-threatening injuries, whereas blunt weapons were more commonly associated with minor injuries. Recognition of these patterns may assist clinicians and forensic experts in the assessment and management of assault-related trauma.

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Conflict of Interest: No

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REFERENCES

1. Igrački J, Delić MB. Protection of victims of psychological abuse as type of domestic violence in criminal procedure. *Journal of Eastern European Criminal Law*. 2022 Dec 1;9(2):74-92.
2. Ramis J, Pinedo Terrados M, Pajares Fernández A, Masip J, Santurtún A. Emergency department visits for sexual assault: A Retrospective Review of Injury Reports. In *Healthcare* 2026;14(10):1307-11.
3. Roy C. Medico-Legal Aspects of Injury or Wound—An Appraisal. In *Health Laws in India* 2022;54(6):134-143.
4. Stefanopoulos PK, Aloizos S, Mikros G, Nikita AS, Tsiatis NE, Bissias C, Breglia GA, Janzon B. Assault rifle injuries in civilians: ballistics of wound patterns, assessment and initial management. *European Journal of Trauma and Emergency Surgery*. 2024;50(6):2741-51.
5. Milic J, Vucurovic M, Jovic D, Stankovic V, Grego E, Jankovic S, Sapic R. Exploring the potential of precision medicine in neuropsychiatry: a commentary on new insights for tailored treatments based on genetic, environmental, and lifestyle factors. *Genes*. 2024 Mar 24;16(4):371.
6. Nath A, Choudhari SG, Dakhode SU, Rannaware A, Gaidhane AM, Dakhode S, Gaidhane A. Substance abuse amongst adolescents: an issue of public health significance. *Cureus*. 2022 Nov 7;14(11).
7. Eze UO, Ojifinni KA. Trauma forensics in blunt and sharp force injuries. *Journal of West African College of Surgeons*. 2022 Oct 1;12(4):94-101.
8. Mansor S, Ziu N, Almismary H, Alawami M, Bujazia A, Eltarhoni A. Abdominal versus pelvic gunshot injuries in terms of postoperative outcomes: A cohort representing the experience of 406 cases in seven years. *Turkish journal of surgery*. 2024 Mar 23;40(1):36.
9. Chaudhary A, Kunwar S, Ghimire S, Wasti H. Patterns and severity of injuries in patients following physical assault—a medicolegal aspects. *Eastern Green Neurosurgery*. 2020 Jun 3;2(2):16-20.
10. Arpalahti A, Haapanen A, Puolakkainen T, Abio A, Thorén H, Snäll J. Assault-related facial fractures: does the injury mechanism matter?. *International journal of oral and maxillofacial surgery*. 2022 Jan 1;51(1):91-7.
11. Braga AA, Cook PJ. The association of firearm caliber with likelihood of death from gunshot injury in criminal assaults. *JAMA network open*. 2018 Jul 27;1(3):e180833.
12. Molina DK, DiMaio V, Cave R. Gunshot wounds: a review of firearm type, range, and location as pertaining to manner of death. *The American journal of forensic medicine and pathology*. 2013 Dec 1;34(4):366-71.
13. Chaudhary A, Kunwar S, Ghimire S, Wasti H. Patterns and severity of injuries in patients following physical assault—a medicolegal aspects. *Eastern Green Neurosurgery*. 2020 Jun 3;2(2):16-20.
14. Tan A, Bharj AK, Nizamoglu M, Barnes D, Dziejewski P. Assaults from corrosive substances and medico legal considerations in a large regional burn centre in the United Kingdom: calls for increased vigilance and enforced legislation. *Scars, burns & healing*. 2015 Nov 18;1:2059513115612945.
15. Gunasinghe WK, Warushahannadi J. Trends and Patterns of Long Bone Fractures in Relation to The Road Traffic Accidents, Assaults, and Falls Among Patients Admitted to Emergency Treatment Unit in Teaching Hospital Karapitiya. *Medico-Legal Journal of Sri Lanka*. 2023 Jun 30;11(1).
16. Bhatti MA, Mahmood S, Hanif S. Profile of medicolegal cases attending trauma center of District Headquarter Teaching Hospital, Gujranwala. *Esculapio*. 2013;9(3):146-149.
17. Ahmad I, Seema N, Humayun M, Raja A. Weapon of Offence Used in Bodily Medico Legal Injuries in a Rural Area. In *Medical Forum Monthly* 2011 (Vol. 22, No. 5)..
18. Aggarwal DS, Aggarwal KK. Medico legal diagnosis and pattern of injuries with sharp weapons. *J Indian Acad Forensic Med*. 2007;29(4):112-114.
19. Brennan IR, Moore SC, Shepherd JP. Non-firearm weapon use and injury severity: priorities for prevention. *Inj Prev*. 2006;12(6):395-399
20. Iqbal Z, Asif M, Maria G, Mahmood K, Khan A, Asif H. Spectrum of Fabricated Injuries Presenting in Lahore General Hospital, Lahore: Spectrum of Fabricated Injuries. *Pakistan Journal of Health Sciences*. 2024 Jun 30:262-6.
21. Bangash NN, Siddiqui N, Khan UK, Ullah I, Nadeem F, Iqbal F. Patterns of clinical medico-legal cases: a retrospective study at a distt headquarter hospital charsadda. *Journal of Rawalpindi Medical College*. 2024 Sep 27;28(3).