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Original Research Article

Detailed Medico-Legal Investigation Of Homicidal Deaths With Special Reference To Weapon Characteristics, Anatomical Distribution Of Injuries, Wound Morphology, Fatal Injury Mechanisms, And The Relationship Between Injury Patterns And Cause Of Death.

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Abstract: ***Background:*** Homicidal deaths represent an important medico-legal challenge requiring systematic evaluation of weapon characteristics, wound morphology, anatomical injury distribution, and fatal injury mechanisms. Detailed autopsy examination is essential for determining the cause of death and interpreting injury patterns. ***Objective:*** To investigate the medico-legal characteristics of homicidal deaths, with special reference to suspected weapon categories, anatomical distribution of injuries, wound morphology, internal injuries, fatal injury mechanisms, and their relationship with the certified cause of death. ***Materials and Methods:*** A retrospective observational study was designed in the Department of Forensic Medicine and Toxicology, Surat Municipal Institute of Medical Education and Research (SMIMER) Medical College, Surat, Gujarat, India. The study covered January 2024 to December 2025 and included 100 cases of homicidal deaths. Data were obtained from medico-legal autopsy reports and associated records. Demographic characteristics, suspected weapons, injury patterns, anatomical locations, internal injuries, fatal mechanisms, and certified causes of death were evaluated using descriptive statistics and appropriate tests of association. ***Results:*** The supplied tables contain illustrative rather than verified results. In this illustrative distribution, males constituted 73% of cases, and the 31–40-year age group represented the largest proportion (26%). Sharp-edged weapons were the most frequent suspected weapon category (32%), while the head and scalp were the most frequently involved anatomical regions (48%). Contusions were the most common injury type (41%). Fatal haemorrhage (32%) and traumatic brain injury (28%) were the leading illustrative fatal mechanisms. These findings require confirmation using the original study records. ***Conclusion:*** Systematic evaluation of weapon characteristics, wound morphology, anatomical injury distribution, and internal pathological findings is essential for interpreting homicidal deaths. Correlation of autopsy findings with the certified cause of death and other investigative evidence can improve medico-legal documentation and support forensic interpretation.

Keywords: Homicidal deaths; forensic autopsy; weapon characteristics; wound morphology; fatal haemorrhage; traumatic brain injury; cause of death; medico-legal investigation.

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INTRODUCTION

Homicidal deaths represent a major medico-legal concern because they involve the loss of human life resulting from violence and require systematic investigation to establish the cause and circumstances of death. The examination of such deaths involves the integration of autopsy findings, injury characteristics, suspected weapon information, and other available investigative evidence. Medico-legal autopsy plays a central role in documenting injuries, identifying fatal pathological changes, and providing scientific evidence to assist law enforcement agencies and the judicial system [1,2].

The investigation of homicidal deaths requires comprehensive external and internal examination of the deceased. External examination includes the assessment of wound location, number, dimensions, shape, margins, and morphological characteristics. Internal examination helps identify fractures, intracranial injuries, vascular damage, and injuries to vital thoracic and abdominal organs. Correlation of these findings is essential for determining the severity of trauma and establishing the relationship between the observed injuries and the certified cause of death [2,3].

Weapon characteristics are important in the interpretation of fatal injuries. Sharp-edged weapons may produce incised wounds, whereas pointed weapons may cause stab or penetrating wounds. Blunt-force trauma may result in abrasions, contusions, lacerations, fractures, and internal organ damage. Firearm injuries require careful examination of entrance and exit wounds, wound tracks, and associated tissue destruction. However, the appearance of a wound alone cannot always establish the exact weapon used. Weapon attribution must therefore be based on the combined assessment of wound morphology, internal pathological findings, and available investigative evidence [2,3].

The anatomical distribution of injuries provides important information regarding the severity and possible fatal consequences of trauma. Injuries involving the head may cause skull fractures, intracranial haemorrhage, and traumatic brain injury. Chest injuries may damage the heart, lungs, or major blood vessels, while abdominal trauma may involve the liver, spleen, kidneys, or other vital structures. Injuries to the neck may compromise major vessels or the airway. When several anatomical regions are involved, the determination of the principal fatal injury may become more complex because multiple injuries can contribute to death [1,2].

Wound morphology must be interpreted alongside the extent of internal tissue damage. A relatively small external wound may be associated with serious internal injury, whereas an extensive superficial wound may not necessarily be fatal. The number and distribution of injuries, the structures involved, and the presence of associated pathological changes must be considered collectively. This approach is particularly important in homicidal deaths involving multiple injuries or more than one suspected weapon [2,3].

Fatal injury mechanisms may include severe haemorrhage, traumatic brain injury, damage to vital organs, airway compromise, or a combination of these processes. Accurate interpretation requires differentiation between the anatomical injury, the physiological mechanism of death, and the final certified cause of death. Comprehensive autopsy documentation is essential for distinguishing the principal fatal injury from contributing injuries and for ensuring that the medico-legal opinion is supported by objective evidence [1,2].

Previous investigations have described variations in the demographic characteristics, weapon categories, and injury patterns associated with homicidal deaths. Gupta et al. reported a predominance of male victims and sharp-weapon injuries in their study of homicidal deaths in Delhi [4]. Buchade and Mohite documented the distribution of weapons, anatomical injuries, internal organ damage, and causes of death in Greater Mumbai [5]. Hugar and Harish also examined injury patterns and the distribution of sharp-weapon injuries in homicidal deaths [6]. Further work by Hugar et al. investigated defence injuries, providing additional information about the patterns of trauma documented during homicide investigations [7].

Patnaik et al. examined isolated fatal mechanical injuries and described the distribution of injury sites, weapon categories, and fatal outcomes [8]. Another investigation by Hugar et al. evaluated the broader pattern of homicidal deaths, including demographic and circumstantial characteristics [9]. Handlos et al. subsequently reviewed sharp-force homicides, examining wound number and location, suspected weapons, defensive injuries, and causes of death [10]. These studies demonstrate the value of systematic forensic examination while also indicating that injury patterns may differ between institutions and populations.

A detailed evaluation of homicidal deaths can improve the quality of medico-legal documentation and facilitate the interpretation of associations between suspected weapons, wound morphology, anatomical injury distribution, and fatal outcomes. Nevertheless, these associations must be evaluated using reliable case-level data, and the presence of a particular injury pattern should not automatically be interpreted as proof of a specific weapon or sequence of events.

The present study was undertaken in the Department of Forensic Medicine and Toxicology at Surat Municipal Institute of Medical Education and Research (SMIMER) Medical College, Surat, Gujarat, India, over

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a two-year period from January 2024 to December 2025. The study included 100 cases of homicidal deaths and aimed to investigate suspected weapon characteristics, anatomical distribution of injuries, wound morphology, internal pathological findings, fatal injury mechanisms, and certified causes of death. It also aimed to examine the relationships between weapon categories, injury patterns, anatomical locations, and fatal outcomes to support a systematic understanding of homicidal deaths in the study population.

MATERIALS AND METHODS

Study Design

The present study was designed as a hospital-based observational study with a retrospective descriptive and analytical approach to investigate the medico-legal characteristics of homicidal deaths. The study focused on the types of weapons involved, anatomical distribution of injuries, morphological characteristics of wounds, mechanisms responsible for fatal outcomes, and the relationship between injury patterns and the certified cause of death.

Study Setting

The study was conducted in the Department of Forensic Medicine and Toxicology at Surat Municipal Institute of Medical Education and Research (SMIMER) Medical College, Surat, Gujarat, India. Relevant medico-legal autopsy records and associated case documents were reviewed to obtain information regarding homicidal deaths investigated during the study period.

Study Duration

The study covered a period of two years, from January 2024 to December 2025.

Sample Size and Sampling Technique

A total of 100 cases of homicidal deaths were included in the study. Eligible cases were selected from medico-legal autopsy records using a consecutive or record-based sampling approach, depending on the availability and completeness of the records. Each case was assigned a unique study identification number to maintain confidentiality and facilitate systematic data collection.

Study Population

The study population comprised individuals who died due to homicidal violence and underwent medico-legal autopsy at the study institution during the specified study period. Information was collected from autopsy reports, inquest papers, police requisitions, available investigation records, and other relevant medico-legal documents.

Inclusion Criteria

The following cases were included in the study:

1. Medico-legal autopsies of deaths classified as homicidal in the available official records.
2. Cases investigated at the study institution between January 2024 and December 2025.
3. Cases with adequate documentation of the external and internal injuries.
4. Cases in which information regarding the suspected weapon, injury characteristics, or cause of death was available in the autopsy or associated medico-legal records.

Exclusion Criteria

The following cases were excluded:

1. Suicidal, accidental, natural, or undetermined deaths not classified as homicidal for the study.
2. Cases with substantially incomplete or missing autopsy documentation.
3. Cases in which the available records were insufficient to establish the principal variables required for analysis.
4. Duplicate records on the same deceased individual.

Data Collection Procedure

Data were collected using a structured proforma developed to record the relevant demographic, circumstantial, injury-related, and pathological characteristics of each case. The information was extracted from existing medico-legal records and systematically entered into a study database.

The following variables were recorded:

- Demographic characteristics: Age and sex of the deceased.
- Circumstantial characteristics: Date of occurrence, date of autopsy, and available information concerning the circumstances of death.
- Weapon characteristics: Type of suspected weapon, categorised where appropriate as sharp-edged, blunt-force, firearm, pointed or penetrating, or other/mixed weapons.
- Anatomical distribution of injuries: Involvement of the head, face, neck, chest, abdomen, back, upper limbs, lower limbs, and other body regions.
- Wound morphology: Type of injury, including incised wounds, stab wounds, lacerations, contusions, abrasions, firearm injuries, and other documented injury patterns.
- Internal injuries: Damage to vital organs, fractures, vascular injuries, intracranial injuries, and injuries involving the thoracic or abdominal cavities.
- Fatal injury mechanisms: Documented mechanisms such as severe haemorrhage, traumatic brain injury, injury to vital organs, airway compromise, or other mechanisms supported by the autopsy findings.
- Cause of death: The final cause of death as recorded in the medico-legal autopsy report, including contributory injuries and complications where documented.

When multiple injuries or weapons were documented in an individual case, each injury was recorded separately where feasible, while the deceased individual remained the unit of analysis for case-level comparisons.

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Assessment of Weapon Characteristics and Wound Morphology

The suspected weapon category was determined from the descriptions documented in the autopsy reports and associated investigation records. Wounds were classified according to their recorded morphological characteristics and the nature of the tissue damage. Sharp-force injuries were assessed on the basis of documented wound margins, dimensions, depth, and involvement of underlying structures.

Blunt-force injuries were evaluated using recorded findings such as abrasions, contusions, lacerations, fractures, and internal tissue damage. Firearm and penetrating injuries were classified according to the available descriptions of entry wounds, exit wounds, wound tracks, and associated internal injuries. Weapon attribution was based on the available medico-legal evidence and was not assumed solely from wound appearance. Where the exact weapon could not be established, the case was categorised according to the documented suspected weapon type or as undetermined.

Assessment of Anatomical Distribution and Fatal Injury Mechanisms

The anatomical distribution of injuries was evaluated by recording the body regions involved in each case. Particular attention was given to injuries affecting vital regions, including the head, neck, chest, and abdomen.

Fatal injury mechanisms were categorised according to the autopsy findings and the certified cause of death. These included fatal haemorrhage, traumatic brain injury, damage to vital thoracic or abdominal organs, airway obstruction or compromise, and other documented mechanisms.

Multiple mechanisms were recorded when more than one injury contributed to death. The relationship between injury location, wound morphology, suspected weapon category, and cause of death was examined to identify patterns and associations within the study population.

Outcome Measures

The primary outcome measures were:

1. Distribution of suspected weapon categories among homicidal deaths.
2. Frequency and anatomical distribution of different injury types.
3. Morphological characteristics of wounds associated with fatal outcomes.
4. Frequency of documented fatal injury mechanisms.
5. Relationship between weapon category, injury pattern, anatomical location, and certified cause of death.

Secondary outcome measures included demographic distribution, the occurrence of multiple injuries, involvement of vital organs, and the frequency of cases in which the exact weapon could not be determined from the available records.

Statistical Analysis

The collected data were entered into Microsoft Excel and analysed using IBM SPSS Statistics, with the software version specified according to the version actually used for the study. Categorical variables, including weapon type, wound morphology, anatomical injury distribution, and cause of death, were summarised as frequencies and percentages. Continuous variables, such as age, were expressed as mean and standard deviation for approximately normally distributed data or median and interquartile range for skewed data.

Associations between categorical variables were assessed using the chi-square test or Fisher's exact test, as appropriate. Comparisons involving continuous variables were performed using suitable parametric or non-parametric tests, depending on data distribution and study-group characteristics. A p-value of less than 0.05 was considered statistically significant. The analysis was interpreted in the context of the observational study design, and associations were not considered evidence of causation.

RESULTS

Table 1. Age and Sex Distribution of Homicidal Deaths (N = 100)

Age group (years)	Male, n (%)	Female, n (%)	Total, n (%)
≤20	5 (7.0)	3 (11.1)	8 (8.0)
21–30	18 (24.7)	7 (25.9)	25 (25.0)
31–40	20 (27.4)	6 (22.2)	26 (26.0)
41–50	14 (19.2)	5 (18.5)	19 (19.0)
51–60	9 (12.3)	3 (11.1)	12 (12.0)
>60	7 (9.6)	3 (11.1)	10 (10.0)
Total	73 (100)	27 (100)	100 (100)

Observation: In this illustrative distribution, the 31–40-year age group accounts for the largest proportion of cases (26%), followed by the 21–30-year group (25%). Males constitute 73% of the study population.

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Table 2. Distribution According to Suspected Weapon Category

Weapon category	Number of cases (n)	Percentage (%)
Sharp-edged weapons	32	32.0
Blunt-force weapons	24	24.0
Firearms	12	12.0
Pointed or penetrating weapons	14	14.0
Multiple weapon categories	13	13.0
Other/undetermined	5	5.0
Total	100	100.0

Observation: Sharp-edged weapons represent the most frequent category in this illustrative dataset (32%), followed by blunt-force weapons (24%).

Table 3. Anatomical Distribution of Injuries

Multiple anatomical regions may be involved in the same case.

Anatomical region	Cases with injury (n)	Percentage (%)
Head and scalp	48	48.0
Face	22	22.0
Neck	18	18.0
Chest	31	31.0
Abdomen	26	26.0
Back	19	19.0
Upper limbs	35	35.0
Lower limbs	29	29.0

Observation: The head and scalp are the most frequently involved regions in this illustrative distribution (48%), followed by the upper limbs (35%) and chest (31%). The percentages are not expected to total 100% because injuries can affect multiple regions.

Table 4. Distribution According to Wound Morphology

Type of injury	Cases with injury (n)	Percentage (%)
Incised wounds	29	29.0
Stab wounds	21	21.0
Lacerations	34	34.0
Contusions	41	41.0
Abrasions	27	27.0
Firearm injuries	12	12.0
Other documented injuries	8	8.0

Observation: Contusions are the most frequent injury type in this illustrative distribution (41%), followed by lacerations (34%) and incised wounds (29%). Multiple wound types may occur in an individual.

Table 5. Distribution According to Number of Injuries per Case

Number of injuries	Cases (n)	Percentage (%)
Single injury	12	12.0
2–5 injuries	39	39.0
6–10 injuries	30	30.0
More than 10 injuries	19	19.0
Total	100	100.0

Observation: Cases with 2–5 documented injuries constitute the largest category (39%) in this illustrative distribution. Multiple injuries are present in 88% of cases.

Table 6. Distribution of Internal Injuries

Multiple findings may occur in the same case.

Internal injury finding	Cases (n)	Percentage (%)
Intracranial injury	29	29.0
Skull fractures	21	21.0
Neck structure or vascular injury	12	12.0
Thoracic organ injury	24	24.0
Abdominal organ injury	22	22.0
Major blood vessel injury	19	19.0
Fractures of other bones	27	27.0
No major internal injury documented	8	8.0

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Observation: Intracranial injuries are the most frequent internal injury finding in this illustrative dataset (29%). The findings overlap and should not be summed as mutually exclusive categories.

Table 7. Distribution According to Fatal Injury Mechanism

Fatal injury mechanism	Cases (n)	Percentage (%)
Fatal haemorrhage	32	32.0
Traumatic brain injury	28	28.0
Injury to vital thoracic organs	15	15.0
Injury to abdominal organs	10	10.0
Airway compromise	5	5.0
Other documented mechanisms	7	7.0
Undetermined mechanism	3	3.0
Total	100	100.0

Observation: Fatal haemorrhage is the leading mechanism in this illustrative distribution (32%), followed by traumatic brain injury (28%). Each case is assigned one primary mechanism for this table; contributing mechanisms may be recorded separately.

Table 8. Distribution According to Certified Cause of Death

Certified cause of death category	Cases (n)	Percentage (%)
Head injury	30	30.0
Haemorrhage due to injuries	28	28.0
Injury to vital thoracic organs	15	15.0
Abdominal organ injury	10	10.0
Neck injury	7	7.0
Multiple injuries/polytrauma	7	7.0
Other/undetermined cause	3	3.0
Total	100	100.0

Observation: Head injury accounts for the largest category in this illustrative distribution (30%), followed by haemorrhage due to injuries (28%). Final categorisation must follow the actual certified cause of death in the autopsy reports.

Table 9. Relationship Between Weapon Category and Predominant Wound Morphology

For this table, each case is assigned one predominant wound morphology.

Weapon category	Incised/stab wounds	Blunt injuries	Firearm injuries	Other/mixed patterns	Total
Sharp-edged weapons	25	2	0	5	32
Blunt-force weapons	1	20	0	3	24
Firearms	0	0	12	0	12
Pointed/penetrating weapons	9	1	0	4	14
Multiple weapon categories	6	5	0	2	13
Other/undetermined	1	1	0	3	5
Total	42	29	12	17	100

Observation: The illustrative cross-tabulation shows that sharp-edged weapons are predominantly associated with incised or stab wounds, while blunt-force weapons are predominantly associated with blunt injuries. These relationships are illustrative and must be tested using the actual data.

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Table 10. Relationship Between Predominant Anatomical Region and Certified Cause of Death

Predominant anatomical region	Head injury-related death	Haemorrhage-related death	Vital organ injury-related death	Other causes	Total
Head and face	25	3	0	2	30
Neck	1	5	0	1	7
Chest	1	8	8	3	20
Abdomen	0	6	4	2	12
Multiple regions	3	6	3	2	14
Other regions	0	0	0	17	17
Total	30	28	15	27	100

Observation: In this illustrative distribution, head and facial injuries are most frequently associated with head injury-related deaths, whereas chest and abdominal injuries are represented among haemorrhage-related deaths. This pattern should not be interpreted as a causal conclusion without the verified case records.

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Table 11. Relationship Between Wound Morphology and Fatal Injury Mechanism

Wound morphology	Haemorrhage	Traumatic brain injury	Vital organ damage	Airway compromise	Other/undetermined	Total
Incised wounds	10	2	3	2	1	18
Stab wounds	10	2	6	1	1	20
Lacerations	5	13	3	0	3	24
Contusions	3	8	1	0	2	14
Firearm injuries	3	2	1	0	1	7
Mixed injury patterns	4	1	1	2	9	17
Total	35	28	15	5	17	100

Observation: The illustrative distribution shows haemorrhage among cases with incised and stab wounds, while traumatic brain injury is more frequent in cases with lacerations and contusions. These categories represent hypothetical predominant injury patterns, not established findings.

DISCUSSION

The present study was designed to investigate the medico-legal characteristics of homicidal deaths through the systematic assessment of demographic variables, suspected weapon categories, anatomical distribution of injuries, wound morphology, internal pathological findings, fatal injury mechanisms, and certified causes of death. The combined interpretation of these variables is essential because the determination of the cause of death often requires correlation between external injuries, internal organ damage, and available investigative evidence. International guidance on death investigation emphasises comprehensive documentation and objective interpretation of autopsy findings [1].

In the illustrative demographic distribution, males constituted 73% of the study population, while the 31–40-year age group accounted for the largest proportion of cases (26%), followed by the 21–30-year age group (25%). These findings, if confirmed by the original records, would indicate a predominance of male victims and a greater representation of young and middle-aged adults. Gupta et al. reported that male victims outnumbered female victims by approximately three to one in their study of homicidal deaths in Delhi, with the 21–30-year age group being the most frequently represented [4]. Buchade and Mohite similarly reported a predominance of male victims, particularly among younger adults, in their investigation of homicidal deaths in Greater Mumbai [5]. Hugar and Harish also described a substantial representation of young adults in their study [6]. Differences in demographic distributions may reflect variations in the study population, geographical setting, and case selection. The demographic findings of the present study should therefore be interpreted after verification against the actual autopsy records.

Sharp-edged weapons constituted the largest category in the illustrative weapon distribution, accounting for 32% of cases, followed by blunt-force weapons (24%), pointed or penetrating weapons (14%), multiple weapon categories (13%), firearms (12%), and other or undetermined weapons (5%). Gupta et al. reported sharp-weapon injuries in 34.9% of homicidal deaths in Delhi [4], while Hugar and Harish reported that sharp-weapon injuries accounted for 51% of cases in their study [6]. In contrast, Buchade and Mohite identified hard and blunt weapons as the most common category in their investigation of homicidal deaths in Greater Mumbai [5]. These differences demonstrate that the distribution of suspected weapons may vary between study settings. They also highlight the importance of consistent classification and the distinction between a suspected weapon category and a weapon definitively identified through investigative evidence. The appearance of an injury alone should not be considered sufficient to establish the exact weapon used [2,3].

The illustrative anatomical distribution showed that the head and scalp were involved in 48% of cases, followed by the upper limbs (35%), chest (31%), lower limbs (29%), abdomen (26%), face (22%), back (19%), and neck (18%). These percentages are not mutually exclusive because an individual may sustain injuries in multiple anatomical regions. The head and scalp were the most frequently involved regions in the example dataset, emphasising the importance of examining cranial injuries and their associated internal damage. Buchade and Mohite reported that the head, face, and neck were frequently targeted in their study of homicidal deaths [5]. Patnaik et al. also identified the head as the most frequent site of isolated fatal mechanical injury in their selected cases [8]. However, the findings of these studies cannot be compared directly without considering differences in study design and injury classification. The significance of an injury must be established through assessment of the extent of tissue damage, associated internal findings, and the relationship between the injury and the certified cause of death [2,3].

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Contusions were the most frequently recorded injury type in the illustrative wound morphology distribution (41%), followed by lacerations (34%), incised wounds (29%), abrasions (27%), stab wounds (21%), firearm injuries (12%), and other documented injuries (8%). These categories may overlap because a single individual may sustain several different types of wounds. Contusions and lacerations are commonly associated with blunt-force trauma, whereas incised and stab wounds are characteristic of sharp-force injury. Nevertheless, accurate interpretation requires consideration of wound dimensions, margins, depth, anatomical location, and underlying tissue damage. Handlos et al. demonstrated the importance of systematic evaluation of wound number and location in sharp-force homicides [10]. The present study should similarly assess wound morphology in conjunction with the internal examination findings rather than relying exclusively on the external appearance of injuries [2,3].

The illustrative distribution of the number of injuries indicated that 88% of cases involved multiple injuries, including 39% with 2–5 injuries, 30% with 6–10 injuries, and 19% with more than 10 injuries. Only 12% of cases were classified as having a single injury. Multiple injuries may complicate the determination of the principal fatal lesion, especially when different anatomical regions or vital organs are affected. Patnaik et al. examined 728 homicidal deaths and reported 63 cases with isolated fatal mechanical injuries, while 665 cases had multiple injuries [8]. This study illustrates the importance of differentiating cases with a single fatal injury from those involving multiple injuries. However, differences in case selection and definitions must be considered when comparing these findings with those of the present study.

The illustrative internal injury distribution showed intracranial injuries in 29% of cases, fractures of bones other than the skull in 27%, thoracic organ injuries in 24%, abdominal organ injuries in 22%, major blood vessel injuries in 19%, and neck structure or vascular injuries in 12%. Skull fractures were documented in 21% of cases, while no major internal injury was recorded in 8%. If verified, these findings would emphasise the importance of a thorough internal examination in addition to external injury documentation. Intracranial injuries, vascular damage, and injuries to vital thoracic or abdominal organs may be directly relevant to determining the cause of death. However, these categories overlap, as a single case may involve several associated pathological findings. Therefore, each finding should be interpreted in the context of the complete autopsy and not treated as an independent fatal event [1–3].

Fatal haemorrhage was the leading mechanism in the illustrative distribution, accounting for 32% of cases, followed by traumatic brain injury (28%), injuries to vital thoracic organs (15%), abdominal organ injuries (10%), airway compromise (5%), other mechanisms (7%), and undetermined mechanisms (3%). Haemorrhage may result from damage to major blood vessels or vascular organs, whereas traumatic brain injury may be associated with structural brain damage and intracranial bleeding. Injuries to vital thoracic and abdominal organs may also result in fatal haemorrhage or loss of organ function. Patnaik et al. examined fatal mechanical injuries in homicidal deaths and described coma and haemorrhagic shock among the important modes of death in their selected subgroup [8]. The comparison highlights the importance of identifying the pathological process responsible for death. However, the actual distribution of fatal mechanisms in the present study must be confirmed from the original records. The anatomical injury, physiological mechanism of death, and certified cause of death should be clearly differentiated during analysis and reporting [1,2].

The relationship between suspected weapon categories and predominant wound morphology is an important component of medico-legal interpretation. The illustrative cross-tabulation showed that sharp-edged weapons were predominantly associated with incised or stab wounds, whereas blunt-force weapons were predominantly associated with blunt injuries. Firearm cases were classified under firearm injury morphology. These patterns are broadly consistent with established forensic principles concerning the relationship between the characteristics of a weapon and the injuries it produces [2,3]. However, the relationship is not necessarily one-to-one because mixed injuries may occur, and wound appearance may be influenced by the anatomical site and interaction between the weapon and tissues. Handlos et al. further demonstrated the importance of examining multiple aspects of sharp-force homicides, including wound distribution, defensive injuries, suspected weapons, and causes of death [10]. Any association identified in the present study should be tested using verified case-level data and an appropriate statistical method. Statistical significance should not be claimed on the basis of illustrative values.

The relationship between anatomical injury distribution and certified cause of death is also important for determining the pathological significance of individual wounds. In the illustrative tables, head and facial injuries were frequently represented among head injury-related deaths, whereas chest and abdominal injuries were represented among haemorrhage-related and vital-organ-injury-related deaths. The illustrative wound morphology table also showed haemorrhage among cases with incised and stab wounds, while traumatic brain injury was more frequently represented among cases with lacerations and contusions. These patterns are anatomically plausible, but they cannot be considered established findings until confirmed against the original autopsy records. A wound at a particular

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anatomical site does not automatically establish the cause of death. Its significance must be determined through correlation with internal pathological findings and the certified cause of death [1–3].

The systematic documentation of weapon characteristics, injury distribution, wound morphology, and fatal mechanisms has important implications for forensic practice. Comprehensive autopsy records may assist in correlating pathological findings with scene-of-crime evidence and other investigative information. They can also help distinguish the principal fatal injury from contributing injuries and identify cases in which the available evidence is insufficient to determine the exact weapon. Studies examining homicidal deaths and defensive injuries have demonstrated the value of recording injury patterns and their distribution systematically [4–7,9,10]. The application of consistent documentation and evidence-based interpretation may improve the quality of medico-legal reports and support the judicial evaluation of forensic findings [1].

The retrospective design of the present study has certain limitations. The analysis depends on the completeness and accuracy of existing medico-legal records, and missing information about suspected weapons, wound dimensions, internal injuries, or circumstances of death may limit interpretation. Variations in documentation and classification may also affect comparisons between cases. Furthermore, the study includes 100 cases from a single institution, which limits the generalisability of the findings to other populations. The observational design allows the identification of associations but does not independently establish causation. These limitations should be considered when interpreting the results and comparing them with previously published investigations.

Overall, the present study provides a framework for examining homicidal deaths through the integrated assessment of demographic characteristics, suspected weapon categories, anatomical injury distribution, wound morphology, internal pathological findings, fatal injury mechanisms, and certified causes of death. Previous investigations have demonstrated the importance of systematic autopsy examination and the documentation of weapon-related injury patterns in homicidal deaths [4–10]. Following verification of the actual study data, the findings may provide institution-specific information that contributes to improved medico-legal documentation and more consistent interpretation of fatal injuries.

CONCLUSION

The present study highlights the importance of systematic medico-legal examination of homicidal deaths, with particular emphasis on suspected weapon characteristics, wound morphology, anatomical injury distribution, and fatal injury mechanisms. Comprehensive assessment of external and internal injuries is essential for establishing the cause of death and interpreting the relationship between injury patterns and fatal outcomes. Accurate documentation and correlation of autopsy findings with investigative evidence can strengthen forensic interpretation and support the judicial process.

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