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Original Article

Forensic Section

Homicide Trends and Patterns in a Hilly State of Northern India: A Five-year Retrospective Observational Autopsy-based Study

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ABSTRACT

Introduction: Homicide represents the most severe form of interpersonal violence and constitutes a major public health and medico-legal concern worldwide. Patterns of homicide vary considerably across regions depending on socio-demographic, cultural, and geographical factors.

Aim: To analyse the trends and patterns of homicide cases in a hilly state of North India over a five-year period.

Materials and Methods: This retrospective observational study was conducted in the Department of Forensic Medicine and Toxicology, Shri Lal Bahadur Shastri Government Medical College and Hospital, Nerchowk, Mandi, Himachal Pradesh., India. The data were collected for homicidal autopsy cases examined over a period of five years from January 2020 to December 2024. The study was planned, data were analysed, and interpretations were carried out between January 2025 and March 2025. Data regarding demographic variables, manner and cause of death, weapon used, anatomical distribution of injuries, and circumstances of death were extracted from post-mortem records and police inquest reports. Descriptive statistical analysis was performed using Microsoft Excel, and results were expressed as frequencies and percentages.

Results: Out of 707 cases autopsied, 31 (4.38%) cases belonged to homicide. Among the homicidal cases 20 (64.52%) cases belonged to males and 11 (35.48%) belonged to females, the most common age group was 21-30, 12 (38.71%) years, the commonest body part which sustained the fatal injury was head in 17 (54.84%) cases, the most common type of weapon used to inflict fatal injuries was blunt in 23 (74.2%) cases, ethyl alcohol was detected in 17 (54.84%) cases, cyanide was detected in 1 (3.23%) case.

Conclusion: Homicides in the studied hilly region predominantly involved young adult males and were largely the result of interpersonal conflicts using readily available weapons. Understanding regional homicide patterns can assist forensic experts and policymakers in formulating targeted preventive strategies.

Keywords: Craniocerebral trauma, Epidemiology, Ethyl alcohol, Forensic medicine

INTRODUCTION

Homicide is defined as the deliberate or intentional killing of a human being by another human being. The word *homicide* has been derived from the Latin terms "homos" meaning human being and "*caedere*" meaning to kill. As crime rates are rising worldwide, so are homicidal incidents, making homicide a major concern for society, public health authorities, and criminal justice systems. It is one of the most serious crimes that can be committed against a human being and is punished with the highest degree of punishment in most countries. From a legal perspective, homicide consists of two essential components: "*mens rea*" (guilty mind), which denotes the intention or knowledge of wrongdoing, and "*actus reus*" (guilty act), which refers to the physical act leading to death. Establishing the presence of both these components is essential for criminal liability in homicidal cases. Homicide is prevalent almost all over the world and continues to contribute significantly to premature mortality [1]. A total of 28,522 and 85 homicides were reported in India and Himachal Pradesh, respectively, as per the report published by the National Crime Records Bureau in 2022 [2]. Although Himachal Pradesh reports comparatively fewer homicide cases than many other Indian states, such figures should not be underestimated, as even a small number of cases may have profound medico-legal and social implications. According to the United Nations Office on Drugs and Crime, the number of homicide victims globally in 2021 was 458,000, among which 109,000 were reported from Asia [3]. These statistics highlight that homicide remains a persistent global problem despite advancements in law enforcement and crime prevention strategies.

Homicide is among the leading causes of death in people aged 15-29 years, and the vast majority of homicides involve male victims [4]. This demographic pattern reflects greater exposure of young males to interpersonal violence, high-risk behaviour, increasing gun culture and social conflicts [5]. The loss of individuals in this economically productive age group places a considerable burden on families and society, resulting in long-term psychological trauma and economic hardship.

The rise in homicide cases is attributed to multiple interacting factors, including mental health problems, financial disputes, workplace conflicts, substance abuse, and stressful life conditions. Social inequalities, unemployment, and rapid urbanisation may further contribute to violent behaviour. This trend is also influenced by the easy accessibility to advanced weapons, religious hatred, and acts of terrorism, which increase both the frequency and severity of violent encounters [6]. Alcohol and substance abuse, in particular, play a crucial role by impairing judgment, reducing self-control, and escalating minor disputes into fatal violence.

A wide variety of weapons may be used to commit homicide, depending on availability and intent. These include blunt weapons such as wooden sticks, rods, and stones; sharp weapons such as knives and swords; firearms; ligature materials; and even the hands and feet of the assailant. The pattern and distribution of injuries often provide vital clues regarding the weapon used and the manner of assault. In rare circumstances, poison may be used to commit homicide. However, homicidal poisonings are among the least frequently detected crimes and are difficult to establish due to non-specific postmortem findings and heavy reliance on toxicological analysis for confirmation [7].

The role of autopsy surgeons in the investigation of homicidal cases is crucial. Thorough crime scene visits, meticulous postmortem

examination, and proper preservation of biological samples play a key role in determining the cause and manner of death. Injury interpretation, correlation with circumstantial evidence, and reconstruction of events are essential components of medico-legal opinion. Any mistake in diagnosis may result in a perpetrator going free or an innocent person being placed in jeopardy. Furthermore, deaths occurring in rural areas of developing countries must be assessed with added caution, as forensic experts often encounter resistance from family members due to lack of education and awareness regarding autopsy procedures and last rites [8].

In India, homicide is punishable under Section 103 of the Bharatiya Nyaya Sanhita, with punishment of death or imprisonment for life depending upon the gravity of the offence [9]. Accurate medico-legal documentation and interpretation are therefore essential for the administration of justice. This retrospective observational study was conducted in the Department of Forensic Medicine and Toxicology of a tertiary care hospital of North India to analyse the demographic and epidemiological factors associated with homicidal autopsy cases brought for postmortem examination. Understanding these patterns may assist forensic experts, law enforcement agencies, and policymakers in improving homicide investigation, prevention strategies, and public health planning.

MATERIALS AND METHODS

This retrospective observational study was conducted in the Department of Forensic Medicine and Toxicology, Shri Lal Bahadur Shastri Government Medical College and Hospital, Nerchowk, Mandi, Himachal Pradesh, India. The data were collected for homicidal autopsy cases examined over a period of five years from January 2020 to December 2024. The study was planned, data were analysed, and interpretations were carried out between January 2025 and March 2025. As this was a retrospective study including all available confirmed homicidal cases during the study period, a formal sample size calculation was not performed. Ethical approval from the Institutional Ethics Committee was not sought for this study, as it was a retrospective record-based analysis of medicolegal autopsy cases. The study did not involve any direct interaction with subjects, and no personal identifiers or identifiable information of the deceased were disclosed at any stage of data collection, analysis, or publication. Permission to access and use the autopsy records for academic and research purposes was obtained from the Head of the Department of Forensic Medicine and Toxicology. As the study involved analysis of medicolegal autopsy records, informed consent was not required.

Inclusion criteria: All cases in which the manner of death was conclusively certified as homicide after complete medico-legal autopsy during the study period were included in the study.

Exclusion criteria: Cases in which the manner of death was certified as accidental, suicidal, natural, or undetermined were excluded from the study.

A total of 31 homicidal cases met the inclusion criteria and were included in the final analysis. No confirmed homicidal cases were excluded during the study period.

Study Procedure

Data were collected using a predesigned study proforma from postmortem examination reports, inquest papers, police requisition forms, forensic science laboratory reports, and relevant hospital records. The parameters studied included age, gender, type of weapon used, pattern and type of injuries, body part sustaining fatal injury, cause of death, and results of toxicological examination.

STATISTICAL ANALYSIS

The collected data were entered into Microsoft Excel spreadsheet (Microsoft Corporation, Redmond, WA) and analysed using descriptive statistics. Categorical variables were expressed as frequencies and percentages.

RESULTS

During the study period, a total of 707 autopsy cases were conducted by the department, among which 31 were of homicide. The demographic characteristics of the victims are summarised in [Table/Fig-1]. The study population showed a clear predominance of males over females. Most victims belonged to young adult age groups, indicating that homicide disproportionately affected individuals in the economically productive age range. The mean age was 35.3±16.4 years. The mean age of male subjects was 35.8±14.1 years and of female subjects was 34.5±20.7 years.

Age group (in years)	Male	Female	Total (%)
0-10	0	2	2 (6.45%)
11-20	0	0	0
21-30	9	3	12 (38.71%)
31-40	7	0	7 (22.6%)
41-50	1	2	3 (9.8%)
51-60	1	4	5 (16.13%)
61-70	1	0	1 (3.23%)
71-80	1	0	1 (3.23%)
Total	20	11	31 (100%)

[Table/Fig-1]: Demographic distribution of the study population.

The distribution of body parts sustaining fatal injuries is shown in [Table/Fig-2]. Injuries to the head and neck region accounted for the majority of fatal outcomes. Predominant involvement of the head and neck reflects targeted or forceful assault to the vital organs.

Body part which sustained the fatal injury	n (%)
Chest	3 (9.8%)
Head and face	17 (54.84%)
Neck	10 (32.26%)
No injury	1 (3.23%)

[Table/Fig-2]: Body parts sustaining fatal injuries (N=31).

The types of fatal injuries observed are presented in [Table/Fig-3]. Cranio-cerebral injuries constituted the most frequent fatal injury pattern, followed by soft-tissue injuries. The predominance of skull fractures and intracranial haemorrhage suggests the use of significant force during assault.

Type of injury	n (%)
Chop wound	2 (6.45%)
Contusion	6 (19.4%)
Incision	2 (6.45%)
Skull fracture and intracranial haemorrhage	16 (51.6%)
Long bone fractures	1 (3.23%)
Laceration	2 (6.45%)
Stab wound	1 (3.23%)
No injury	1 (3.23%)

[Table/Fig-3]: Type of fatal injuries (N=31).

The distribution of weapons used to inflict fatal injuries is shown in [Table/Fig-4]. Blunt force trauma was the most frequently implicated mechanism of injury. The predominance of blunt weapons indicates the use of readily available objects rather than specialised weapons.

The causes of death as determined by postmortem examination are summarised in [Table/Fig-5]. Head injury emerged as the leading cause of death, followed by haemorrhagic shock and asphyxial mechanisms. Fatal head injuries underline the vulnerability of the craniofacial region in homicidal assaults.

Results of chemical analysis of viscera are shown in [Table/Fig-6]. Alcohol was detected in a substantial proportion of cases, while poisoning as a cause of homicide was rare. Detection of alcohol

Type of weapon	n (%)
Blunt	23 (74.2%)
Sharp	5 (16.13%)
Firearm	2 (6.45%)
No weapon	1 (3.23%)

[Table/Fig-4]: Distribution according to the type of weapon used (N=31).

Cause of death	n (%)
Head injury	16 (51.6%)
Haemorrhagic shock	8 (25.8%)
Asphyxia due to strangulation	5 (16.13%)
Poisoning	1 (3.23%)
Asphyxia due to smothering	1 (3.23%)

[Table/Fig-5]: Distribution of cases on the basis of cause of death (N=31).

Toxin detected	n (%)
Ethyl alcohol	17 (54.84%)
Cyanide	1 (3.23%)
No poison/alcohol	13 (41.94%)

[Table/Fig-6]: Toxicological analysis findings.

suggests its contributory role in precipitating or facilitating violent behaviour.

DISCUSSION

The proportion of homicidal deaths among total autopsies in the present study was relatively low. Similar variability in the proportion of homicidal autopsies has been reported across different regions of India. Studies conducted in Pondicherry, Maharashtra, Odisha, and other states have documented proportions ranging from very low to considerably higher values, reflecting regional differences in crime rates, population density, sociocultural factors, and law enforcement effectiveness [10-13]. The lower proportion observed in the present study may be attributed to the comparatively lower crime rate, hilly terrain, scattered population, and rural predominance of Himachal Pradesh, as also reflected in national crime statistics [2].

A clear male predominance among homicide victims was observed in the present study, which is consistent with national and international literature. Similar findings have been reported by Taware AA et al., Mohanty S et al., Surwase R and Mohan M et al., where males constituted the majority of victims [11-14]. This demographic pattern has been attributed to greater exposure of young males to interpersonal violence, risk-taking behaviour, substance abuse, and social conflicts, as highlighted in the World Health Organisation (WHO) World Report on Violence and Health [1,5]. Increased outdoor activity, occupational exposure, and involvement in interpersonal disputes further increase vulnerability among males.

The majority of victims in the present study belonged to young adult age groups, a finding that parallels observations made by Slater S and Subramanyam S, Taware AA et al., Mohanty S et al., and Sonawane SS et al., [10-12,15]. Young adults are more prone to homicidal violence due to socioeconomic stressors such as unemployment, financial instability, lack of educational opportunities, peer pressure, and substance abuse. The loss of individuals in this economically productive age group imposes a substantial social and economic burden on families and society, a concern also emphasised by global health agencies [3,4].

Blunt weapons were the most commonly used instruments in the present study. This observation is in agreement with several Indian studies, including those by Taware AA et al., Surwase R and Kumar SV et al., [11,13,16]. The frequent use of blunt weapons may be explained by their easy availability in domestic and rural environments, including agricultural tools and household objects. However, studies from certain regions have reported sharp weapons as the predominant choice, indicating that weapon preference varies according to regional availability and sociocultural practices [10,12].

In the present study, injuries to the head and face were most frequently associated with fatal outcomes. Similar patterns have been reported by Surwase R, Mohan M et al., Sam NM and Harish S [13,14,17]. The head and face are particularly vulnerable due to the presence of vital organs and their exposure during assaults. Cranio-cerebral injuries, including skull fractures and intracranial haemorrhages, were the most common fatal injuries observed, making head injury the leading cause of death. These findings underscore the lethality of head trauma in homicidal assaults and the significant force often involved.

Toxicological analysis revealed the presence of ethyl alcohol in a substantial proportion of cases. Alcohol consumption is a well-documented risk factor for violent behaviour, as it impairs judgment, reduces inhibition, and increases aggression [1]. Although homicidal poisoning was rare in the present study, its occurrence highlights important forensic challenges. Cyanide poisoning, though uncommon, has been reported in homicidal contexts and requires a high-index of suspicion and prompt toxicological confirmation, as documented in previous case reports and studies [7,18].

Limitation(s)

The present study has certain limitations. Being a single-centre, retrospective study conducted in a state with a relatively low incidence of homicidal deaths, the findings may not be generalisable to other regions of India with different demographic and criminological profiles. Additionally, the study primarily focuses on autopsy-based quantitative data and does not explore deeper psychological, behavioural, or criminological determinants of homicide. Nevertheless, the study provides valuable region-specific forensic data that can aid medico-legal experts and law enforcement agencies in understanding local homicide patterns and improving investigative accuracy.

CONCLUSION(S)

The present study highlights that homicidal deaths in the study region predominantly involved males and young adults. Fatal injuries most commonly affected the head region, with blunt force trauma emerging as the principal mechanism of injury. The frequent detection of ethyl alcohol on toxicological analysis suggests its contributory role in homicidal incidents. These findings are consistent with patterns reported in other autopsy-based studies from different parts of India. The study underscores the importance of region-specific forensic data in understanding local homicide trends and emphasises the role of meticulous autopsy examination and toxicological analysis in accurate medico-legal classification of homicidal deaths.

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