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Original Research Article

Observational Analysis of Unnatural Deaths Based on Autopsy Reports at a Tertiary Care Center

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Abstract:

Background: Unnatural deaths, including road traffic accidents, suicides, homicides, burns, poisoning, and drowning, remain a major medico-legal concern in India. Autopsy-based studies provide vital epidemiological data for prevention and policy-making. This study analyzed the demographic profile, manner, and causes of unnatural deaths at a tertiary care center.

Material and Methods: This retrospective observational study was conducted in the Department of Forensic Medicine at a tertiary care centre for 1 year. A total of 312 medico-legal autopsies of unnatural deaths were included, excluding incomplete records, decomposed or unidentified bodies, and natural deaths. Data from autopsy reports, inquest papers, police records, and hospital files were analyzed for age, sex, cause and manner of death, seasonal distribution, injury patterns, and toxicological findings. Statistical analysis was performed using SPSS v25, with $p < 0.05$ considered significant.

Results: Males accounted for 75.0% of cases (male-to-female ratio 3:1), with the highest incidence in the 21–30 years age group (31.7%). Accidental deaths predominated (61.2%), followed by suicides (25.9%) and homicides (9.0%). Road traffic accidents were the leading cause (45.5%), followed by hanging (13.5%), poisoning (11.5%), burns (9.3%), and drowning (8.0%). Seasonal peaks occurred during the monsoon (29.8%). Head injuries were the most common fatal injury pattern (43.1%) in trauma cases, and organophosphorus compounds were the most frequent toxic agent (58.3%) in poisoning cases.

Conclusion: Young adult males are most affected by unnatural deaths, predominantly due to road traffic accidents. The findings emphasize the need for targeted road safety enforcement, suicide prevention programs, and toxicological surveillance.

Keywords: Unnatural deaths, Autopsy, Road traffic accidents, Forensic medicine, India.

Introduction

Unnatural deaths remain a significant public health and medico-legal concern in India and across the globe. [1] These deaths, resulting from causes such as road traffic accidents, suicides, homicides, burns, poisoning, drowning, and electrocution, represent a major burden on legal, healthcare, and administrative systems. [2]

In India, the role of the medico-legal autopsy is especially critical, as it serves to determine not only the cause and manner of death but also provides valuable evidence that supports judicial proceedings, informs public health policies, and reveals hidden socio-economic and psychological stressors within the community. [3] The comprehensive examination of such deaths through postmortem analysis forms an integral part of forensic medicine practice in tertiary care centers, where large volumes of medico-legal cases are referred regularly. [4] According to annual reports by the National Crime Records Bureau (NCRB), unnatural deaths account for a considerable proportion of mortality statistics in India. [5] Road traffic accidents continue to be among the leading causes of death, especially among males in the productive age group. [6] Simultaneously, suicides have shown an increasing trend, particularly among adolescents and young adults, driven by factors such as academic stress, unemployment, substance abuse, domestic violence, and mental health disorders. [7]

Homicidal deaths, though relatively less frequent, continue to highlight critical law-and-order challenges, while accidental deaths due to burns, electrocution, and drowning reflect the existing gaps in workplace safety, home hazards, and rescue infrastructure. [8] Many of these deaths are

preventable with timely intervention, improved awareness, and focused policy action. Autopsy-based studies provide crucial epidemiological and demographic insights that may not be captured through clinical reporting alone. [9] In tertiary care hospitals, especially those attached to government medical colleges, medico-legal autopsies are carried out under the jurisdiction of the law and provide an opportunity to study a broad spectrum of unnatural deaths across a defined geographic region. These centers cater to rural and urban populations alike, and the autopsy records serve as an invaluable data source for understanding regional trends in mortality.10 Despite this, few published studies offer comprehensive observational analysis of such data from Western India, particularly at the state or district level. There exists a noticeable gap in region-specific forensic research, which, if addressed, can greatly assist in planning localized preventive strategies and judicial reforms. [11]

In light of the above, the present study was undertaken to analyze the demographic profile, causes, and manner of unnatural deaths based on medico-legal autopsy reports at a tertiary care center over a defined one-year period.

The retrospective observational nature of this study enabled the evaluation of real-world data from actual autopsy cases, with the goal of identifying major contributors to unnatural mortality in the region. The study also aimed to assess age and gender distribution, patterns of injuries, and seasonal trends associated with these deaths. Such evidence-based insights can serve as a foundation for future interventions by public health authorities, traffic and urban planners, and law enforcement agencies.

Material and Methods

This hospital-based observational study was conducted in the Department of Forensic Medicine at a tertiary care Center in western Gujarat over a period of one year. A total of 312 medico-legal autopsy cases of unnatural deaths were included in the study. All cases of unnatural deaths—such as those due to road traffic accidents, suicides, homicides, burns, drowning, poisoning, and electrocution—were included. Cases with incomplete documentation, decomposed or unidentified bodies, and clearly established natural causes of death were excluded. Data were collected retrospectively from autopsy registers, postmortem reports, inquest papers, police reports, and relevant hospital records. The variables analyzed included age, sex, cause and manner of death, type and distribution of injuries, time of death, and toxicological findings where available. The data were systematically entered into a Microsoft Excel spreadsheet and subsequently analyzed using SPSS version 25. Descriptive statistics such as frequencies, percentages, means, and standard deviations were used to summarize the data. Associations between categorical variables were assessed using chi-square test, and a p-value <0.05 was considered statistically significant. Ethical clearance for the study was obtained from the Institutional Ethics Committee prior to data collection, and all patient identifiers were removed to maintain confidentiality and anonymity.

Results

A total of 312 medico-legal autopsies of unnatural deaths were analyzed during the study period of one year. Out of the 312 cases, 234 (75.0%) were males and 78 (25.0%) were females, with a male-to-female ratio of 3:1. The highest number of cases were reported in the 21–30 years age group (31.7%), followed by the 31–40 years age group (22.1%), indicating a predominance of unnatural deaths among young adults. The mean age of the deceased was 34.6 ± 14.2 years.

Table 1: Manner of Death

Manner of Death	Frequency	Percentage
Accidental	191	61.2 %
Suicidal	81	25.9 %
Homicidal	28	9.0 %
Undetermined	12	3.9 %

Table 2. Presents the distribution of unnatural deaths based on autopsy findings during the study period. Road traffic accidents were the most common cause, followed by hanging, poisoning, burns, and drowning.

Table 2: Cause of Death

Cause	Number of cases	Percentage
Road Traffic Accident	142	45.5%
Hanging	42	13.5%
Poisoning	36	11.5%
Burns	29	9.3%
Drowning	25	8.0%
Firearm Injury	8	2.6%
Electrocution	7	2.2%
Sharp Weapon Injury	6	1.9%
Fall from Height	5	1.6%
Others	12	3.9%

Analysis of monthly data showed a peak in unnatural deaths during the monsoon season (July–September) accounting for 29.8% of cases, followed by the summer months (April–June) with 27.6%, winter (October–December) with 24.0%, and the lowest in January–March (18.6%).

Among the 181 trauma-related deaths (including RTA, fall, homicide, firearm), the most commonly injured body region was the head (78 cases, 43.1%), followed by multiple injuries (53 cases, 29.3%), and thoracoabdominal injuries (37 cases, 20.4%). Internal organ injuries, especially involving the brain, lungs, liver, and spleen, were significant contributors to mortality. Out of 36 poisoning cases, organophosphorus compounds were the most commonly identified agents (21 cases, 58.3%), followed by aluminum phosphide (7 cases, 19.4%), and unknown substances (8 cases, 22.2%). Toxicological analysis was pending or inconclusive in 11 cases at the time of report compilation.

There was a statistically significant association between age group and manner of death ($p < 0.05$), with suicides more common in younger adults and accidental deaths predominant in middle-aged males. A significant seasonal variation was observed in cases of drowning and electrocution ($p < 0.05$), with peaks during the monsoon.

Discussion

In the present study, males constituted 75.0% of unnatural deaths, with a male-to-female ratio of 3:1, and the highest incidence was in the 21–30 years age group (31.7%).

This male predominance and concentration in young adults are consistent with findings by Venkatesulu et al. (2022) [12], who reported 72.8% male victims with the most affected age group being 21–30 years. Similarly, in the Thoothukudi youth mortality study (2024) [13], 69.5% of cases were male and young adults were disproportionately affected, underscoring the vulnerability of this demographic due to occupational hazards, higher exposure to outdoor risk factors, and increased involvement in high-speed vehicular travel.

Accidental deaths accounted for 61.2% of cases in our study, followed by suicides (25.9%), homicides (9.0%), and undetermined manner (3.9%). This distribution aligns with the Sharma et al (2024) [14], which found accidental deaths in 55% of cases, suicides in 26.4%, and homicides in 4.65%. The Venkatesulu et al. (2022) [12] also reported a predominance of accidental deaths (58.3%) with suicides and homicides forming smaller proportions. These findings suggest that in most Indian settings, accidental mortality—especially traffic-related—remains the primary contributor, with suicides emerging as a significant secondary concern. Road traffic accidents (45.5%) were the leading cause of unnatural death in our study, followed by hanging (13.5%), poisoning (11.5%), burns (9.3%), and drowning (8.0%). This pattern is similar to that reported by Venkatesulu et al. (2022) [12], where road traffic accidents comprised 47.8% of cases, and to the railway accident analysis from Jibril et al (2021) [15], where transport-related fatalities dominated. However, in the Thoothukudi youth mortality study (2024) [13], hanging and poisoning contributed a larger share among young victims, indicating that age composition of the study population significantly influences cause-of-death patterns.

Our study observed the highest proportion of unnatural deaths during the monsoon season (29.8%), followed by summer (27.6%) and winter (24.0%), with the lowest in January–March (18.6%). This seasonal trend is comparable to the Venkatesulu et al. (2022) [12], which reported peaks in monsoon months due to increased drowning, electrocution, and road accidents associated with adverse weather conditions. Similar findings were noted in the Jibril et al (2021) [15] study, where monsoon months accounted for the highest fatalities, largely attributed to slippery tracks and reduced visibility.

Head injuries were the most common fatal injury pattern in our trauma-related deaths (43.1%), followed by multiple injuries (29.3%) and

thoracoabdominal injuries (20.4%). These results are in line with the Sharma et al (2024) [14], which identified head injuries as the predominant fatal lesion in vehicular trauma. Venkatesulu et al. (2022) [12] also observed a similar pattern, with the head being the most frequently injured region in both accidental and homicidal cases, highlighting the need for targeted preventive strategies such as improved helmet compliance and road safety enforcement. [16]

In our poisoning cases, organophosphorus compounds were most common (58.3%), followed by aluminum phosphide (19.4%) and unknown substances (22.2%). This mirrors the study by Kumar et al (2020) [17], where pesticide ingestion was responsible for 80% of poisoning deaths, and the majority were organophosphorus-related. The study by Rajan et al (2023) [18] also reported pesticides as the leading toxic agent, indicating a persisting rural-agricultural risk profile across various regions of India.

The study was conducted in a single tertiary care center, which may limit the generalizability of the findings to other regions with different socio-demographic and environmental conditions. The study relied on the completeness and accuracy of existing documentation, and some variables such as precise circumstances of death or detailed toxicology reports were unavailable in certain cases.

Conclusion

This observational analysis of 312 unnatural deaths based on autopsy reports at a tertiary care center highlights the predominance of road traffic accidents, followed by suicides and poisoning, with young adult males being the most affected demographic. Seasonal trends and injury patterns observed in this study emphasize the multifactorial nature of such fatalities, reflecting both environmental influences and preventable risk factors.

The findings underline the urgent need for targeted public health measures, improved trauma care systems, enhanced mental health support, and stringent enforcement of safety regulations.

Region-specific autopsy-based data, as generated in this study, serve as a valuable tool for guiding law enforcement agencies, policymakers, and healthcare providers in reducing the burden of unnatural deaths.

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