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ORIGINAL RESEARCH PAPER

A five-year observational study on unnatural female deaths in a tertiary care centre in Mumbai

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ABSTRACT

Background and aims: Women's unnatural deaths, which are frequently caused by homicides, suicides, accidents, and socio-economic reasons such as dowry violence and domestic abuse, are a major public health and forensic concern. Autopsies are crucial for ascertaining the cause of death and discovering foul play. However, the experiences of women in these settings are frequently underreported. The study will examine the medico-legal profile of unnatural female deaths reported at a tertiary healthcare facility. **Methods:** This retrospective analysis examined years of post-mortem records (2019-2023) of unnatural female fatalities, extracting socio-demographics, causes, ways, and circumstances from autopsy and police reports to identify patterns and contributing factors. **Results:** This retrospective analysis examined 434 unnatural female fatalities (January 1, 2019–December 31, 2023) from 5,791 autopsies (female 1,619). Most were 21-30 years old (32.95%), Hindu (81.80%), middle-school educated (45.16%), housewives (69.12%), and married (72.58%; 78.86% over 7 years). Accidents 52.30%, suicides 28.11%, and homicides 19.59%. Accidents: RTAs 34.8%, burns 28.6%, and 82.28% pillion riders. 71.3% of suicides involved hanging. Homicides: blunt trauma 6.69%, husbands 22.22%. Incidents between 12 and 8 pm: 61.98%; deaths: 50.23% at presentation overall. **Conclusion:** Unnatural female deaths primarily afflict young married housewives, who are killed by road traffic (particularly pillion riders), suicide by hanging, and homicides related to marital disputes/domestic violence, which husbands frequently commit. Peaks in the afternoon and evening, as well as a significant number of brought-dead instances, underscore the need for improved traffic safety, prevention of domestic violence, mental-health support, and speedier emergency response.

Keywords: unnatural female fatalities; mode of death; medico-legal autopsy.

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INTRODUCTION

Unnatural deaths of women remain a recurrent medical-legal and public-health issue in India. Beyond their immediate forensic implications, they reflect underlying socio-

economic causes such as gender inequality, intimate partner violence, marital conflict, dowry-related harassment, economic insecurity, and dangerous transportation conditions. According to national statistics, a

significant proportion of female mortality in the reproductive age group is caused by preventable unnatural causes, most commonly accidents (particularly road traffic injuries), suicides (with hanging and poisoning prominent), and homicides (often in intimate or familial settings). These patterns impose a significant strain on families and healthcare systems, as well as specific demands on forensic services entrusted with scientifically determining the cause, manner, and circumstances of death.

According to the National Crime Records Bureau's (NCRB) 2022 report, 445,256 offences against women were registered in India. Murder with rape or gang rape accounted for 250 occurrences, while dowry deaths played a large role, with 6,516 incidents documented. Furthermore, 5,107 incidents of female suicide aid were registered, suggesting a serious worry about women's mental health and the social pressures they confront. Furthermore, 140 occurrences of acid attacks and 38 attempted acid attacks were reported, demonstrating the horrible crime's continuance. The data also indicated a stunning 144,593 incidences of cruelty by husbands and family, accounting for a major fraction of all crimes committed against women. In Mumbai, the crime rate against women is 72.5.¹

This data summary highlights the urgent need for various initiatives to combat violence and discrimination against women in the country. Autopsy-based research is critical to our project. Unlike hospital discharge summaries or police first information reports, which are limited by reporting biases, medico-legal post-mortem examinations combine external and internal examination findings with scene history, medical records, toxicology, histology, and inquest documentation. This triangulation enables reliable classification of cause and method of death, detection of concealed or mixed-mode injuries, differentiation of antemortem vs post-mortem artefacts, and recognition of complicated patterns such as homicide presented as suicide. Such evidence serves as a foundation for fair adjudication

for policymakers and the judiciary, while physicians and public health planners can use it to target prevention efforts.

Mumbai provides a unique urban backdrop for investigating unnatural female mortality. As India's most densely populated metropolis, it combines high-speed transport, overcrowded housing, socio-economic stratification, and significant migrant intakes. These variables influence risk exposure, ranging from high-speed traffic corridors and suburban trains to employment dangers, burns in small household spaces, and psychosocial stressors exacerbated by urban living costs. Simultaneously, Mumbai has tertiary referral hospitals that receive both brain-dead patients and transfers from other facilities, capturing a wide range of severity and scenarios.

Despite the city's size and developed medico-legal infrastructure, extensive, multi-year autopsy-based evaluations that focus solely on women are still very rare. The study will look at the trends, causes, and demographics of unnatural female fatalities in a tertiary care institution in Mumbai, India, over five years. The paper's objectives are to study the socio-demographic characteristics of females who died due to unnatural causes, to classify unnatural deaths based on the manner of death and the mode of death, to evaluate the time intervals between the incident and death, including survival periods in cases of hospital admission, and to identify the role of socio-cultural factors, including dowry-related issues, domestic violence, and mental health, in contributing to these.

MATERIAL AND METHOD

This study is a retrospective, cross-sectional, observational analysis carried out in the Department of Forensic Medicine and Toxicology at Grant Government Medical College in Mumbai, India. The investigation encompasses instances of institutional fatalities submitted for medico-legal autopsy, along with cases referred from external medical facilities or

law enforcement bodies, spanning from January 1, 2019, to December 31, 2023. The data for the study were gathered from autopsy reports, police documents, hospital records, viscera analyses, and histopathological examination findings. The socio-demographic patterns and methods of death were documented.

Inclusion criteria: This study will encompass all instances of female patients who have succumbed to unnatural causes. This includes those who were pronounced dead during treatment as well as those who were brought in deceased, all of which will undergo a comprehensive medico-legal autopsy.

Exclusion criteria: All female fatalities that were officially certified and not subjected to a medico-legal autopsy, as well as those attributed to natural causes of death. Exclusions

were made for all maternal mortality deaths and any deaths of females with unknown status.

The demographic details of the deceased, along with the cause and manner of death, were systematically compiled in Microsoft Excel. The data was then analysed using the software to generate frequency distributions and descriptive statistics.

RESULTS

Out of the 1619 female deaths, 434 cases are included in the study, while the remaining 1185 cases were excluded from the study because they were of natural causes of death, and the cause of death was not ascertained. Regarding age distribution, the highest number of deaths was observed in the 21-30 years age group (143, 32.95%). All other demographic variables are shown in **Table 1**.

Table 1 Socio-demographic distribution

Age distribution	Frequency	Percentage
Less than 10 years	24	5.53%
11 to 20 years	67	15.44%
21 to 30 years	143	32.95%
31 to 40 years	71	16.36%
41 to 50 years	48	11.06%
51 to 60 years	29	6.68%
61 to 70 years	33	7.60%
71 to 80 years	17	3.92%
81 to 90 years	02	0.46%
91 to 100 years	00	0.00%
Place of residence	Frequency	Percentage
Rural	316	72.81%
Urban	118	27.19%
Education-wise distribution	Frequency	Percentage
Honours	00	0.00%
Graduate	01	0.23%
Diploma	80	18.43%
High school certificate	28	6.45%
Middle school certificate	196	45.16%
Primary school certificate	103	23.73%
Illiterate	09	2.07%

Age distribution	Frequency	Percentage
Less than 05 years	17	3.92%
Occupation-wise distribution	Frequency	Percentage
Housewife	300	69.12%
Student	81	18.66%
Working women	36	8.30%
Less than 05 years	17	3.92%
Marital status distribution	Frequency	Percentage
Married	315	72.58%
Unmarried	63	14.52%
Less than 18 years	54	12.44%
Divorced	02	0.46%
Distribution of the duration of marriage	Frequency	Percentage
Marriage within 07 years	65	21.14%
Married for over 07 years	250	78.86%
Time of incidence	Frequency	Percentage
Early Hours (4 am to 12 pm)	104	23.96%
Late Hours (After 12 pm to 8 pm)	269	61.98%
Night Hours (After 8 pm to 04 am)	61	14.06%
Period of survival	Frequency	Percentage
Brought dead	218	50.23%
Less than 06 hours	03	0.69%
06 to 12 hours	03	0.69%
12 to 24 hours	40	9.22%
02 to 03 days	81	18.66%
04 to 07 days	51	11.75%
More than 01 week	38	8.76%

Accidental cases were found to be the maximum (n=227, 52.30%), followed by suicidal (n=122, 28.11%), and homicidal cases were 85 (19.59%), as shown in **Figure 1**.

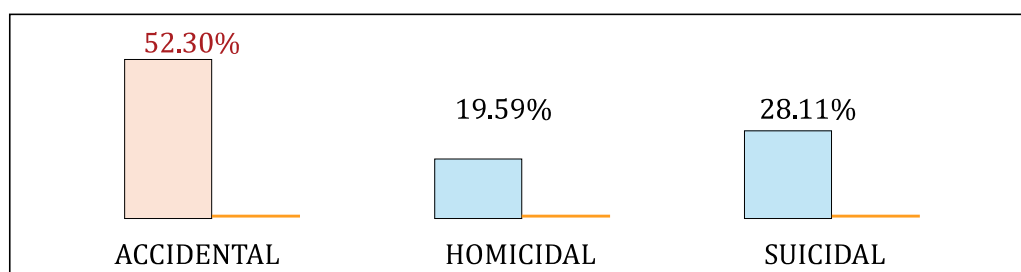


Figure 1 Manner of death-wise distribution

Among the accidental manners of death, road traffic accidents accounted for a majority (n=79, 34.8%), followed by burns (n=65, 28.6%). The detailed distributions of the variables are shown in **Figure 2**.

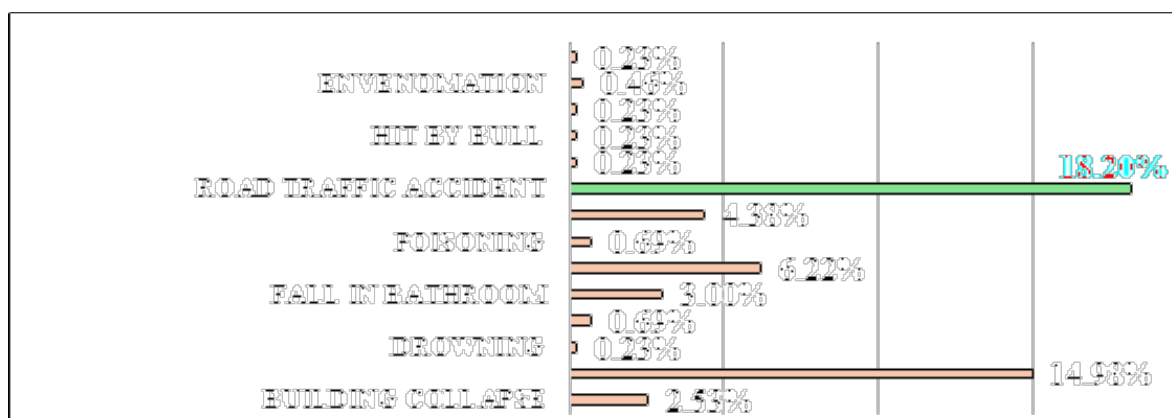


Figure 2 Distribution of accidental deaths

Hanging was the most common method among suicidal cases (n=87, 71.3%), followed by poisoning (n=15, 12.30% of cases) and burns (n=13, 3.00% of cases). The details of the distribution of suicidal deaths are shown in **Figure 3**.

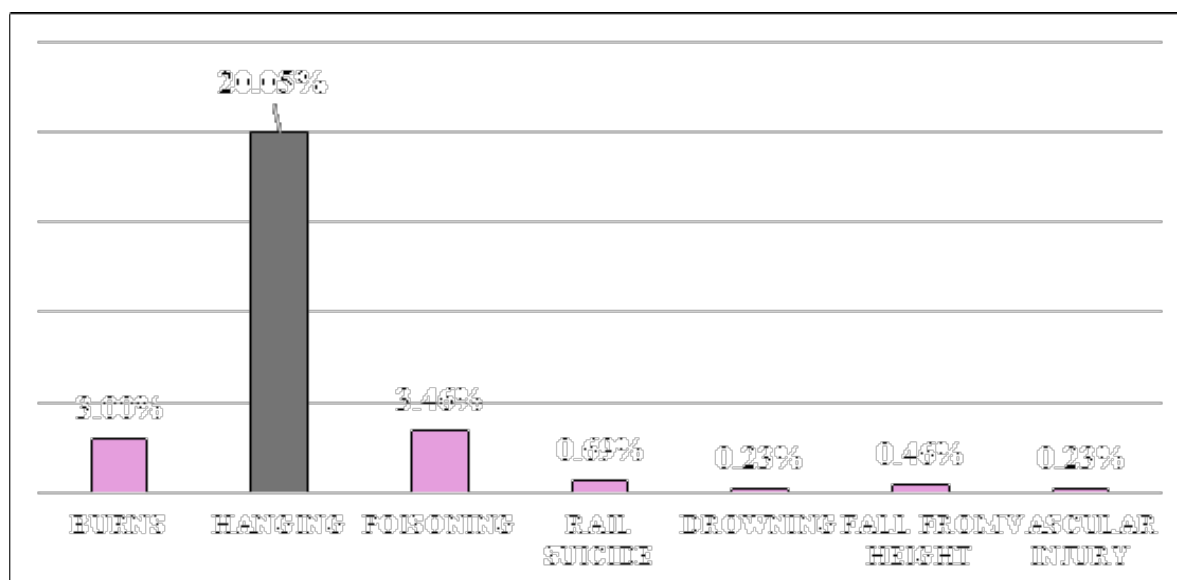


Figure 3 Distribution of suicidal deaths

Assault with a hard and blunt weapon was the most common method in homicide cases (n=29, 6.69%), followed by ligature strangulation (n=18, 4.61% of cases) and cut throat injury (n=12, 2.76% of cases). Homicidal drowning comprised 1 case (0.23%), as shown in **Figure 4**.

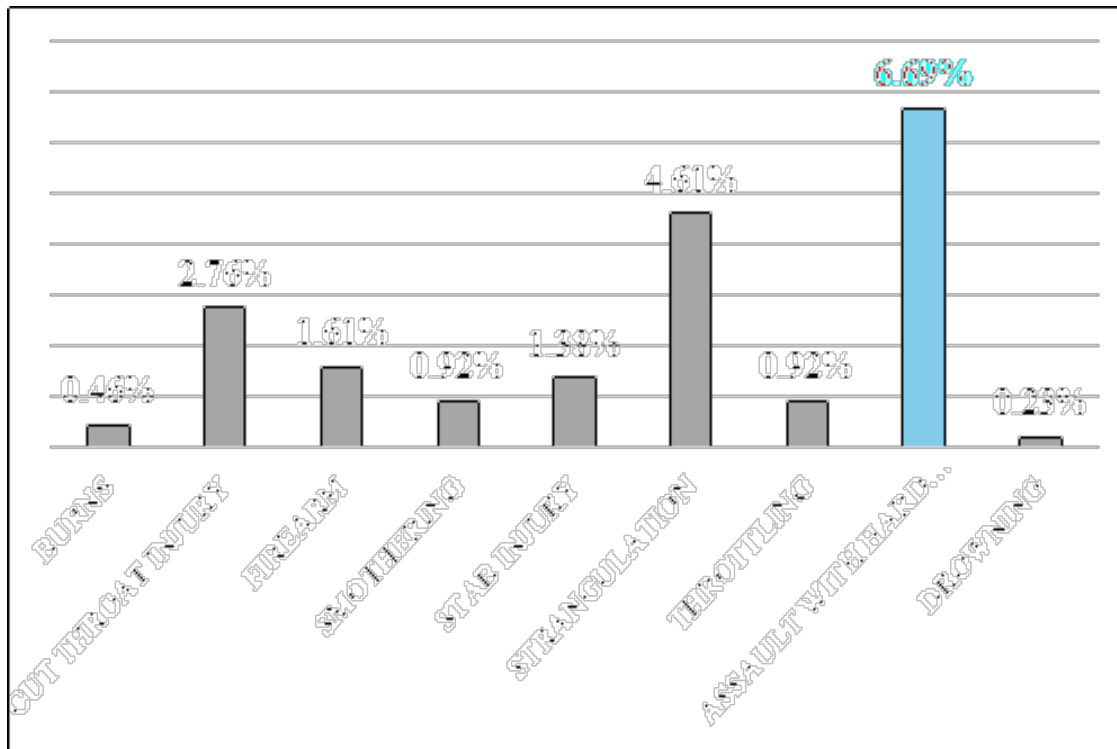


Figure 4 Distribution of homicidal deaths

In the homicidal manner of death, 10 cases (2.30%) had genital injuries. Among these 10 cases, the majority (n=8, 1.84%) of the females were under 18 years of age. Smothering, strangulation, throttling, assault with a hard and blunt weapon and drowning were the causes of death in these cases.

While considering the driving factor for suicides, marital disputes were the most common (n=67, 15.44%), as shown in **Figure 5**. Among homicidal cases, marital dispute-related deaths were the most common (n=27, 6.22%),

as shown in **Figure 6**. The alleged perpetrator in most of the cases was the husband (n=46, 22.22%), as shown in **Figure 7**.

The majority of cases occurred in late hours, i.e., 12 pm to 08 pm (269, 61.98% of cases), followed by early hours, i.e., after 04 am to 12 pm (104, 23.96%), and night hours, i.e., after 08 pm to 04 am (61, 14.06% of cases). According to the period of survival distribution, the majority of cases (218, 50.23%) were brought dead, as shown in **Table 1**.

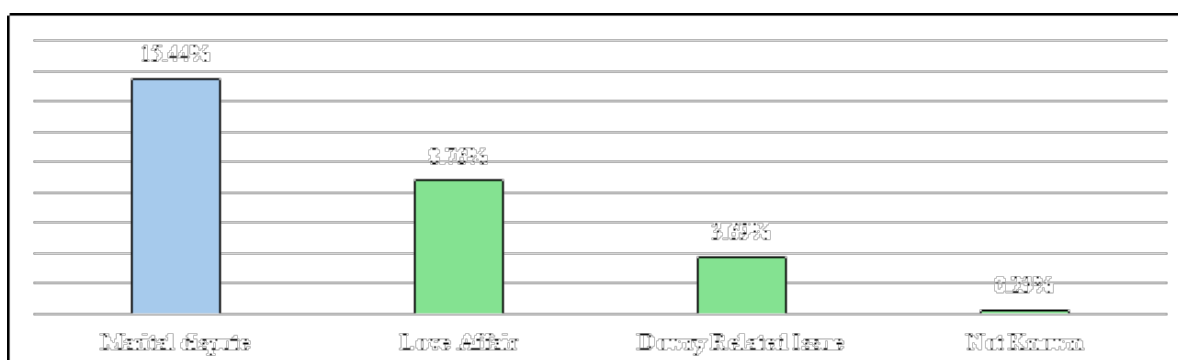


Figure 5 Distribution of driving factors for suicidal death

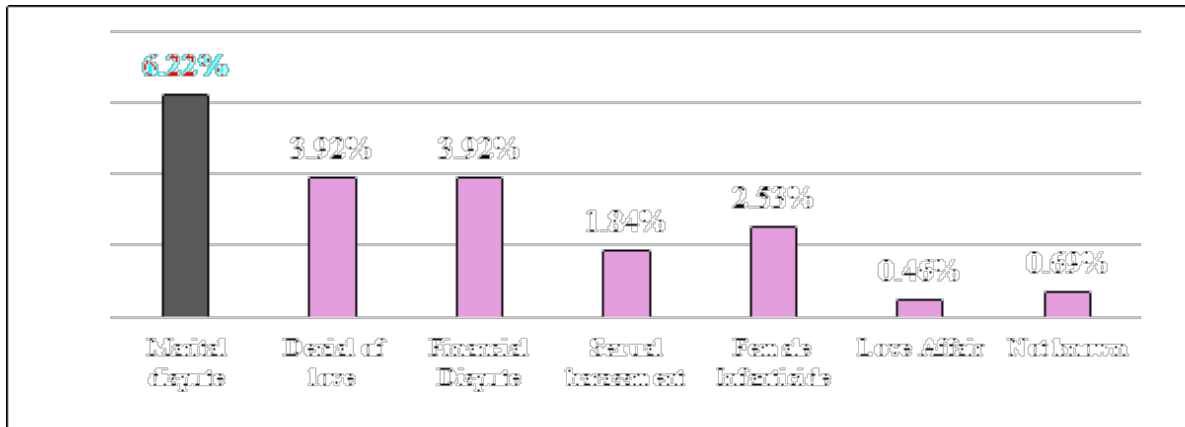


Figure 6 Distribution of driving factors for homicidal death

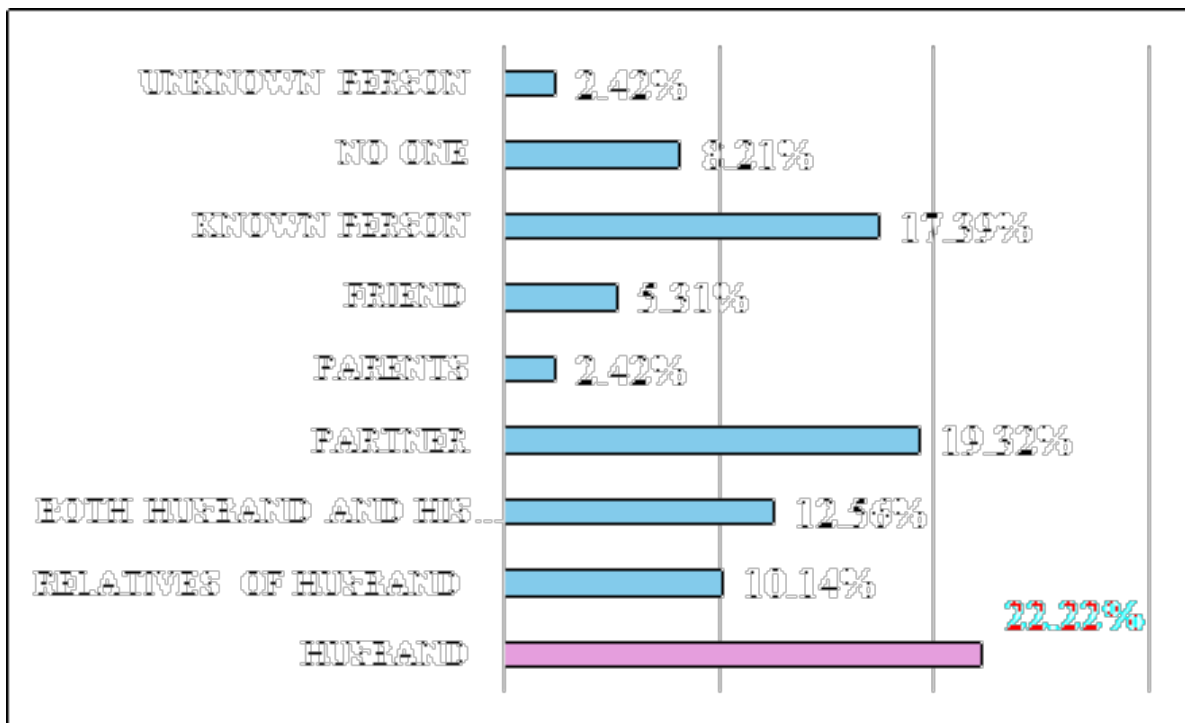


Figure 7 Distribution of the alleged perpetrator

DISCUSSION

The highest incidence of cases occurred in the 21 to 30 years age group ($n = 143$, 32.95%). These findings were consistent with several recent investigations.²⁻⁷ 316 (72.81%) of the occurrences occurred in rural regions, corroborating research conducted in India.^{3,6,8} In the examination of educational attainment among the study subjects, middle school was the predominant level ($n=196$, 45.16%), followed by primary school (23.73%). The

results contrast with other recent research.^{4,9,10} The disparity in educational attainment among these studies may stem from variations in educational access and rural representation in the current study.

The predominant demographic of deceased females was housewives ($n=300$, 69.12%), consistent with other research.^{4-6,10} Among the 315 cases, 72.58% were married, representing the majority, and these results align with prior studies.^{2-6,9,11} Among married women ($n=250$,

78.86%), the majority had been wed for more than 7 years.

Accidental incidents comprised the bulk (n=227, 52.30%), followed by suicidal cases (n=122, 28.11%), while homicidal cases totalled 85 (19.59%). The findings aligned with prior research.^{6,9,11-14} Although they deviated from the studies undertaken by others.^{2,5,7,16} The variance in findings about the way of death reflects divergent patterns in socio-cultural, economic, and regional factors affecting this aspect.

Road traffic accidents represented the most frequent cause of mortality among accidental fatalities (n=79, 18.20% of cases). These findings align closely with those reported in previous investigations.^{9,11-14} It differs from another study,² in which poisoning is the leading cause of mortality among accidental cases. This may be attributable to regional differences.

In cases of suicide, hanging was identified as the most prevalent cause of death (n=29, 6.69% of cases), followed by poisoning (n=15, 12.30% of cases) and burns (n=13, 3.00% of cases). This finding aligns with existing studies,^{9,12} while contrasting with other research,^{2,5} which indicates that poisoning is the leading cause of death. The discrepancies in findings may be ascribed to various factors, including geographical and demographic variations, cultural differences, access to specific resources, temporal trends, reporting methodologies, and psychosocial influences affecting the selection of suicide methods.

In the realm of homicidal incidents, fatalities resulting from assaults involving hard and blunt instruments were the most prevalent (n=29, 6.69% of cases), followed by ligature strangulation (n=18, 4.61% of cases) and injuries from throat cutting (n=12, 2.76% of cases). The results align with the research conducted in India.^{2,9} In a research,⁵ ligature strangulation emerged as the predominant cause of death in homicidal cases. Conversely, the investigation¹³ identified assault with a sharp weapon as the leading cause of death in

similar cases. The disparities in the causes of death within homicidal cases may stem from a variety of factors, including regional differences in violent crime patterns, socio-economic and cultural contexts, the accessibility and utilisation of weapons (such as sharp or blunt instruments), variations in criminal behaviour or modus operandi, and prevailing local crime trends that shape the methods employed in homicides. The alleged perpetrator in suicidal and homicidal cases was the husband (n=46, 22.22% of cases). These are consistent with a recent study.⁹

In the present study, the driving factor for death in suicidal and homicidal cases was marital dispute (n=94, 21.7% of cases). This is similar to studies,^{13,16} and differs from study 9, where mental stress was the most common driving factor. The difference could be due to variations in the study populations, regional factors, cultural contexts, or differences in how marital disputes and mental stress were perceived and reported across the two studies.

The majority of cases occurred in late hours, i.e., 12 pm to 08 pm (269, 61.98% of cases). These results were similar to a recent study⁷ and differed from another research finding,⁹ which found that 09 pm to 06 am was the most common time of incidence. The difference in timing of incidents between the present study and Kumar S et al.'s study¹⁰ could be due to regional and cultural differences, daily routines, or the availability of support systems in Lucknow, India, compared to the population in the present study, which may influence when such incidents are more likely to occur.

CONCLUSIONS

This research presents an in-depth examination of unnatural female deaths across five years, highlighting significant demographic, socio-economic, and regional trends. The results indicate that the majority of cases occurred in the 21-30 age group, primarily in rural regions, with housewives being the most affected demographic. Accidental

deaths, especially those resulting from road traffic incidents, constituted the predominant cause of mortality, followed by suicides and homicides. Marital disputes emerged as the primary factor contributing to both suicidal and homicidal deaths. The research identified notable discrepancies in the timing of incidents and causes of death relative to other studies, attributable to regional, cultural, and socio-economic factors. The findings highlight the need for targeted interventions, such as enhanced road safety awareness, mental health support, and marital counselling, especially in rural regions. The findings offer significant insights into female mortality patterns and

establish a foundation for formulating region-specific preventive strategies aimed at reducing unnatural female deaths.

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Conflict of interest: None declared.

Contribution of authors: We declare that this work was done by the authors named in this paper, and the authors will bear all liabilities about claims relating to the content of this article.

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