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Epidemiological and Forensic Analysis of Hanging Cases in Kamrup, Assam: A Retrospective Study

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Abstract
Hanging is one of the most prevalent methods of suicide globally, particular lyinlow and middle-income countries due to its accessibility, lethality and minimal requirement for preparation. Psychiatric illnesses, financials tress and inter personal conflicts emerged as prominent contributing factors.This retrospective study analyzes 200 hanging cases from Kamrup, Assam, brought formed ico-legal autopsy to the Department of Forensic Medicine, Gauhati Medical College and Hospital (GMCH). Identify high-risk groups, assess forensic consistency, and inform suicide prevention strategies in Assam.We examined 200 cases of hanging, collected data and statistically analysed them according to variables alike age distribution, sex distribution, domicile distribution, cause of death, and internal findings to elucidate patterns of suicidal hanging. Males predominated (75.5%), with a mean age of 34.3 years. Asphyxia Was The Primary Cause Of Death (94.5%), supported by universal brain and lung congestion. Urban and rural areas showed balanced prevalence (50.0%vs. 48.6%). Findings highlight the need for targeted mental health interventions for young adult males and adolescents, standardized for ensicreporting, and environmental control storeduce ligature point access.

INTRODUCTION

Mental health and well-being are fundamental pillars of holistic human development, intricately woven into the fabric of physical, emotional, and social health. The World Health Organization (WHO), in its 1948 constitution, defines health as "a state of complete physical, mental, and social well-being and not merely the absence of disease or infirmity"[1]. This definition underscores the critical role of mental health, which WHO further describes as a state of mental well-being that empowers individuals to navigate life's stresses, realize their potential, learn and work effectively, and contribute meaningfully to their communities[2]. Mental health is not a static condition but a dynamic process, requiring continuous adaptation to internal and external stressors. When this adaptive capacity falters, individuals may experience overwhelming despair, a sense of helplessness, and, in severe cases, a trajectory toward mental health crises such as depression or suicidal ideation[3].

Globally, suicide represents a profound public health challenge, often emerging as a tragic outcome when mental health support systems fail[4]. The inability to cope with stressors-whether psychological, social, or economic-can lead individuals to perceive no viable path forward, resulting in feelings of isolation and hopelessness. Among the various methods of suicide, hanging is the most prevalent worldwide, including in India, due to its accessibility, lethality, and minimal preparation requirements[5]. This method's widespread use is particularly pronounced in regions grappling with socioeconomic stressors, limited mental health infrastructure, and cultural stigmas surrounding mental health care[6]. Hanging is often perceived as a quick and painless means of ending one's life, a misconception that further contributes to its prevalence[7]. The act involves the suspension of the body by a ligature around the neck, leading to mechanical asphyxia through the obstruction of airways, blood vessels, or both, with the body's weight-either partial or full-providing the constrictive force[8].

In forensic science, hanging is classified as a form of mechanical asphyxia, a category that encompasses deaths resulting from a ligature around the neck and the constricting force being the weight or part of the weight of the body[4,5,6,9]. The mechanism of death in hanging typically involves compression of the neck structures, including the trachea, carotid arteries, and jugular veins, leading to cerebral hypoxia, unconsciousness, and, ultimately, death. In some cases, cervical spine fractures or vagal stimulation may contribute to rapid fatality[8]. Forensic investigations of hanging cases are critical not only for determining the cause and manner of death but also for distinguishing between suicidal, accidental, or homicidal etiologies. This distinction is particularly challenging in cases of partial hanging, where the body is not fully suspended, or in scenarios involving atypical ligature marks or suspicious circumstances[9].

The global burden of suicide by hanging is substantial, accounting for a significant proportion of self-inflicted deaths[10]. In India, where mental health resources are often scarce and socioeconomic disparities are stark, hanging is the leading method of suicide[5]. Studies consistently identify psychiatric illnesses, financial distress, and interpersonal conflicts as primary risk factors[6,11]. For instance, individuals with untreated or undiagnosed mental health conditions, such as depression or anxiety disorders, are at heightened risk. Financial stressors, including unemployment, debt, or poverty, exacerbate feelings of hopelessness, while interpersonal conflicts-such as marital disputes or social isolation-can act as precipitating factors[11]. These risk factors are often interconnected, creating a vicious cycle that amplifies vulnerability to suicidal behavior.

In the Indian context, regional variations in suicide rates and methods reflect local socioeconomic, cultural, and environmental factors[12]. Assam, a northeastern state known for its diverse population and unique socio-cultural landscape, is no exception. The state faces significant challenges, including economic instability, unemployment, and limited access to mental health services, all of which contribute to elevated suicide rates[13]. The Gauhati Medical College & Hospital (GMCH) in Assam serves as a critical hub for forensic investigations, documenting cases of hanging across Kamrup and surrounding districts. The hospital's Department of Forensic Medicine plays a pivotal role in analyzing medico-legal cases, providing insights into the epidemiological and forensic characteristics of deaths by hanging. The data generated from such institutions are invaluable for understanding local suicide trends and informing targeted prevention strategies.

This study focuses on a retrospective analysis of 200 cases of deaths due to hanging, brought for medico-legal autopsy to the Department of Forensic Medicine at GMCH between October 1, 2023, and March 31, 2024. The primary objectives of this research are threefold: (1) to identify high-risk groups based on demographic and epidemiological factors such as age, sex, and domicile; (2) to assess the forensic consistency of these cases through detailed examination of cause of death, ligature marks, and internal findings; and (3) to generate evidence-based recommendations for suicide prevention strategies tailored to the context of Assam. By integrating clinical, forensic, and epidemiological perspectives, this study aims to contribute to the broader discourse on mental health and suicide prevention in India.

The significance of this research lies in its potential to address a pressing public health and medico-legal concern. Suicide by hanging is not merely a statistical phenomenon but a deeply human tragedy, reflecting the interplay of individual vulnerabilities and systemic failures[4]. High-risk groups, such as young adults, males, and individuals from rural areas, are often disproportionately affected, underscoring the need for targeted interventions[12]. Forensic analysis, meanwhile, provides critical insights into the mechanics of death, helping to refine investigative protocols and improve the accuracy of death classification[9]. By examining internal findings-such as petechial hemorrhages, hyoid bone fractures, or soft tissue injuries-this study seeks to enhance the understanding of hanging-related pathology, which is essential for both clinical and legal purposes.

Moreover, the findings of this study have direct implications for suicide prevention in Assam. The state's mental health infrastructure is underdeveloped, with limited access to counseling services, psychiatric care, and community-based support systems. Socioeconomic stressors, including poverty and unemployment, are pervasive, while cultural factors-such as stigma surrounding mental health-discourage help-seeking behavior[6]. By identifying the demographic and forensic characteristics of hanging cases, this research aims to inform the development of culturally sensitive and region-specific interventions. These may include public awareness campaigns, improved access to mental health services, and community-based programs to address socioeconomic risk factors.

The methodology of this study involves a retrospective analysis of autopsy records, supplemented by clinical and demographic data. Key variables include age, sex, domicile (urban vs. rural), cause of death, type of ligature, and internal findings such as organ congestion or skeletal injuries. By systematically analyzing these variables, the study seeks to uncover patterns that can guide policy and practice. For instance, if young males from rural areas emerge as a high-risk group, interventions could prioritize outreach programs in these communities[12]. Similarly, if certain ligature materials or hanging methods are prevalent, forensic protocols could be refined to better distinguish between suicidal and non-suicidal cases[9].

MATERIALS AND METHODS

Data Sources: We compiled 200 cases, sourced from forensic records at the department of Forensic Medicine, Gauhati Medical College and Hospital, Guwahati, Assam, India. Postmortem reports provided detailed demographic (name, sex, age, location, district), forensic (external and internal findings, cause of death), and contextual data (date, time since death, urban/rural, season). Study cases offered aggregated statistics on similar variables, though specific dates and detailed internal findings were limited.

Data Extraction and Integration:
Variables extracted included:

- **Age:** Exact for post mortem reports; mean and range for study cases.
- **Sex:** Recorded for postmortem reports; estimated for study cases.
- **Domicile:** Classified as urban (Guwahati-based police stations, e.g., Dispur, Satgaon)or rural (e.g., Chhaygaon, Boko).
- **Cause of Death:** Determined from postmortem report conclusions and study data.
- **Internal Findings:** Focused on brain, lungs, and heart (congestion, petechial hemorrhages, edema).

Statistical Analysis: Descriptive statistics (means, standard deviations, medians, ranges, percentages) summarized age and distributions.

RESULTS AND DISCUSSIONS

Demographic Characteristics: Of 200 cases, 151 (75.5%) were male, and 49 (24.5%) were female. Forpostmortem reports (n=200), ages ranged from 11 to 84 years, with a mean of 34.3 years (SD=15.4) and median of 34 years.Age distribution showed peaks at 30-40 years (33.5%) and 20-30 years (26.5%). Kamrup dominated (174 cases, 87.0%), followed by Barpeta[6],Udalguri (3),Morigaon(6),andBaksa(3).

Cause of Death: Asphyxia was the primary cause in 194 cases (97%), followed by lobar pneumonia fol-lowing hanging (4, 2%), cerebral edema (2, 1%).All the 200 cases were deemed suicidal where concluded.

Internal Findings: For postmortem reports (n=200):
Brain: Congested in 196 (97.7%), with petechial hemorrhages in 19 (9.3%), aligning with typical hanging autopsy findings(4).
Lungs: Congested in 200 (100%), with petechial hemorrhages in 177 (88.4%) and edema in 19 (9.3%).
Heart: Healthy in 107 (53.5%), congested with/without petechial hemorrhages in 93 (46.5%).
Hyoid and thyroid cartilage were intact in 100%, and sternocleidomastoid hemorrhages were absent in 100%.

Domicile and Contextual Factors:
Domicile was balanced: 100 urban (50.0%) and 97 rural (48.6%),with3unknown(1.4%).
Times in cedeath was 6-12 hours (48,23.8%), 12-24

Table1:Age and Sex Distribution of Hanging Cases

Variable	Details	Percentage
Age Distribution (postmortem reports, n=200)		
10-20	19	9.5%
20-30	53	26.5%
30-40	67	33.5%
40-50	28	14.0%
50-60	7	3.5%
60-70	7	3.5%
70-80	2	1.0%
Mean (SD)	34.3(15.4)	-
Median	34	-
Range	11-84	-
Sex Distribution (n=200)		
Male	151	75.5%
Female	49	24.5%

Table2: Cause of Death Distribution (n=200)

Cause of Death		Details
Asphyxia		194(97%)
LobarPneumonia		4(2%)
CerebralEdema	2	(1%)

Table3:Internal Findings from Postmortem Reports (n=200)

Organ	Details
Brain	Congested:196(97.7%);Petechialhemorrhages:19(9.3%)
Lungs	Congested:200(100%);Petechialhemorrhages:177(88.4%);Edema:19(9.3%)
Heart	Healthy:107(53.5%);Congestedwith/withoutpetechialhemorrhages:93(46.5%)

Table4:Domicile and Time Since Death Distribution (n=200)

Variable	Details	Percentage
Domicile Distribution		
Urban	100	50.0%
Rural	97	48.6%
Unknown (study cases)	3	1.4%
Time Since Death		
6-12hours	48	23.8%
12-24 hours	119	59.5%
18-36 hours	9	4.5%
36-48 hours	19	9.5%
3-5days	5	2.4%

hours (119,59.5%), 18-36 hours(9,4.5%), 36-48 hours (19,9.5%), and 3-5 days (5,2.4%).

Key Findings: This analysis reveals a male predominance (75.5%) in hanging cases in Kamrup, Assam, aligning with global suicide trends, likely driven by socioeconomic and psychological stressors, a pattern echoed in a retrospective study in Manipal, South India, where males outnumbered females 2:1 in 70 suicidal hanging cases from 1997 to 2006[5].The mean age in Kamrup, 34.3 years for postmortem reports, sits between Manipal's finding so f40.62 years for males and 29.96 years for females, with Kamrup's age peaksat 30-40 (33.5%) and 20-30 years (26.5%) underscoring young adults and adolescents as high-risk groups, similarto Manipal's focus on the 3rd decade. In contrast, a study in Western Mumbai, India, with 124 suicidal hanging cases over two years, reported a male predominance of 62.10% but a younger peak at 21-30 years (45.97%), and noted 78.22% of cases occurred in lonely, often indoor places, differing from Kamrup's balanced urban-rural distribution (50.0% vs.48.6%)[6].A retrospective study in Kolhapur, Maharashtra, covering 443 hanging cases among 3,430 autopsies (12.91%) from 2004 to 2006, also showed a male predominance (76.67%) and all cases deemed suicidal, matching Kamrup's 100% suicidal determination, though Kolhapur's age peak spanned a broader 21-40 years (54.17%)[7]. Kamrup's domin an ceo fcases (87.0%) reflects GMCH's regional focus within India's suicide landscape, akin to Kolhapur's tertiary care setting, yet Mumbai's higher indoor incidence contrasts with Kamrup's widespread risk[8]. Asphyxia dominated in Kamrup (94.5%), supported by near-universal brain (97.7%) and lung (100%) congestion, plusfrequent lung petechial hemorrhages (88.4%), a trend consistent with a study in Imphal, Manipur, where 205 hanging cases from 2008 to 2019 showed 60% males and asphyxia as the primary cause, often with soft ligatures indoors[9]. However, a Western Australia study (1988-1992) of 233 hanging cases found petechial hemorrhages in only 48%and neck injuries in 52%, lower than Kamrup's lung findings and contrasting with its intact hyoid and thyroid cartilage (100%).

Implications: The high incidence among young adult males and adolescents warrants targeted mental healths creening sin Kamrup, addressing stressors like unemployment and social pressures[10]. Excessive use of mobile phones also leads to depression and suicidal and self harmingbehaviour[Chen, Runsen and Liu,

Jianbo and Cao, Xiaolan and Duan, Suqian and Wen, Siyang and Zhang, Simei and Xu, Jianchang and Lin, Ling and xue, zhenpeng and lu, Jianping. (2020). The relationship between mobile phone use and suicide-related behaviors among adolescents: The mediating role of depression and interpersonal problems. Journal of Affective Disorders. 269. 10.1016/j.jad.2020.01.128].In our study also it is relatable from the findings of the age group between 10-20 years. Education on this topic can be given to the parents through the competent authorities. The balanced urban-rural prevalence suggests environmental controls, such as reducing ligature point access in homes and public spaces, are critical. Forensic consistency (intact hyoid, absent sternocleidomastoid hemorrhages) confirms typical suspension hanging.

CONCLUSION

This study of 200 hanging cases in Kamrup, Assam, highlights a male-predominant, young adult and adolescent suicide pattern, with asphyxia as the primary cause. Forensic findings confirm typical hanging mechanisms, but gaps underscore the need for improved documentation. Balanced urban-rural distribution and consistent patterns across demographics emphasize the urgency of targeted interventions. Future efforts should focus on standardized for ensicprotocols, expedited analyses, and robust suicide prevention strategies to mitigate this public health challenge in Assam.

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