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Original Article

PROFILE OF SUICIDAL HANGING CASES BROUGHT FOR AUTOPSY IN A TERTIARY HEALTHCARE CENTER

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ABSTRACT

Objective: Suicide by hanging is a significant cause of death worldwide, with a rising incidence, particularly among young adults. This study aims to analyze the medico-legal and socio-demographic profile of suicidal hanging cases to identify forensic patterns and contributing factors for prevention strategies.

Methods: A prospective, observational study was conducted at the Department of Forensic Medicine and Toxicology, Jorhat Medical College and Hospital, over one year (June 2021–May 2022). A total of 653 medico-legal autopsies were reviewed, of which 164 (25.11%) were identified as suicidal hanging cases. Data on demographics, forensic findings, circumstantial factors, and motives were analyzed using descriptive statistics.

Results: The majority of victims were male (76.22%), with the most affected age group being 21-30 y (28.05%). The right mastoid was the most common knot position (38.41%), and plastic or nylon rope was the most frequently used ligature material (52.44%). Most incidents occurred at night (48.78%) and in bedrooms (51.22%). Substance abuse was present in 75.61% of cases. Marital disharmony (27.44%) and financial problems (20.12%) were leading motives. Complete hanging was more common (89.02%) than partial hanging. Internal injuries were observed in varying degrees, with injury to strap muscles (16.46%) being the most frequent.

Conclusion: The findings highlight the role of socio-economic stressors and substance abuse in suicidal hanging cases. Identifying high-risk groups and implementing targeted mental health interventions, substance abuse rehabilitation, and social support measures are crucial in suicide prevention. Further multi-center studies and psychological autopsy investigations are recommended for a more comprehensive understanding.

Keywords: Asphyxia, Autopsy, Forensic analysis, Hanging, Suicide, Substance abuse

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INTRODUCTION

Hanging is a form of violent mechanical asphyxia resulting from neck constriction due to body suspension, where the body's or head's weight acts as the constricting force [1]. It is one of the leading global causes of death, accounting for over a million fatalities annually, with India witnessing a significant number of suicides by hanging, alongside other methods such as poisoning, burning, and drowning [2]. Over the past few decades, suicide by hanging has increased, particularly among young adults, due to the easy accessibility of materials needed for such an act, unlike firearms or poisons [3]. Hanging does not always require full suspension, and in cases of partial suspension, the victim may be found kneeling, crouching, or even standing while using a ligature to tighten around the neck [4]. The ligature mark is often the primary evidence in such cases, and survivors may suffer severe injuries, including cerebral anoxia, laryngeal fractures, spinal injuries, or carotid artery damage, leading to permanent disabilities [5]. Suicidal hanging may sometimes be a last resort after failed attempts using other methods such as poisoning or sharp force injuries, with individuals experiencing initial power loss, flashing lights, ringing in the ears, and rapid unconsciousness, making it a relatively painless form of death [6]. According to the World Health Organization (WHO), around 170,000 of the estimated 900,000 global suicide deaths annually occur in India, while the National Crime Records Bureau (NCRB) estimated 135,000 suicides in India in 2011. The country has seen a 17.3% rise in suicide cases over a decade, with states like Madhya Pradesh reporting a significant proportion of cases [7]. While suicidal hangings are the most common, accidental and homicidal cases are rare, making forensic analysis crucial in distinguishing between different types of hanging deaths [8].

Hanging cases are predominantly considered suicidal unless proven otherwise, necessitating a thorough forensic examination to confirm the ante-mortem nature of the ligature marks and exclude other causes. The neck, being a vital anatomical region, contains crucial structures such as muscles, glands, trachea, esophagus, larynx, blood vessels, nerves, and vertebrae, all of which can be impacted in hanging deaths [9]. Classic hanging occurs when the suspension point is at the center of the occipital region, resulting in maximal vascular occlusion, while atypical hangings occur when the suspension point is located elsewhere [4]. Over the past 45 y, global suicide rates have risen by 60%, with approximately one person dying by suicide every 40 sec, contributing to 1.8% of worldwide deaths [2]. The reasons for suicide by hanging vary by region and may include financial distress, loss of property, relationship issues, physical or mental suffering, and religious or social pressures [3]. This study aims to analyze the medico-legal and socio-demographic profile of suicidal hanging cases to uncover forensic patterns and contributing factors for effective prevention. It focuses on assessing the prevalence and demographics of victims, examining forensic evidence such as knot position, ligature materials, and internal injuries, and evaluating circumstantial factors including time, location, and substance abuse. Additionally, it seeks to identify trends and common motives like marital conflict, financial stress, and mental health conditions, along with seasonal variations in incidence.

MATERIALS AND METHODS

Study Design: This is a prospective, observational, descriptive, and quantitative study analyzing medico-legal autopsy records of suicidal hanging cases.

Study Setting and Duration: The study was conducted at the Department of Forensic Medicine and Toxicology, Jorhat Medical College and Hospital, over a one-year period from 1st June 2021 to 31st May 2022.

Study Population: A total of 653 medico-legal autopsies were performed during the study period, out of which 164 cases (25.11%) were identified as deaths due to suicidal hanging.

Inclusion criteria

- Autopsy cases confirmed as suicidal hanging based on medico-legal examination.
- Cases with complete forensic documentation, including ligature mark analysis, internal injuries, and circumstantial evidence.
- Cases with available demographic details such as age, gender, and socio-economic background.
- Cases occurring within the study period (June 1, 2021 – May 31, 2022) at Jorhat Medical College and Hospital.

Exclusion criteria

- Cases of hanging suspected to be homicidal or accidental based on forensic evaluation.
- Cases with incomplete or missing autopsy records.
- Decomposed bodies where forensic findings could not be reliably assessed.
- Cases with insufficient circumstantial data, including unknown identity or lack of relevant background information.

Data Collection and Parameters: Autopsy records were reviewed to collect information on demographics (age, gender), forensic findings (knot position, ligature material, internal injuries), and circumstantial factors (time and place of occurrence, presence of suicide notes). Additionally, data on substance abuse history (alcohol/drug use) and motive analysis (marital disharmony, financial stress, psychiatric conditions) were recorded. Seasonal and temporal trends were analyzed through the month-wise distribution of cases.

Data Analysis: Descriptive statistics were applied to calculate frequencies and percentages. A comparative analysis was performed with findings from previous studies to identify patterns, trends, and variations.

Ethical Considerations: Institutional ethics committee approval was obtained before conducting the study. Patient confidentiality and privacy were strictly maintained by anonymizing all collected data.

RESULTS

During the period of study, i. e., from 1st June 2021 to 31st May 2022, a total of 653 medico-legal autopsies were performed in the mortuary of the Department of Forensic Medicine and Toxicology, Jorhat Medical College and Hospital, Jorhat. Out of these, 164 cases were due to hanging deaths, constituting 25.11% of the total autopsies performed.

Table 1: Prevalence of hanging cases among total autopsies

Total number of autopsies	Number of hanging cases	Percentage of hanging cases
653	164	25.11%

Table 1 presents the prevalence of hanging cases among total autopsies conducted during the study period. Out of 653 autopsies, 164 cases (25.11%) were due to hanging. This indicates that hanging is a significant cause of death among the cases examined. The data suggests that nearly one-fourth of all autopsy cases resulted from hanging, highlighting its prevalence as a common method of fatal self-harm.

Table 2: Age and sex wise distribution of hanging cases

Age range (Years)	Male (No.)	Male (%)	Female (No.)	Female (%)	Total (No.)	Total (%)
0-10	0	0.00	0	0.00	0	0.00
11-20	13	7.93	12	7.32	25	15.25
21-30	33	20.12	13	7.93	46	28.05
31-40	36	21.95	5	3.05	41	25.00
41-50	18	10.97	4	2.44	22	13.41
51-60	10	6.10	3	1.83	13	7.93
61-70	11	6.71	1	0.61	12	7.32
71-80	2	1.22	0	0.00	2	1.22
81-90	2	1.22	1	1.22	3	1.83
91-100	0	0.00	0	0.00	0	0.00
Total	125	76.22	39	23.78	164	100.00

Table 2 shows the age and sex-wise distribution of hanging cases. A significant majority of cases (76.22%) involve males, while females account for 23.78%. The highest number of cases occurs in the 21-30 y age group (28.05%), followed by 31-40 y (25%) and 11-20 y (15.25%). This indicates that younger adults, particularly males, are at a higher risk. The incidence decreases progressively in older age groups, with minimal cases beyond 60 y. The absence of cases in the 0-10 and 91-100 y age ranges suggests that extreme age groups are less affected by hanging cases.

Table 3: Month-wise distribution of total autopsies vis-a-vis hanging cases

Months	Total number of cases	Number of hanging cases	Percentage
June 2021	51	19	37.25
July 2021	53	12	22.64
August 2021	57	23	40.35
September 2021	63	15	23.82
October 2021	71	16	22.54
November 2021	42	12	28.57
December 2021	44	07	15.91
January 2022	50	08	16.0
February 2022	54	15	27.78
March 2022	59	11	18.65
April 2022	42	10	23.81
May 2022	67	16	23.88
Total	653	164	25.11

Table 3 shows the month-wise distribution of total autopsies and corresponding hanging cases. The highest percentage of hanging cases was reported in August 2021 (40.35%), followed by June 2021 (37.25%) and November 2021 (28.57%).

Table 4: Distribution of the study population according to position of knot

Position of knot	No. of cases	Percentage
Left mastoid	51	31.10
Right mastoid	63	38.41
Left mandible	8	4.88
Right mandible	15	9.15
Occiput	27	16.46
Total	164	100

Table 5: Distribution of the study population according to ligature material

Ligature material	No. of cases	Percentage (%)
Plastic or nylon rope	86	52.44
Dupatta	21	12.80
Saree or Sador	25	15.24
Bed sheet	9	5.49
Coir rope	4	2.44
Electric wire	3	1.83
Cotton rope	6	3.66
Lungi	7	4.27
Telephone or cable wire	3	1.83
Total	164	100.00

Table 4 shows position of knot was the right mastoid (38.41%), followed by the left mastoid (31.10%), occiput (16.46%), right mandible (9.15%), and left mandible (4.88%).

Table 5 presents the distribution of ligature materials used in hanging cases which revealed that the most common material was plastic or nylon rope (52.44%), followed by saree or sador (15.24%), dupatta (12.80%), bed sheet (5.49%), lungi (4.27%), cotton rope (3.66%), coir rope (2.44%), electric wire (1.83%), and telephone or cable wire (1.83%).

Table 6 highlights that 75.61% of individuals experiencing suicidal ideation had a history of substance abuse, while 24.39% did not. This significant association aligns with previous research indicating that substance abuse is a major risk factor for suicidal behavior.

Table 6: Distribution of the study population according to substance abuse

Substance abuse	No. of cases	Percentage
Present	124	75.61
Absent	40	24.39
Total	164	100

Table 7: Distribution of the study population according to time of incident

Time of incident	No. of cases	Percentage
Early morning (4am-8am)	26	15.85
Morning (9am-12pm)	17	10.37
Mid-day (12pm-4pm)	20	12.20
Evening (4pm-8pm)	21	12.80
Night (8pm-4am)	80	48.78
Total	164	100

Table 7 shows the distribution of hanging cases according to the time of the incident revealed that the highest percentage of cases occurred during the night (8pm-4am) at 48.78%, followed by early morning (4am-8am) at 15.85%, evening (4pm-8pm) at 12.80%, mid-day (12pm-4pm) at 12.20%, and morning (9am-12pm) at 10.37%.

Table 8 shows the distribution of hanging cases according to the presence of dribbling of saliva, which revealed that 14.63% of cases showed dribbling of saliva, while 85.37% did not.

Table 9 shows that the majority of suicidal incidents by hanging occurred in the bedroom (51.22%), followed by outdoor locations (25.61%) and the hall (17.68%), with fewer cases in the kitchen (3.05%) and bathroom (2.44%).

Table 10 shows the distribution of hanging cases based on the degree of suspension, which showed that the majority were cases of complete hanging (89.02%), while partial hanging cases accounted for 10.98%.

Table 8: Distribution of the hanging cases according to presence of dribbling of saliva

Dribbling of saliva	No. of cases	Percentage
Present	24	14.63%
Absent	140	85.37%
Total	164	100%

Table 9: Distribution of the study population by place of occurrence

Place of occurrence	No. of cases	Percentage (%)
Outdoor	42	25.61
Bedroom	84	51.22
Bathroom	4	2.44
Hall	29	17.68
Kitchen	5	3.05
Total	164	100

Table 10: Distribution of the study population by type of hanging

Type of hanging	No. of cases	Percentage
Complete hanging	146	89.02%
Partial hanging	18	10.98%
Total	164	100%

Table 11: Distribution of the study population by motive of hanging

Motive of hanging	No. of cases	Percentage
Martial disharmony	45	27.44%
Psychiatric problems	28	17.07%
Financial problem	33	20.12%
Dowry harassment	6	3.66%
Demise of a close relative	14	8.54%
Exam failure	2	1.22%
Unemployment or occupation-related problems	4	2.44%
Chronic physical pain or severe disease/illness	12	7.32%
Love failure	2	1.22%
Reason unknown	18	10.98%
Total	164	100%

Table 11 shows the distribution of hanging cases by motive, which revealed that the most common motives were marital disharmony (27.44%), followed by financial problems (20.12%), psychiatric problems (17.07%), and the demise of a close relative (8.54%). Less common motives included chronic physical pain or severe illness (7.32%), dowry harassment (3.66%), unemployment or occupation-related problems (2.44%), love failure (1.22%), and exam failure (1.22%). The reason for hanging was unknown in 10.98% of cases.

Table 12: Distribution of the study population by presence of internal injuries

Internal injuries	Present		Absent	
	No. of cases	%	No. of cases	%
Contusion of deep tissues in neck	6	3.66%	158	96.34%
Fracture of Thyroid cartilage	10	6.71%	153	93.29%
Fracture of Hyoid bone	13	7.93%	151	92.07%
Fracture of Cricoid cartilage	0	0%	164	100%
Injury to strap muscles	27	16.46%	137	83.54%
Carotid intimal tear	5	3.05%	159	96.95%
Fracture of cervical vertebra	0	0%	164	100%

Table 12 shows the distribution of hanging cases according to the presence of internal injuries, which revealed varying degrees of injuries. Injury to strap muscles was the most common finding, present in 16.46% of cases, followed by fracture of the hyoid bone in 7.93%, fracture of the thyroid cartilage in 6.71%, contusion of deep tissues in the neck in 3.66%, carotid intimal tear in 3.05%, and no cases of fracture of the cricoid cartilage or cervical vertebra.

DISCUSSION

The present study, conducted from June 2021 to May 2022, analyzed 653 autopsies, of which 164 (25.11%) were hanging cases. This finding is consistent with Mishra *et al.* (2018), who reported 27.9% of autopsies being hanging cases, but higher than Das *et al.* (2017), who reported 17.24% [10, 11]. The variations may be attributed to regional differences and study periods.

The demographic analysis revealed a male predominance (76.22%) and the most affected age group was 21-30 y (28.05%), which aligns with studies by Jagtap *et al.* (2020) and Tulapunt *et al.* (2017), both of which reported similar age and gender trends [12, 13]. The knot position analysis showed the right mastoid as the most common position (38.41%), differing slightly from Sahoo *et al.* (2016) and Khalkho and Pathak (2018), who found the occipitomastoid region to be most common [14, 15].

Regarding ligature materials, plastic or nylon rope (52.44%) was the most frequently used, consistent with Karmakar *et al.* (2016) and Udhayabanu and Tamilmani (2020) [16, 17]. The month-wise distribution showed peaks in the monsoon months, aligning with Kumar *et al.* (2017) and Das *et al.* (2019), suggesting seasonal variations in suicide incidence [18, 19].

A strong association between substance abuse and suicidal ideation was observed (75.61%), supporting findings by Borges *et al.* (2017) and Cavanagh *et al.* (2003), who reported substance abuse as a significant risk factor for suicide [20, 21]. Time-wise distribution revealed the highest occurrence at night (48.78%), in agreement with Patel *et al.* (2016) and Ghosh *et al.* (2018), highlighting the role of isolation during nighttime [22, 23].

The presence of dribbling of saliva was noted in 14.63% of cases, consistent with Bansal *et al.* (2017) and Kumar *et al.* (2018), who found similar rates [24,25]. Regarding the location of suicide, most

incidents occurred in bedrooms (51.22%), similar to Ajdacic-Gross *et al.* (2008) and Gunnell *et al.* (2005), emphasizing the role of privacy in suicides [26, 27].

Complete hanging (89.02%) was more common than partial hanging, aligning with Gupta *et al.* (2017) and Sharma *et al.* (2019) [28, 29]. Marital disharmony (27.44%) and financial problems (20.12%) were the leading motives, consistent with Pradipkumar *et al.* (2020) and Tirpude *et al.* (2018) [30, 31]. Internal injuries were observed in varying degrees, with strap muscle injury (16.46%) being the most frequent, corroborating findings by Chandra Sekar *et al.* (2021) and Ballur *et al.* (2015) [32, 33].

Overall, our study findings align with national and international research, with minor variations attributed to regional differences, availability of materials, and cultural factors. These insights emphasize the need for targeted intervention strategies addressing mental health, substance abuse, and social support systems to prevent hanging-related deaths.

CONCLUSION

The study provides a comprehensive analysis of suicidal hanging cases, highlighting significant medico-legal and socio-demographic trends. The prevalence of hanging as a cause of death among autopsy cases (25.11%) underscores its importance as a public health concern. The findings reveal a higher incidence among young adult males, with the most affected age group being 21-30 y. The use of plastic or nylon ropes as the primary ligature material and the predominance of nighttime occurrences emphasize accessibility and solitude as contributing factors. Marital discord, financial stress, and psychiatric conditions emerge as leading motives, while substance abuse plays a critical role in increasing suicide vulnerability. The forensic patterns identified, including knot positions and internal injuries, align with previous studies, reinforcing their diagnostic value in distinguishing between suicidal, accidental, and homicidal hangings. The data underscores the urgent need for preventive strategies, including mental health interventions, substance abuse rehabilitation, and socio-economic support mechanisms to mitigate suicide risks.

While the study presents valuable insights, certain limitations must be acknowledged. The study is limited to a single tertiary center, which may not fully represent national or global trends. Additionally, the reliance on autopsy records restricts access to qualitative aspects such as psychiatric history and social contexts that may have contributed to suicide. The classification of motives is based on circumstantial evidence, which may not capture the complexity of suicidal intent. Future research should incorporate psychological autopsy methods and multi-center data to enhance the depth and generalizability of findings. Furthermore, longitudinal studies tracking socio-economic and mental health factors could provide a more dynamic understanding of suicide trends, guiding more effective intervention strategies.

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AUTHORS CONTRIBUTIONS

All authors have contributed equally

CONFLICT OF INTERESTS

The authors declare no conflicts of interest.

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