



Autopsy Analysis of Hanged Bodies: The Medicolegal Perspectives

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ABSTRACT:

Hanging is one of the most common modes of suicide and a frequent subject of medicolegal autopsies in India. Understanding its demographic and pathological patterns is essential for distinguishing suicidal from homicidal or accidental deaths and for guiding preventive measures. This retrospective study was conducted in the Department of Forensic Medicine, School of Medical Sciences and Research, Sharda University, Greater Noida, Uttar Pradesh, and included all cases of death due to hanging between November 2010 and August 2012. A total of 124 cases were analyzed based on autopsy reports, police inquests, and hospital records. The study evaluated parameters such as age, sex, type of hanging, ligature material, knot position, and autopsy findings. The majority of victims were males (71.8%), with the peak incidence in the 21-40-year age group (68.5%). Complete hanging was observed in 62.9% of cases, and nylon rope was the most common ligature material used (41.1%). The knot was most often situated on the left side of the neck (54%). Classical signs such as an oblique ligature mark, pale face, protruded tongue, and dribbling of saliva were present in most cases. Fracture of the hyoid bone was seen in 11% of cases, predominantly in older individuals. All cases were determined to be suicidal in nature, with no evidence of homicide or accident. The findings highlight that hanging remains a preferred method of suicide among young adults due to its accessibility and lethality. The study emphasizes the importance of early psychological intervention, social support, and mental health awareness to prevent such avoidable deaths.

Introduction

Hanging is one of the most common forms of asphyxial deaths encountered in medicolegal practice and continues to be a major public health and forensic concern in India. It is defined as a form of violent asphyxia caused by the suspension of the body by a ligature around the neck, the constricting force being the weight of the body or part of it [1]. From a medicolegal standpoint, hanging is most frequently suicidal in nature, though accidental and homicidal hangings are occasionally reported [2,3]. Its simplicity, easy availability of means, and high lethality make it a preferred method of suicide in both rural and urban populations [4].

Globally, suicide accounts for nearly one million deaths each year, with hanging being among the leading

methods across most regions [5]. According to the World Health Organization (WHO), hanging represents one of the most common methods of suicide in low- and middle-income countries, including India [6]. In India, the National Crime Records Bureau (NCRB) consistently reports hanging as the predominant means of suicide, contributing to more than 50% of cases annually [7]. These statistics highlight the social and psychological distress prevalent in the country, where rapid urbanization, economic challenges, academic pressure, and familial discord are major contributory factors [8].

The forensic significance of hanging lies not only in establishing the cause of death but also in differentiating suicidal hanging from homicidal strangulation or postmortem suspension [9]. A detailed medicolegal autopsy aids in identifying characteristic external and



internal findings such as the ligature mark, knot position, type of suspension (complete or partial), and fracture of the hyoid bone or thyroid cartilage, all of which assist in determining the manner of death [10,11]. The pattern and location of the ligature mark, for instance, help in distinguishing hanging from strangulation — an oblique, non-continuous mark being typical of hanging, while a transverse, continuous mark is suggestive of ligature strangulation [12].

Socio-demographic studies have revealed that hanging deaths are most common among young adults aged 21-40 years, with a marked male predominance [13,14]. This group is often vulnerable to occupational stress, relationship problems, and mental health issues such as depression and substance abuse [15]. The choice of ligature material also reflects cultural and socioeconomic contexts; commonly used materials include nylon ropes, dupattas, sarees, and electrical wires, which are readily available in most households [16].

The medicolegal autopsy therefore plays a crucial role in not only determining the cause of death but also in contributing to epidemiological surveillance and suicide prevention strategies. A systematic evaluation of autopsy findings helps in identifying trends, assessing the effectiveness of preventive measures, and guiding mental health interventions [17]. Despite the magnitude of the problem, regional data from northern India remain limited, particularly from the western Uttar Pradesh belt, where sociocultural and economic variations may influence suicide patterns.

Hence, the present study was undertaken to analyze the demographic characteristics, ligature materials, type of hanging, position of knot, and associated autopsy findings in deaths due to hanging reported at the Department of Forensic Medicine, School of Medical Sciences and Research, Sharda University, Greater Noida, during the period November 2010 to August 2012. The study aims to contribute valuable regional data for comparison with national trends and to reinforce the medicolegal understanding of hanging deaths.

Materials and Methods

Study Design and Setting

This was a retrospective descriptive study conducted in the Department of Forensic Medicine and Toxicology, School of Medical Sciences and Research, Sharda

University, Greater Noida, Uttar Pradesh, India. The study covered a period of 21 months, from November 2010 to August 2012, during which all medicolegal autopsies conducted in the department were reviewed.

Study Population

All cases in which death was attributed to hanging, based on autopsy findings and police inquest reports, were included in the study. Cases with advanced decomposition where the ligature mark or internal neck structures could not be reliably examined, and cases with uncertain cause of death, were excluded [1,2,9].

Data Sources

Data were collected from multiple official records:

- **Postmortem reports** maintained in the Department of Forensic Medicine,
- **Police inquest papers** (Panchnama and case files), and
- **Hospital records**, when available.

Each record was carefully reviewed, and relevant data were extracted using a structured proforma to ensure uniformity of documentation and minimize bias [1,3,9].

Parameters Studied

The following parameters were recorded and analyzed:

1. **Demographic details:** age, sex, and occupation of the deceased.
2. **Circumstantial information:** place of occurrence (residence, workplace, or public area), and any available history of psychiatric illness or suicide note.
3. **Type of hanging:** classified as *complete* or *partial*, depending on whether the entire body was suspended or partially supported [1,4,9].
4. **Ligature material:** the type of material used, such as nylon rope, dupatta, saree, bed sheet, or electrical wire [4,16].
5. **Position of knot:** categorized as *left-sided*, *right-sided*, or *posterior*, according to the anatomical site of suspension [13,14].



6. **Characteristics of ligature mark:** including level, obliquity, continuity, and base of the groove [9,12].
7. **Associated external findings:** presence of dribbling of saliva, protruded tongue, petechiae, facial congestion, and cyanosis [1,9,12].
8. **Internal examination of neck structures:** focusing on hemorrhages in the strap muscles, fracture of the hyoid bone or thyroid cartilage, and congestion of internal organs [10,11].
9. **Manner of death:** determined through correlation of autopsy findings with circumstantial evidence, scene information, and police investigation [2,9,10].

Autopsy Examination Procedure

All autopsies were performed as per the standard protocols described by Reddy [1] and Knight & Saukko [9].

- The neck dissection was carried out using the *bloodless dissection technique* to identify hemorrhages within neck muscles without introducing artifacts.
- The ligature mark was examined in detail for shape, direction, width, and position relative to anatomical landmarks such as the thyroid cartilage and mandible [12].
- The internal examination involved meticulous inspection of the hyoid bone, thyroid cartilage, and surrounding soft tissues for hemorrhages or fractures [10,11].
- The internal organs were examined for classic asphyxial signs including congestion, petechiae, and cyanosis [1,9].

All findings were recorded systematically, with photographic documentation for each case.

Data Compilation and Statistical Analysis

The collected data were tabulated using Microsoft Excel and analyzed through descriptive statistics.

Categorical variables such as sex, age group, type of hanging, and ligature material were expressed as frequencies and percentages.

No inferential tests were applied, as the objective was to describe patterns rather than establish statistical associations [17].

Results

During the study period (November 2010 - August 2012), a total of 124 medicolegal autopsies of deaths due to hanging were analyzed.

The results are presented below according to demographic distribution, type of hanging, ligature material used, position of knot, and characteristic autopsy findings.

1. Demographic Characteristics

Out of 124 victims, 89 (71.8%) were males and 35 (28.2%) were females, yielding a male-to-female ratio of 2.5: 1.

The 21-40-year age group comprised the majority (68.5%) of cases, followed by 41-60 years (19.3%). The least affected age group was above 60 years (3.2%) (Table 1).

Table 1. Age- and Sex-wise Distribution of Hanging Deaths (n = 124)

Age group (years)	Male	Female	Total (%)
< 20	6	5	11 (8.9)
21-30	33	11	44 (35.5)
31-40	29	12	41 (33.0)
41-50	13	5	18 (14.5)
51-60	6	0	6 (4.8)
> 60	2	2	4 (3.2)
Total	89	35	124 (100)

Young adults in the second and third decades thus represented nearly two-thirds of all victims, a pattern consistent with other Indian studies [13-15].

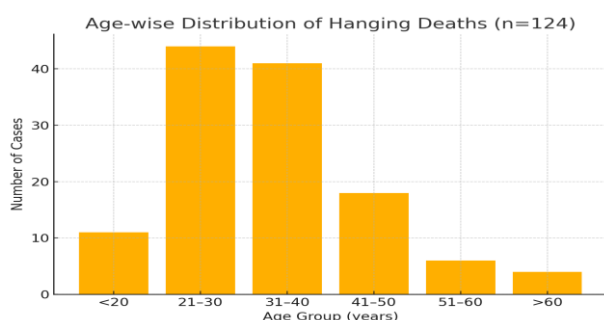


Figure 1. Age-wise distribution of hanging deaths.

2. Type of Hanging

Of the total, 78 cases (62.9%) were complete hangings, while 46 (37.1%) were partial hangings (Table 2).

Complete suspension was more frequent among males (65.2%) than females (57.1%).

Table 2. Type of Hanging by Sex

Type of hanging	Male (n = 89)	Female (n = 35)	Total (%)
Complete	58	20	78 (62.9)
Partial	31	15	46 (37.1)
Total	89	35	124 (100)

3. Ligature Material Used

The nylon rope was the most common ligature material used (41.1%), followed by dupatta/chunni (24.2%), bed-sheet (13.7%), and electric wire (8.9%). Less common materials included saree, belt, and towel (Table 3).

Availability and tensile strength were major determinants of choice [4,16].

Table 3. Distribution of Cases According to Ligature Material

Ligature material	Number of cases	Percentage (%)
Nylon rope	51	41.1
Dupatta / Chunni	30	24.2

Bed sheet	17	13.7
Electric wire	11	8.9
Saree	10	8.1
Others (belt, towel, etc.)	5	4.0
Total	124	100

Figure 2. Distribution of Ligature Materials Used in Hanging

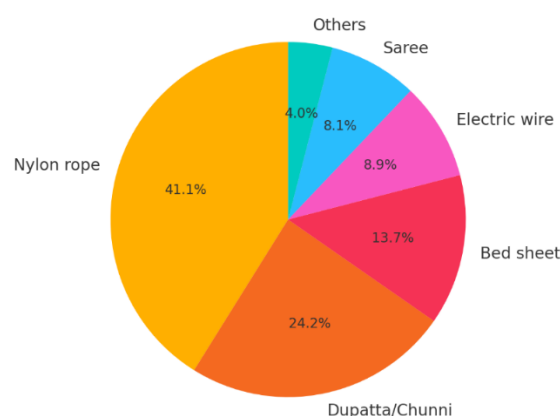


Figure 2. Distribution of ligature materials used.

4. Position of Knot

The left-sided knot was most frequently observed (54.0%), followed by the right-sided (25.0%) and posterior (21.0%) positions (Table 4).

Left-sided knots were predominant among right-handed individuals, a trend noted in previous literature [13,14].

Table 4. Distribution of Cases According to Knot Position

Knot position	Cases (n = 124)	Percentage (%)
Left side of neck	67	54.0
Right side of neck	31	25.0
Posterior	26	21.0
Total	124	100

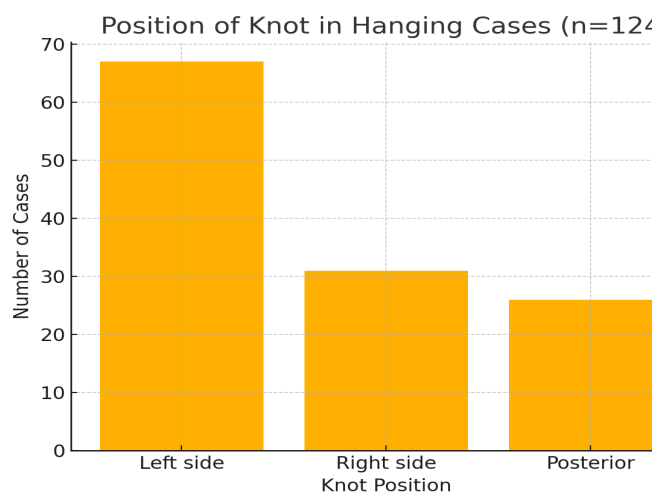


Figure 3. Knot position in hanging cases.

5. Characteristic External Findings

Classical external features of antemortem hanging were noted in the majority of cases (Table 5).

- Oblique, non-continuous ligature mark was seen in 92% of victims.
- Pale face and protruded tongue occurred in 74%.
- Dribbling of saliva from the mouth angle, a highly characteristic sign of hanging, was observed in 63%.
- Petechial hemorrhages in conjunctiva and facial skin were seen in 48% of cases.

Table 5. Frequency of Common External Findings

External finding	Present (n)	Percentage (%)
Oblique ligature mark (non-continuous)	114	91.9
Pale face / protruded tongue	92	74.2
Dribbling of saliva	78	62.9
Petechial hemorrhages	60	48.4
Facial congestion / cyanosis	55	44.4

Abrasions / contusions around ligature mark	19	15.3
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6. Internal Findings of the Neck

On internal examination, subcutaneous hemorrhages beneath the ligature mark were observed in 64% of cases.

Fracture of the hyoid bone was present in 11% (mostly in persons > 40 years), while thyroid cartilage fracture was seen in 7%. No carotid artery rupture or cervical spine injury was detected.

Table 6. Internal Findings of the Neck Structures

Internal finding	Number of cases	Percentage (%)
Hemorrhage in strap muscles	79	63.7
Fracture of hyoid bone	14	11.3
Fracture of thyroid cartilage	9	7.3
Congestion of neck tissues	82	66.1
No internal injury	33	26.6

These results are comparable to the frequency of neck-structure injuries reported by Aggarwal et al. [10] and Goyal et al. [11].

7. Manner of Death

In all 124 cases, circumstantial and autopsy findings were consistent with suicidal hanging. There was no evidence of homicidal or accidental hanging. Scene investigation and police reports corroborated suicidal intent in each case [2,9,17].

Summary of Key Findings

Parameter	Major Observation
Total cases	124
Male: Female ratio	2.5: 1
Peak age group	21-40 years (68.5%)
Common ligature	Nylon rope (41.1%)



Type of hanging	Complete > Partial
Common knot position	Left-sided (54%)
Hyoid fracture	11%
Manner of death	100% suicidal

Interpretation

The analysis demonstrates that hanging is predominantly a suicidal act among young adult males, employing readily available household materials, most frequently nylon ropes or clothing items.

The classical oblique ligature mark and absence of defense injuries affirm the diagnosis of suicidal hanging.

Low frequency of hyoid fracture corresponds to the younger age profile of victims and soft ligature materials used [1,10,11,13].

These findings align with earlier Indian studies from Delhi, Punjab, and Gujarat, reinforcing similar demographic and pathological patterns [4,13-17].

Discussion

Hanging continues to be one of the most common causes of unnatural deaths encountered in medicolegal practice, especially in India, and it represents a significant mode of suicide across all age groups. The present study of 124 cases conducted at Sharda University, Greater Noida, provides important insights into the demographic patterns, ligature characteristics, and autopsy findings of deaths due to hanging, and its findings are largely consistent with the existing literature from different regions of the country [1,4,9,13,14,18]. The predominance of males in the present study (71.8%) is in accordance with several previous reports showing that men are at a higher risk of suicide by hanging compared to women [13,14,16,18,19]. Social, occupational, and financial stressors, coupled with substance abuse and the cultural expectation for men to suppress emotional distress, are major factors contributing to this gender disparity [6,8,15]. In contrast, among females, hanging is often associated with domestic violence, dowry disputes, and emotional trauma [20].

The most affected age group in the present study was between 21 and 40 years, which comprised nearly 69% of the total victims. This finding parallels earlier studies

by Kumar and Verma [14], Patel et al. [16], and Sharma and Chattopadhyay [17], which also reported the highest frequency of hanging deaths among young adults. This age group represents the economically productive and socially active phase of life, where individuals are vulnerable to stress due to professional competition, academic failures, relationship breakdowns, and unemployment. These factors, combined with limited mental health awareness and stigma associated with psychiatric help-seeking, contribute significantly to suicidal tendencies in this population [15,21].

In the present study, complete hanging was observed in approximately 63% of cases, whereas partial hanging accounted for about 37%. These findings correspond with those of Sharma et al. [4] and Goyal et al. [11], who reported similar proportions. Complete suspension is usually associated with strong suicidal intent, but death can also occur in partial hanging, where only a part of the body weight provides the constricting force. This highlights the fact that total suspension of the body is not a prerequisite for fatal outcome; even minimal pressure on the neck can obstruct venous return, compress carotid arteries, and lead to rapid cerebral hypoxia [9,12,22].

Nylon rope emerged as the most frequently used ligature material (41%), followed by dupatta or chunni (24%) and bed sheet (14%), a trend also observed in other Indian regions such as Delhi, Gujarat, and Tamil Nadu [13,16,23]. The prevalence of these materials can be attributed to their easy accessibility, durability, and high tensile strength, as most suicides occur within the home environment. The knot was most commonly found on the left side of the neck (54%), consistent with studies by Singh et al. [13] and Kumar and Verma [14]. This predominance of left-sided knots has been explained by the right-hand dominance of most individuals, who tend to tie the ligature in such a manner that the knot rests on the opposite side. The position of the knot and direction of the ligature mark are critical in distinguishing suicidal hanging from homicidal strangulation, as the latter typically presents with a horizontal, continuous mark and an anterior knot [9,12].

The classical external signs of hanging, such as an oblique, non-continuous ligature mark, pale face, protruded tongue, and dribbling of saliva, were prominent in this study. The oblique mark, seen in over 91% of cases, is a hallmark of hanging, whereas a



transverse mark indicates ligature strangulation [1,9,12]. Dribbling of saliva from the angle of the mouth was present in 63% of cases and is considered a highly specific sign of antemortem hanging, as it requires vital reflex mechanisms that operate only before death [9]. Other features, such as petechial hemorrhages and cyanosis, are due to raised venous pressure and capillary rupture caused by neck constriction [4,9,12]. These findings correspond with those reported by Sharma et al. [4] and Aggarwal et al. [10].

Internal examination revealed hemorrhages in neck muscles in about 64% of cases, while fracture of the hyoid bone was found in 11% and thyroid cartilage fracture in 7%. These results are similar to the findings of Aggarwal et al. [10] and Goyal et al. [11], who documented hyoid fractures in approximately 10-14% of hanging deaths. The likelihood of such fractures increases with age due to ossification of the laryngeal cartilages and greater brittleness of the hyoid bone [9,22,24]. In younger individuals, the structures are more elastic and less likely to break, particularly when soft ligatures like cloth or nylon ropes are used. The absence of defensive injuries, facial abrasions, and atypical findings in this study further supports the suicidal nature of the cases, as all 124 deaths were determined to be suicidal in manner. These findings agree with the observations of Patel et al. [16] and Sharma and Chattopadhyay [17], who also found suicidal hanging to be the predominant form of death in their regions. Homicidal hanging remains extremely rare, and careful evaluation of ligature marks, internal injuries, and scene circumstances is essential to exclude foul play [9,25].

When compared with other Indian studies, the demographic and pathological profiles in the present series are remarkably consistent. Most authors have reported a predominance of male victims in their second to fourth decades of life, with nylon rope or dupatta as the common ligature material and complete hanging as the usual type [4,13,14,16,17,18]. The hyoid fracture rate in this study (11%) also falls within the range observed by other researchers (9-14%) [10,11,18]. Thus, the current findings reaffirm the general pattern of suicidal hanging observed in different regions of India and underline the uniformity of forensic characteristics across diverse populations.

From a medicolegal perspective, proper examination and documentation of ligature marks, knot position, and internal neck findings are vital for determining the cause and manner of death. The combination of an oblique, non-continuous ligature mark, absence of fingernail abrasions, dribbling of saliva, and absence of defensive injuries strongly supports a diagnosis of suicidal hanging [1,9,12,25]. Equally important is the correlation of autopsy findings with circumstantial evidence and scene investigation to rule out homicide or staging.

Beyond the medicolegal significance, the study's findings carry major public health implications. The concentration of cases among young adults reflects the growing psychosocial pressures faced by this demographic. Suicide prevention strategies should therefore prioritize early recognition of depression and psychological distress, community-based counseling, and promotion of mental health awareness [6,8,15,21,26]. Educational institutions and workplaces should develop structured stress management programs, and mental health helplines must be strengthened to offer immediate crisis support [26,27]. Removing the stigma associated with psychiatric illness and increasing accessibility to professional help could significantly reduce the incidence of such preventable deaths.

In summary, the findings of this study highlight that hanging is a predominantly suicidal act among young adult males using easily available household materials, most commonly nylon rope. The consistent pathological features observed reaffirm the classical forensic descriptions of hanging. Strengthening psychological support systems, improving socioeconomic stability, and promoting awareness of mental health resources are critical steps toward reducing suicide rates in India.

Conclusion

Hanging remains a major cause of suicidal death, particularly among young adult males in their most productive years. The majority of cases in this study involved complete hanging using easily available ligature materials such as nylon ropes, with characteristic oblique ligature marks and left-sided knots confirming the classical features of suicidal hanging. No case of homicidal or accidental hanging was observed. The findings emphasize the need for early identification of psychological distress, improved mental health



awareness, and community-based intervention programs to prevent such avoidable deaths.

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Ethical Approval: Not Applicable

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