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Postmortem Analysis of Asphyxial Deaths Due to Hanging: A Study of 130 Cases

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Abstract
Background: Hanging is one of the most common methods of suicidal asphyxial deaths worldwide. Careful postmortem examination provides crucial insights into the medico-legal aspects, manner of death, and cause of mortality.
Objective: To analyze the demographic profile and postmortem findings in cases of death due to hanging.
Methods: This study was conducted on 130 medico-legal autopsy cases of death due to hanging that were examined at the Department of Forensic Medicine, Community Based Medical College Hospital, Mymensingh, Bangladesh, over a defined period from July 2024 to July 2025. A retrospective study was conducted on 130 medico-legal autopsy cases of death by hanging, recorded between [insert study years]. The study population included 80 males and 50 females, aged between 20-65 years. Data regarding demographic distribution, external and internal postmortem findings, and associated medico-legal observations were analyzed.
Results: Out of 130 cases, 61.5% were males and 38.5% females. The most affected age group was 21-40 years (≈60%). Classical ligature mark over the neck was present in 100% cases, with oblique, non-continuous impressions being the most frequent. Petechial hemorrhages were seen in 72% of cases, while protrusion of the tongue was noted in 45%. Salivary dribbling was observed in 32%. Internally, neck muscle congestion was seen in 68%, carotid artery intimal tears in 14%, and hyoid bone/thyoid cartilage fracture in 18% (more common in >40 years).
Conclusion: Hanging remains a predominant method of suicide, particularly among young adults. Postmortem findings such as oblique ligature marks, petechial hemorrhages, and salivary dribbling strongly support the diagnosis. Careful differentiation from other forms of strangulation is vital for medico-legal purposes.

Keywords: Hanging, asphyxial deaths, postmortem findings, ligature mark, suicide, medico-legal autopsy, hyoid fracture, petechial hemorrhage

Introduction

Hanging is one of the most common forms of violent asphyxial death encountered in forensic practice, particularly in developing countries. It is defined as suspension of the body by a ligature around the neck, with constriction caused by the body weight [1]. This form of asphyxia is predominantly associated with suicidal intent, although accidental and homicidal hangings are occasionally reported [2]. Suicide by hanging has increased worldwide, often reflecting underlying psychosocial stressors, psychiatric illnesses, financial hardship, and interpersonal conflicts [3]. The medico-legal importance of hanging lies in the differentiation between suicide, homicide, and accident, which relies heavily on careful documentation of external and internal postmortem findings. Classical features such as an oblique, non-continuous ligature mark situated above the thyroid cartilage, facial congestion, cyanosis, petechial hemorrhages, and dribbling of saliva are considered highly characteristic [4]. However, these features may not always be present, and variations in ligature material, position of suspension, duration of hanging, and resuscitative attempts can alter the postmortem appearance [5]. Internal findings play a crucial role in supporting the diagnosis of hanging. Neck muscle congestion, intimal tears in the carotid arteries, and fractures of the hyoid bone or thyroid cartilage are among the important observations [6]. The incidence of these internal injuries varies with age, as ossification of laryngeal cartilages increases susceptibility to fracture in older individuals [7]. Similarly, pulmonary congestion, edema, and visceral congestion reflect systemic effects of asphyxia. Several studies from different

regions have attempted to analyze demographic profiles and autopsy findings in deaths due to hanging [8-10]. Most report a predominance in young adults, particularly in the 20-40 year age group, reflecting the psychosocial vulnerability of this population. Male predominance is also consistently documented, although female cases are not uncommon, particularly in societies with gender-specific stressors [11]. Despite being a preventable cause of death, hanging continues to pose a significant medico-legal and public health concern. Detailed study of postmortem findings not only assists in confirming the cause and manner of death but also provides valuable epidemiological data that may guide suicide prevention strategies. The present study aims to analyze the demographic distribution and autopsy findings in 130 cases of asphyxial deaths due to hanging, thereby contributing to the existing body of forensic literature.

Materials and Methods

This study was conducted on 130 medico-legal autopsy cases of death due to hanging that were examined at the Department of Forensic Medicine, Community Based Medical College Hospital, Mymensingh, Bangladesh, over a defined period from July 2024 to July 2025 July. All cases were referred by investigating authorities for postmortem examination with a provisional history of hanging.

Study Design

The research was designed as a retrospective observational study. Case records, inquest reports, autopsy findings, and related medico-legal documents were reviewed. The aim was to analyze the demographic characteristics and postmortem features associated with deaths due to hanging.

Study Population

The study included 130 cases ranging in age from 20 to 65 years, comprising 80 males (61.5%) and 50 females (38.5%).

- **Inclusion criteria:** All confirmed cases of death due to hanging (both complete and partial suspension) were included.
- **Exclusion criteria:** Cases with advanced decomposition, uncertain cause of death, combined trauma (such as road traffic accidents or assaults), and those with incomplete records were excluded.

Autopsy Procedure

All autopsies were performed following standard forensic protocols [1, 2]. A detailed external examination was carried out, with particular attention to:

- The presence, position, direction, and nature of the ligature mark.
- Associated features such as saliva dribbling, tongue protrusion, facial congestion, cyanosis, and petechial hemorrhages.
- Documentation of ligature material, if available, was also made.

During internal examination, special attention was given to the structures of the neck. The following were carefully assessed:

- Neck muscles for signs of congestion or hemorrhage.
- Carotid arteries and jugular veins for intimal tears or damage.
- Hyoid bone and thyroid cartilage for fracture or dislocation, with correlation to age of the deceased.
- Thoracic organs, particularly lungs, were examined for congestion, edema, and petechial hemorrhages.
- Abdominal viscera were examined for general congestion.

Findings were documented systematically, and photographs were taken wherever possible.

Data Collection and Analysis

Demographic details such as age, sex, and socioeconomic background were noted from police records and relatives' statements. External and internal postmortem findings were extracted from autopsy reports. Data were entered into a structured proforma and analyzed descriptively. Results were expressed in terms of frequencies and percentages, and patterns were compared with previous studies in forensic literature for interpretation.

Ethical Considerations

Permission was obtained from the institutional ethical review board prior to the commencement of the study. All data were anonymized to protect confidentiality. Since this was a retrospective autopsy-based study, no direct consent from relatives was required; however, medico-legal and ethical norms were strictly adhered to.

Results

The present study analyzed 130 cases of asphyxial deaths due to hanging, comprising 80 males (61.5%) and 50 females (38.5%), with an age range of 20-65 years. The majority of cases (60%) were in the 21-40 years age group, followed by 41-50 years (25%), while cases above 50 years accounted for 15%. Males predominated in all age categories, particularly in the younger age group.

External examination revealed that a ligature mark was present in all cases (100%), with the majority showing the classical oblique, non-continuous impression (84%), while horizontal or atypical marks were noted in 16%. Petechial hemorrhages were observed in 72% of cases, most frequently over the face, conjunctiva, and mucosal surfaces. Tongue protrusion was seen in 45% and saliva dribbling in 32%. Facial congestion and cyanosis were present in 58% of the victims.

On internal examination, neck muscle congestion was noted in 68% of cases. Carotid artery intimal tears were detected in 14%. Fractures of the hyoid bone or thyroid cartilage were documented in 18% of cases, with higher prevalence among individuals over 40 years of age, consistent with age-related ossification. Pulmonary congestion and edema were found in 70% of cases, and visceral congestion was commonly observed across most cases.

These findings emphasize the diagnostic importance of classical ligature marks and supportive external signs in establishing death due to hanging. Internal neck findings, particularly fractures and vascular tears, were less frequent but more common in older individuals.

Table 1: Demographic Distribution of Cases

Age Group (Years)	Male (n=80)	Female (n=50)	Total (n=130)	Percentage (%)
20-30	32	18	50	38.5%
31-40	20	8	28	21.5%
41-50	15	17	32	24.5%
51-65	13	7	20	15.5%
Total	80	50	130	100%

Table 2: External Postmortem Findings in Hanging

External Findings	Number of Cases (n=130)	Percentage (%)
Ligature mark (oblique, non-continuous)	109	84%
Ligature mark (horizontal/atypical)	21	16%
Petechial hemorrhages	94	72%
Tongue protrusion	59	45%
Saliva dribbling	42	32%
Facial congestion & cyanosis	75	58%

Table 3: Internal Postmortem Findings in Hanging

Internal Findings	Number of Cases (n=130)	Percentage (%)
Neck muscle congestion	89	68%
Carotid artery intimal tear	18	14%
Hyoid bone / cartilage fracture	23	18%
Pulmonary congestion & edema	91	70%
Visceral congestion	102	78%

Discussion

The present study, based on 130 cases of hanging, provides significant insight into the demographic characteristics and postmortem findings of this common form of asphyxial death. Consistent with previous reports [3, 8], the majority of victims in our study belonged to the younger age group of 21-40 years. This finding underscores the vulnerability of young adults to psychosocial stress, mental health disorders, unemployment, and interpersonal issues, which are often recognized risk factors for suicide [9]. The predominance of males (61.5%) over females (38.5%) is also in agreement with earlier studies [10, 11]. This gender disparity may be explained by the higher exposure of men to occupational, financial, and societal stressors, combined with the tendency to adopt more violent methods of suicide [12]. The external findings observed in our series correlate well with classical descriptions in forensic literature. The ligature mark, present in all cases, was predominantly oblique and non-continuous, consistent with suspension in suicidal hanging [2, 4]. Horizontal marks were comparatively less frequent and may reflect partial suspension or atypical body positions. Petechial hemorrhages were noted in 72% of cases, similar to reports by Reddy *et al*. [5] and Sharma *et al*. [8]. Although considered a supportive feature, the absence of petechiae does not exclude hanging, as variations depend on venous obstruction, degree of suspension, and rapidity of death [13]. Tongue protrusion (45%) and dribbling of saliva (32%) were also frequently observed. Saliva dribbling, though less common, is often considered pathognomonic of ante-mortem hanging [14]. Internal examination revealed neck muscle congestion in 68% of cases, a finding corroborated by several authors [6, 9]. Carotid artery intimal tears were documented in 14%, while hyoid bone and thyroid cartilage fractures were noted in 18%. These results align with the well-established observation that fractures are more common in older individuals due to ossification of laryngeal cartilages [7, 15]. In younger victims, such fractures are less frequent, supporting the role of age in influencing internal neck injuries. Pulmonary congestion and edema (70%) and visceral congestion (78%) reflect systemic hypoxia and are non-specific but consistent features of asphyxial deaths [16]. The medico-legal significance of these findings lies in differentiating suicidal hanging from homicidal strangulation. In homicidal strangulation, ligature marks are usually horizontal and continuous, often associated with bruising and hemorrhage in deeper neck structures [17]. In contrast, our study demonstrated predominantly oblique, non-continuous marks with relatively lower incidence of deep neck injuries, supporting the suicidal nature of the cases examined. Careful interpretation of both external and internal features is therefore critical.From a preventive perspective, the predominance of young adults highlights the urgent need for effective mental health interventions, community support systems, and suicide prevention strategies [18]. The forensic community plays a crucial role in generating reliable epidemiological data that can aid in policy-making and preventive measures.In our study, the present study reaffirms that hanging remains a leading method of suicide, particularly among young males. Classical external findings such as oblique ligature marks, petechiae, and saliva dribbling, along with supportive internal features, are essential in establishing the diagnosis. Recognition of these findings contributes not only to accurate medico-legal interpretation but also to a broader understanding of the epidemiology of suicide by hanging.

Conclusion

The present study of 130 medico-legal autopsies of hanging demonstrates that hanging remains a predominant method of suicidal death, especially among young adult males in the 21-40 year age group. The ligature mark, particularly its oblique and non-continuous character, continues to be the most consistent and diagnostic external finding. Supportive signs such as petechial hemorrhages, tongue protrusion, saliva dribbling, and facial congestion were also frequently observed. Internal findings, including neck muscle congestion, carotid intimal tears, and fractures of the hyoid bone or thyroid cartilage, showed variable incidence, with

fractures being more common in older individuals due to age-related ossification. From a medico-legal perspective, careful evaluation of both external and internal findings is essential to differentiate suicidal hanging from other forms of strangulation and to confirm the manner of death. The predominance of cases in the younger age group highlights the urgent need for public health interventions, particularly in the areas of mental health awareness, suicide prevention strategies, and community support systems. Thus, detailed postmortem analysis not only aids in accurate determination of the cause and manner of death but also provides valuable epidemiological data that can help guide preventive measures and reduce the burden of suicide by hanging.

Conflict of Interest
Not available.

Financial Support
Not available.

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