

Macroscopic Neck Findings in Cases of Asphyxial Deaths Due to Hanging and Strangulation with Reference to Hyoid Bone Brought to the Police Morgue of a Tertiary Care Hospital

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Abstract

Background: The most frequent cause of asphyxial deaths from hanging or strangulation is neck lesions linked with laryngo-hyoid fractures. It is uncertain, therefore, whether these pathological features are diagnostically significant in identifying the mode of asphyxia.

Methods: From July 2022 to December 2023, asphyxial death cases from strangling or hanging were gathered for this observational cross-sectional study. Decomposed or mutilated remains and other forms of asphyxia were omitted, whereas autopsy results were used to include cases. Solvin's formula was used to determine the sample size, and GraphPad Prism software version 8 was used for statistical analysis.

Results: Among 100 cases, hanging was the most prevalent (n=83), followed by strangulation (n=9), partial hanging (n=5), and throttling (n=3). Abrasions were present in 26% of cases, with 69% didn't exhibit any. The knot position was predominantly over the left mastoid (56%), over the right mastoid (17%), and 7% over the occipital bone. Out of the hanging cases, 77% of the deceased exhibited a high up in their level of ligature material in hanging ones. Hanging victims exhibited a much greater prevalence of grooved ligature marks compared to strangulated instances (56% vs. 1%, p<0.0001) and were most prevalent (21.7%) among those aged 41-50 years (p=0.91). Abrasions were noted in 19% vs. 77% of hanging and strangulation cases (p<0.0001), with 59% of hanging victims displaying dry skin under the ligature while 37.5% displaying bruised skin in cases of strangling (p < 0.0001).

Conclusion: This study improves forensic evaluations and emphasizes the significance of comprehensive autopsies by highlighting notable differences in results between hanging and strangulation deaths.

Keywords: Macroscopic findings, Neck injuries, Asphyxial deaths and Strangulation.

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Introduction

Asphyxial deaths are frequent in the field of forensics. The word "asphyxia" literally translates to "defective aeration of blood" and is usually used to refer to "lack of oxygen." This can occur for a variety of reasons, such as interference with the type and manner of respiration or a shortage of oxygen in inspired air, which results in very little or no oxygen present at the tissue level. Drowning, strangulation, and hanging deaths are frequently referred to as violent asphyxial deaths. When a large amount of external pressure is applied to the neck, chest, or any other area of the body, mechanical asphyxia occurs, which causes the breathing to stop. When there is external pressure on the neck area, hanging and strangulation are the most frequent forms of violent fatalities, which are unnatural deaths. Strangulation is either caused by

hands known as manual strangulation or by means of ligature known as ligature strangulation.

Hanging is a type of strangulation in which external constrictive forces affecting the neck originate from the gravitational drag due to partial or complete suspension of the body.

The hyoid bone may fracture in any of the aforementioned types due to direct pressure on the larger cornu or indirect strain on the thyrohyoid membrane. The hyoid is a little bone that sits between the thyroid cartilage and the tongue root. It is made up of a body, two lesser horns (cornu), and two greater horns. Because of its free-flowing nature, fractures are extremely rare, but if they are discovered during autopsy, they are crucial from a medicolegal standpoint.

Asphyxial deaths are common in forensics, and determining whether they are accidental, suicidal, homicidal, or natural is a crucial issue. Among suffocation deaths, hanging is the most common[1]. The mode of death (suicide, homicide, or accident) is not always clear without a thorough and careful inquiry, even though the cause of death in a hanging may be very obvious[2]. Since hanging is, in theory, nearly always a suicide in terms of the mode of death, this specification is required to fully clarify the diagnostic issues pertaining to asphyxia caused by hanging[3]; and the other manners of death (homicide and accident) are very rare but do occur. Regarding homicide, there are two possibilities [4]: (1) a true homicidal hanging, which presupposes a disproportion of strength between the victim (much weaker or weakened) and the aggressor (much stronger or multiple aggressors); (2) a suspension of the corpse (simulation of hanging with victim dead from another cause). Typical hanging findings will obviously be different in the two cases (present in case 1, absent in case 2). According to the literature, accidental hangings are likewise extremely uncommon and often only occur in autoerotic deaths. The challenge of this differential diagnosis is especially severe in forensic pathology when it comes to the particular subset of suspensions of a body. The statistical analysis of anatomo-pathological findings in hanging, which is the goal of the current investigation, can provide intriguing clues. Although differential diagnoses using only anatomo-pathological evidence is fundamentally impossible in other manners of death, it is pertinent to note this element for the sake of completeness. The relevant literature frequently reports significant variations in the incidence of abnormal findings. Furthermore, there are a lot of data available on this issue, and they are frequently very different. For instance, several experts have pointed out a paradoxical contradiction in the remarkable variety of laryngo-hyoid fractures in hanging victims[5].

By providing numbers and statistical evaluations, we aim to answer an important question for forensic pathologists regarding hanging: which diagnostic values can we give, in cases of hanging, to neck lesions, haemorrhages, and pleural and epicardial petechiae? Second, we aimed to establish whether there was any significant correlation between the findings of hanging and the physical features of the victims, a question we examined due to its recurrent appearance in the literature [6]. To the best of our knowledge, no study has ever tried to use statistical techniques to define these qualities statistically.

There is currently no work that analyzes hanging with non-hanging injuries using a traditional contingency table system, nor has any forensic

pathology literature conducted a true statistical comparison utilizing contingency tables. The vast majority of existing research can be classified as reviews since it attempts to count the injuries within the same group of hanging instances. Thus, any trauma of the neck (not only hanging) can cause, for example, lesions of the laryngeal skeleton. The trauma of hanging, however, cannot result in any lesions of the osteocartilaginous laryngeal structures. Thus, we used contingency tables to analyse this problem more precisely.

This study aims to examine the macroscopic findings of the hyoid bone in asphyxial fatalities caused by strangling and hanging. The goal of the study is to identify any notable variations in the hyoid bone damage or alterations by contrasting the results between these two causes of death. The study will also investigate the prevalence of hanging in different age groups, providing information on any age-related trends.

Material and Methods

Study Subjects: The study will be conducted on cases of asphyxial deaths brought to Police Morgue of R.G. Kar Medical College and Hospital.

Study Period: 1st July 2022 to 31st December 2023.

Requirement of Control: No controls required.

Inclusion Criteria

- All cases with history of asphyxial death due to hanging or strangulation
- All cases without any history but autopsy findings are suggestive of the same.

Exclusion Criteria

- Decomposed and mutilated Bodies
- Non asphyxial deaths
- Asphyxial deaths other than hanging and strangulation.

Study Design: Observational Cross-sectional study

Sampling: Convenience sampling was done

Sample Size: As per Solvin's formula, $n = \frac{N}{1 + Ne}$, Here $n =$ Specific study population. $N =$ Total no. of cases. $E = 0.1$ as I'm 90% confident about my study.) $n =$ Sample size, $N = 3622$.

$E = 0.1$. So, $n = \frac{3622}{1 + 3622(0.1)}$ $n = \frac{3622}{37.22}$
 $n = 97.31$, for the convenience sample of my study I take 100 as my Sample Size.

Sample size = 100

Statistical Analysis Plan: All data will be collected, compiled and subjected to suitable statistical analysis using appropriate methods. Results will be presented using charts, tables, diagrams and photographs. Finally the findings will be critically studied on background knowledge and the experience of past works done.

Ethical Clearance: Synopsis will be submitted to our institutional ethics committee for ethical clearance.

Work Plan: The research work’s activity schedule will be during autopsy hours at the morgue on all working days in between.

Statistical Analysis: Data for the statistical analysis were entered into a Microsoft Excel spreadsheet and analyzed using SPSS (version 27.0) and Graph Pad Prism (version 5). Numerical variables were summarized as mean and standard deviation, while categorical variables were

presented as counts and percentages. Two-sample t-tests were used for independent samples, while paired t-tests, which offer greater power, were used for related samples. Chi-squared tests (specifically Pearson's chi-squared) assessed categorical data, with unpaired proportions compared using either the Chi-square test or Fisher’s exact test. The document provides explicit formulas for various t-tests and their corresponding degrees of freedom. A t-value leads to a p-value, which, if below the significance threshold (typically 0.05), results in rejecting the null hypothesis.

Result

Table 1: Comparison between Demographic parameter and Type of incident

		Hanging	Partial hanging	Strangulation	Throttling	Total	Chi-Square Value	P-Value
Age in group	<20	15(18.1%)	1(%)	2(%)	1(%)	19(%)	13.13	0.904
	21-30	11(13.3%)	2(40%)	1(12.7%)	1(33.3%)	15(15%)		
	31-40	17(20.5%)	1(20%)	1(100%)	1(33.3%)	20(20%)		
	41-50	18(21.7%)	0(%)	1(12.5%)	0(%)	19(19%)		
	51-60	9(10.8%)	0	1(12.5%)	0(%)	10(10%)		
	61-70	8(9.6%)	1(20%)	3(37.5%)	0(0%)	12(12%)		
	71-80	4(4.8%)	0(0%)	0(0%)	0(0%)	4(4%)		
	>81	1(1.2%)	0(0%)	0(0%)	0(0%)	1(1%)		
Total	83(100%)	5(100%)	9(100%)	3(100%)	100(100%)			
Sex	Female	31(37.3%)	0(%)	3(37.5%)	1(33.3%)	35(35%)	2.908	0.406
	Male	52(62.7%)	5(100%)	6(66.7%)	2(66.7%)	65(100%)		
	Total	83(100%)	5(100%)	9(100%)	3(100%)	100(100%)		
Socio Economic Status	Lower Middle	12(14.5%)	1(20%)	0(0%)	1(33.3%)	14(14%)	3.706	0.930
	N.A	1(1.2%)	0(0%)	0(0%)	0(0%)	1(1%)		
	Upper Lower	56(67.5%)	2(40%)	7(77.8%)	2(66.7%)	67(67%)		
	Upper Middle	14(16.9%)	2(40%)	2(22.2%)	0(0%)	18(18%)		
	Total	83(100%)	5(100%)	9(100%)	3(100%)	100(100%)		
	Hindu	80(96.4%)	5(100%)	7(77.8%)	2(66.7%)	94(94%)		
	Muslim	3(3.6%)	0(0%)	2(22.2%)	1(33.3%)	6(6%)		
Total	83(100%)	5(100%)	9(100%)	3(100%)	100(100%)			

Table 2: Comparison between Level, Pattern, Tissue and Type of incident

Parameter		Hanging	Partial hanging	Strangulation	Throttling	Total	Chi-Square Value	P-Value
Level of Ligature material	At thy Cart	0	0	2(22.2%)	0	2(2%)	212.53	<0.0001
	Below thyroid	0	0	4(44.4%)	0	4(4%)		
	High up	74(89.2%)	3(60%)	0	0	77(77%)		
	Horizontal	0	0	1(11.1%)	0	1(1%)		
	Middle of neck	3(3.6%)	1(20%)	1(11.1%)	0	5(100%)		
	Middle, oblique	0	1(%)	0	0	1(%)		
	N.A	0	0	0	3(%)	3(%)		
	oblique	6(7.2%)	0	0	0	6(6%)		
	thyroid level	0	0	1(11.1%)	0	1(1%)		
	Total	83(100%)	5(100%)	9(100%)	3(100%)	100(100%)		
Pattern of	Present	14(16.9%)	0	3(33.33%)	0	17(17%)	12.44	0.133
	Absent	68(81.9%)	5(100%)	6(66.67%)	2(66.67%)	81(100%)		

Ligature material	No appreciable	1(1.2%)	0	0	1(33.3%)	2(2%)		
	Total	83(100%)	5(100%)	9(100%)	3(100%)	100(100%)		
Tissue under the Ligature Material	Bleeding muscle	0	0	1(12.5%)	0	1(1%)	162.18	<0.0001
	Bruising	1(1.2%)	1(20%)	3(37.5%)	1(33.3%)	6(6%)		
	Congested	1(1.2%)	1(20%)	1(12.5%)	0	3(3%)		
	Deep bruise	0	0	1(1%)	2(66.7%)	3(3%)		
	Dry & Parch	49(59%)	0	0	0	49(49%)		
	Ecchymosed	0	0	1(12.5%)	0	1(1%)		
	Glistening	2(2.4%)	0	0	0	2(2%)		
	Mild Cong.	12(14.5%)	1(20%)	1(12.5%)	0	14(14%)		
	Normal	7(8.4%)	0	0	0	7(7%)		
	Petechial haemorrhage	0	2(40%)	1(11.11%)	0	3(3%)		
	Superficial	1(1.2%)	0	0	0	1(1%)		
	White glistening	10(12%)	0	0	0	10(10%)		
	Total	83(100%)	5(100%)	9(100%)	3(100%)	100(100%)		

Table 3: Comparison between Position of knot, Skin Changes, Abrasion and Type of incident

Parameter		Hanging	Partial hanging	Strangulation	Throttling	Total	Chi-Square Value	P-Value
Position of knot	Back of neck	0	1(20%)	1(12.5%)	0	2(2%)	121.37	<0.0001
	Below Chin	1(1.2%)	0	0	0	1(1%)		
	Chin	2(2.4%)	0	0	0	2(2%)		
	Left angle of mandible	0	1(20%)	0	0	1(1%)		
	Left mastoid	56(67.5%)	0	0	0	56		
	Occiput	7(8.4%)	3(60%)	2(25%)	0	12(12%)		
	Rt. Mastoid	17(20.5%)	0	3(37.5%)	0	20(20%)		
	Under chin	0	0	1(12.5%)	0	1(1%)		
	N.A	0	0	2(22.2%)	3(100%)	5(5%)		
	Total	83(100%)	5(100%)	9(100%)	3(100%)	100(100%)		
Skin Changes	Absent	1(1.2%)	0	0	0	1(1%)	107.71	<0.0001
	Bruise	0	0	3(33.3%)	2(66.7%)	5(5%)		
	Deep	8(9.6%)	0	0	0	8(8%)		
	Ecchymosed	0	0	1(11.1%)	0	1(1%)		
	Faint	10(12%)	0	3(33.3%)	1(33.3%)	14(14%)		
	Faint, Reddish	0	0	1(11.1%)	0	1(1%)		
	Grooved	52(62.7%)	1(1.9%)	0	0	53(100%)		
	Mild Deep	1(1.2%)	0	0	0	1(1%)		
	Narrow, Grooved	1(1.2%)	0	0	0	1(1%)		
	Shallow	1(1.2%)	0	0	0	1(1%)		
	Superficial	9(10.8%)	4(80%)	1(11.11%)	0	14(14%)		
	Total	83(100%)	5(100%)	9(100%)	3(100%)	100(100%)		
	Abrasion	Absent	64(77.1%)	4(80%)	1(11.1%)	0		
Nail Mark		0	0	1(11.1%)	3(100%)	4(4%)		
Present		19(22.9%)	0	7(77.8%)	0	26(26%)		
Petechial haemorrhage		0	1(20%)	0	0	1(1%)		
Total		83(100%)	5(100%)	9(100%)	3(100%)	100(100%)		

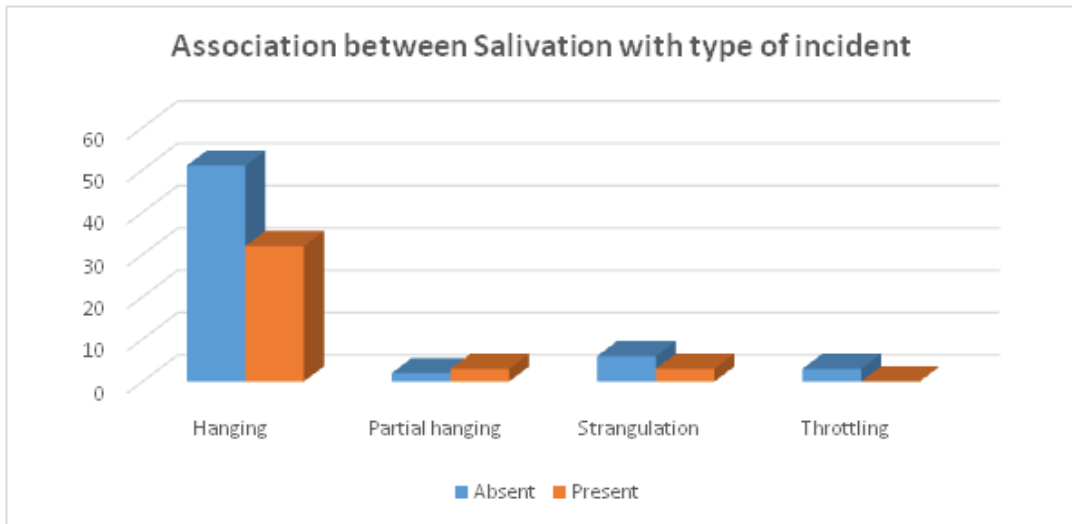


Figure 1: Association between Salivation: Type of incident

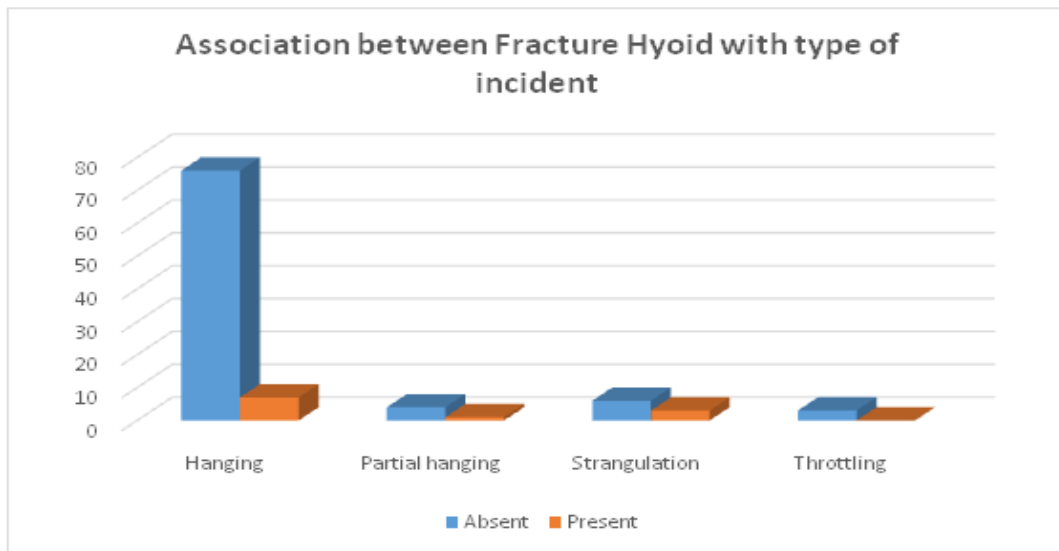


Figure 2: Association between Fracture Hyoid: Type of incident

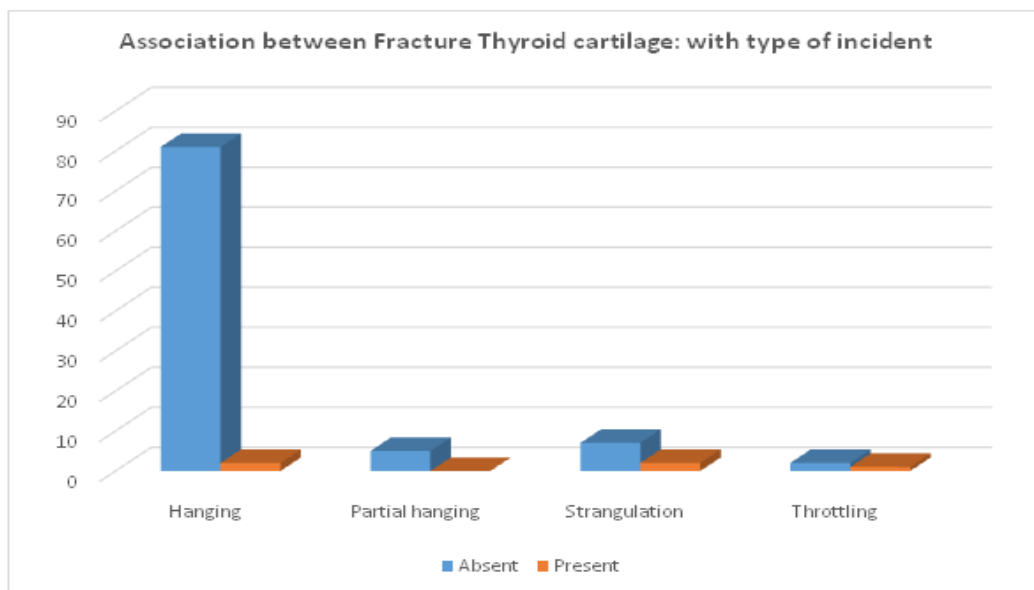


Figure 3: Association between Fracture Thyroid cartilage: Type of incident

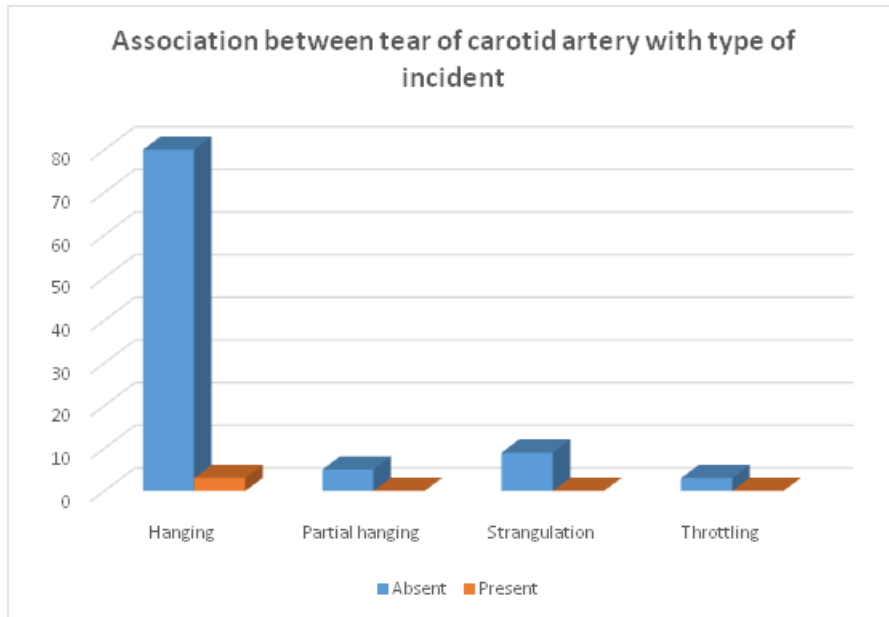


Figure 4: Association between tear of carotid artery: Type of incident

In Hanging, 15 (18.1%) deceased were <20 years of age, 11 (13.3%) patients were 21-30 years of age, 17 (20.5%) patients were 31-40 years of age, 18 (21.7%) patients were 41-50 years of age, 9 (10.8%) patients were 51-60 years of age, 8 (9.6%) patients were 61-70 years of age, 4 (4.8%) patients were 71-80 years of age and 1 (1.2%) patient was >81 years of age. In Partial hanging, 1 (20.0%) patient was <20 years of age, 2 (40.0%) patients were 21-30 years of age, 1 (20.0%) patient was 31-40 years of age and 1 (20.0%) patient was 61-70 years of age. In Strangulation 2 (25.0%) patients were <20 years of age, 1 (12.5%) patient were 21-30 years of age, 1 (12.5%) patient was 41-50 years of age, 1 (12.5%) patient was 51-60 years of age and 3 (37.5%) patients were 61-70 years of age. In Strangulation, (100.0%) patient was 31-40 years of age.

In Throttling, 1 (33.3%) patient was <20 years of age, 1 (33.3%) patient was 21-30 years of age and 1 (33.3%) patient was 31-40 years of age. Association of Age in group with Type of incident was not statistically significant ($p=0.9102$). In Hanging, 31 (37.3%) patients were Female and 52 (62.7%) patients were Male. In Partial hanging, 5 (100.0%) patients were Male. In Strangulation 3 (37.3%) patients were Female and 6 (66.7%) patients were Male. In Throttling, 1 (33.3%) patient was Female and 2 (66.7%) patients were Male. Association of Sex with Type of incident was not statistically significant ($p=0.406$). In Hanging, 12 (14.5%) patients were Lower Middle class, 56 (67.5%) patients were Upper Lower class and 14 (16.9%) patients were Upper Middle class. In Partial hanging, 1 (20.0%) patient was Lower Middle class and 2 (40.0%) patients were Upper Lower class and 2 (40.0%) patients were Upper

Middle class.(77.8%) deceased belonging to Upper Lower class and 2 (25.0%) deceased were Upper Middle class who died of strangulation In Throttling, 1 (33.3%) patient was Lower Middleclass and 2 (66.7%) patients were Upper Lower class. Association of Socio Economic Status with Type of incident was not statistically significant ($p=0.930$).

In Hanging, 74(89.2%) patients had High up, 3(3.6%) patients had Middle of neck, 6(7.2%) patients had oblique. In Partial hanging, 3(60%) patients had High up, 1(20%) patient was Middle of neck and 1(%) patient was Middle, oblique. In Strangulation, 2(22.2%) patients had at thy Cart, 4(44.4%) patients had Below thyroid, 1(11.1%) patient was Horizontal, 1(11.1%) patient was Middle of neck and 1(11.1%) patient was thyroid level. In Throttling,3(%) patients had N.A. Association of Level of Ligature material with Type of incident was statistically significant ($p<0.0001$). In Hanging, 14 (16.9%) patients had Pattern of Ligature material. In strang, 3 (37.5%) patients had Pattern of Ligature material. Association of Pattern of Ligature material with Type of incident was not statistically significant ($p=0.133$). In Hanging, 1(1.2%) patient was Bruising, 1(1.2%) patient was Congested, 49(59%) patients had Dry & Parch, 2(2.4%) patients had Glistening, 12(14.5%) patients had Mild Cong, 7(8.4%) patients had Normal, 1(1.2%) patient was Superficial and 10(12%) patients had White glistening. Association of Pattern of Ligature material with Type of incident was statistically significant ($p<0.0001$). In Partial hanging, 1(20%) patient was Bruising, 1(20%) patient was Congested, 1(20%) Mild Cong and 2(40%) patients had Petechnial haemorrhage. Association of Pattern

of Ligature material with Type of incident was not statistically significant ($p=0.133$). In Strangulation, 1(12.5%) patient was Bleeding muscle, 3(37.5%) patients had Bruising, 1(12.5%) patient was Congested, 1(12.5%) patient was Deep bruise, 1(12.5%) patient was Ecchymosed, 1(12.5%) patient was Mild Cong and 1(11.11%) patient was Petechial haemorrhage. In Throttling, 1(33.3%) patient was Bruising and 2(66.7%) patients had Deep bruise. Association of Tissue under the Ligature Material with Type of incident was statistically significant ($p<0.0001$).

In Hanging, 1(1.2%) patient was Below Chin, 2(2.4%) patients had Chin, 56(67.5%) patients had Left mastoid, 7(8.4%) patients had Occiput and 17(20.5%) patients had Rt. Mastoid. In Partial hanging, 1(20%) patient was Back of neck, 1(20%) patient was Left angle of mandible, and 3 (60%) patients had Occiput. In Strangulation, 1(12.5%) patient was Back of neck, 2(25%) patients had Occiput, 3(37.5%) patients had Rt. Mastoid, 1(12.5%) patients had under chin, and 2 (22.2%) patients had N.A. In Throttling, 3(100%) patients had N.A. Association of Position of knot with Type of incident was not statistically significant ($p<0.0001$).

In Hanging, 8(9.6%) patients had Deep, 10(12.5%) patient was Faint, 52(62.7%) patients had Grooved, 1(1.2%) patient was Mild Deep, 1(1.2%) patient was Narrow, Grooved, 1(1.2%) patient was Shallow and 9(10.8%) patients had Superficial. In Partial hanging, 1(1.9%) patient was Grooved and 4(80%) patients had Superficial. In Partial hanging, 1(1.9%) patient was Grooved and 4(80%) patients had Superficial. In Strangulation, 3(33.3%) Bruise, 1(11.1%) patient was Ecchymosed, 3(33.3%) patients had Faint, 1(11.1%) patient was Faint, Reddish and 1(11.11%) patient was Superficial. In Throttling, 2(66.7%) Bruise and 1(33.3%) patient was Faint. Association of Skin Changes with Type of incident was not statistically significant ($p<0.0001$).

In Hanging, 19 (22.9%) patients had Abrasion. In Partial hanging, 1 (20.0%) patient was Petechial haemorrhage. In Strangulation, 1 (100.0%) patient was Nail Mark abrasion while rest 7(77.8) had usual ligature abrasion. In Throttling, 3 (100.0%) patients had Nail Mark. Association of Abrasion with Type of incident was not statistically significant ($p<0.0001$). In Hanging, 32 (38.6%) patients had Salivation. In Partial hanging, 3 (60.0%) deceased had Salivation. In strangulation 3 (33.3%) deceased had Salivation. Association of Salivation with Type of incident was not statistically significant ($p=0.398$). In Hanging, 7 (8.4%) patients had Fracture Hyoid. In Partial hanging, 1 (20.0%) patient had Fracture Hyoid. In Strangulation 3 (33.3%) patients had Fracture Hyoid. Association of Fracture Hyoid with Type

of incident was not statistically significant ($p=0.115$). In Hanging, 2 (2.4%) patients had Fracture Thyroid cartilage. In Strangulation 2 (22.2%) patients had Fracture Thyroid cartilage. In Throttling, 1 (33.3%) patient had Fracture Thyroid cartilage. Association of Fracture Thyroid cartilage with type of incident was statistically significant ($p=0.007$). In Hanging, 3 (3.6%) patients had Tear of carotid absent. Association of tear of carotid with type of incident was not statistically significant ($p=0.89$).

Discussion

100 patients were analyzed, with an emphasis on variations in age, gender, socioeconomic level, and religious background among the groups that were strangled, hung, throttled, and partially hung. Some important findings were statistically significant, but the majority of data—including the age distribution, male-to-female ratio, and socioeconomic status—were not. Notably, occiput knot placements and Hinduism were more common among patients in the partial hanging group, but bruises and thyroid cartilage fractures were more common in the strangulation group. The study admits its shortcomings, including its small sample size, and recommends more investigation to confirm its conclusions. Zátópková L et al [7](2018) found that we prospectively and consecutively analyzed the occurrence of laryngo-hyoid fractures in a group of 178 suicidal hanging victims (M/F = 150/28, aged 14–94 years, mean age = 50, complete suspension = 111 cases, partial suspension = 67 cases) in relation to selected variables (age, sex, weight, the completeness of body suspension, and ligature knot location).

In our study, out of 100 patients most of the patients were 31-40 years old [20 (20.0%)] but this was not statistically significant ($p=0.9102$).

Ali MA et al [8](2018) found that out of 87 cases, 53(60.9%) were male and 34(39.1%) female.

We found that, male population was higher [65 (65.0%)] than the female population [35 (35.0%)]. Male: Female ratio was 1.8:1 but this was not statistically significant ($p=0.4843$).

Ali MA et al [8](2018) found that according to the police inquest, 52(59.8%) victims belonged to lower socio-economic status while urban area predominance appreciated in 61(70.1%) cases.

Our study showed that, most of the deceased belonged to Upper Lower Socio-Economic Status (67%) as compared to other socio-economic status with ($P=0.930$).

Charoonnate N et al [9](2010) found that the knot was at the back of the neck in most cases (12 cases, 60%) and at the left, front, and right in four, two, and two cases, respectively.

We found that, most of patients had occiput Position of knot in Partial hanging Group [3 (60.0%)] compared to strangulation Group [2 (25.0%)] and Hanging Group [7 (8.4%)], but this was statistically significant ($p < 0.0001$)

We found that, only 1 patient had Horizontal Level of Ligature Material in Strangulation Group 1 (100.0%) but this was statistically significant ($p < 0.0001$)

We observed that, most of patients had Bruise under skin changes in Throttling Group [2 (66.7%)] compared to strangulation group 3(33.3%) but this was statistically significant ($p < 0.0001$)

We observed that, most of patients had Nail Mark abrasion in Throttling Group and this was statistically significant ($p < 0.0001$)

We found that, most of patients had Pattern of Ligature material in strangulation Group [3 (37.5%)] compared to Hanging Group [14 (16.9%)] but this was statistically significant ($p = 0.0125$)

Kaushik V et al [10](2019) found that evidence of extravasations of blood around the fracture site was accepted as antemortem in presence of other injuries to neck like bruises and soft tissue haemorrhage

We observed that, most of patients had Deep bruise in Strangulation Group [3(100.0%)] compared to Throttling Group [2 (66.7%)] but this was statistically significant ($p < 0.0001$)

We showed that, most of patients had Salivation in Partial hanging Group [3 (60.0%)] compared to Hanging Group [32 (38.6%)], which was not statistically significant ($p = 0.398$)

Charoonnate N et al [9](2010) found that a prospective study of hyoid bone and thyroid cartilage fractures in Thai people who died from suicidal hanging between November 2008 and August 2009

We observed that, most of patients had Fracture Hyoid in strangulation Group [3 (27.3%)] compared to Partial hanging Group [1 (20.0%)] and Hanging Group [7 (8.4%)], but this was not statistically significant ($p = 0.115$)

Dunsby AM et al [11](2011) found that the thyroid cartilage alone was fractured in 38 cases; the hyoid bone alone was fractured in 19 cases; the larynx and hyoid bone were both fractured in 21 cases, including one which involved the cricoid cartilage

We found that, most of patients had Fracture of Thyroid cartilage in strangulation Group [2 (22.2%)] compared to Hanging Group [2 (2.4%)], but this was statistically significant ($p = 0.007$)

We observed that, most of patients had Tear of Strap Muscle in Throttling Group [1 (33.3%)]

compared to strangulation Group [2 (22.2%)], Partial hanging Group [1 (20.0%)], and Hanging Group [10 (12.0%)], but this was not statistically significant ($p = 0.604$)

We found that, only 3 patients had tear of carotid in Hanging Group 3(3.6%) but this was not statistically significant ($p = 0.89$)

We found that, mean Age (years) was more in partial hanging [62.60 ± 15.63] compared to Hanging [38.58 ± 18.18], strangulation [39.00 ± 8.57] and Throttling [43.67 ± 3.05] but this was not statistically significant ($p = 0.06$).

Conclusion

The study analyzed macroscopic neck findings in hanging and strangulation cases involving 100 patients. While the majority of patients were aged 31-40 and a higher male-to-female ratio (1.8:1) was noted, these findings were not statistically significant. Significant findings included a predominance of Hindu patients in the Partial Hanging Group and an occiput position of the knot, both of which were statistically significant. The Strangulation Group showed a significant presence of bruising and a pattern of ligature material compared to other groups. Fractures of the thyroid cartilage were also significantly more common in the Strangulation Group. Overall, the study offers insightful information, even though some components, such as salivation and hyoid bone fractures, did not produce significant results. It notes drawbacks, such as sample size, and recommends more studies with bigger groups to improve generalizability and dependability.

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