# A prospective study of Knot, Ligature Pattern & other External Findings observed in various cases of Hanging in Allahabad; Uttar Pradesh

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Article history Received: May.3, 2019 Received in revised form: July 19, 2019 Accepted: August 6, 2019 Available online: Nov 05, 2019	<ul> <li>Background: Hanging is caused by suspension of the body by a ligature encircling the neck. The person may use any article readily available for this purpose, like a rope, saree, belt, bed sheet etc. Most times, Ligature mark and material may be the only evidence available in deaths due to either hanging or strangulation. Their thorough examination and analysis is extremely helpful in differentiation and provide vital medicolegal information.</li> <li>Material and Method: Present study was conducted among the dead bodies brought to the mortuary of Swaroop Rani Nehru hospital MLN Medical College Allahabad. Out of 2654 cases autopsied during the study period from 01/05/2016 to 30/4/2017; 184 cases (6.93%) were caused by violent asphyxial death. Out of that 120 (65.2%) cases including hanging (94) and strangulation (26) were takon for study.</li> </ul>
Corresponding author	<b>Results and Conclusion:</b> The young adults of the age group of 21-40 years
Dr. Archana Kaul Associate Professor & Head, Moti Lal Nehru Medical College, Allahabad Phone: +919415687077 Email: drarchanakaulmln@gmail.com	contributed for majority of cases with 66(55%) of cases of hanging and 16(13.3%) of cases of strangulation. The position of knot was seen on the right side in 42(35%) cases. Duppatta was most commonly used ligature material 41(34.16%). The most common external finding was cyanosis seen in 84 (70%) and 26 (21.66%) cases of hanging and strangulation, respectively. Present study provides vital information for the Doctors, Police and concerned authorities in investigating cases of Hanging and strangulation.

Keywords: Asphyxia; ligature; strangulation; hanging; autopsy; India.

## Introduction

Violence in any form is intolerable and unacceptable. But the incidents of violence in both the forms; killing self or someone are recorded since the existence of human being for one or the other reason. An increasing death rate as a result of violence amounts to a large group in medicolegal autopsies particularly deaths caused by asphyxia, which is one of the most important cause in violent deaths (1).

Asphyxia is a condition caused by interference with respiration or lack of oxygen in inspired air due to which the organs and tissues become deprived of oxygen causing unconsciousness or death. The classical features of asphyxia are found when the air passage is constricted by pressure to the neck or to the chest and when there has been struggle to breathe. In pathological asphyxia, the entry of oxygen to the lungs is prevented by diseases of the upper respiratory tract or of the lungs. In toxic asphyxia, poisonous substances prevent the use of oxygen and in the environmental asphyxia there is insufficiency of oxygen in inspired air. Conventionally, the term asphyxia has been applied to all conditions in which oxygen supply to blood and tissue has been reduced appreciably below the normal working level by any interference with respiration. Serious deprivation of oxygen for 5 to 10 minutes can result the permanent damage of CNS and CVS resulting death. Asphyxial deaths may be caused by different methods, such as hanging,

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strangulations (manual and ligature), suffocations (environmental, smothering, choking, mechanical, and suffocating gases), chemical asphyxia (carbon monoxide, hydrogen cyanide, and hydrogen sulfide), and drowning (2) (3).

In forensic context, asphyxia is usually obstructive in nature, where some physical barrier prevents access of air to lung. This obstruction can occur at any point from the nose and mouth to the alveolar membranes.

Clinical and pathological features of different types of asphyxia vary up to a large extent. Nervous tissues are affected first by deficiency of oxygen and their functions are disturbed even by mild oxygen deficiency. Subnormal oxygen in the blood supply to the brain causes rapid unconsciousness. In all forms of asphyxia heart may continue to beat for several minutes after stoppage of respiration. The types of asphyxia may be mechanical, pathological, traumatic, environmental, positional and iatrogenic. Hanging is that form of asphyxia which is caused due to compression of the neck by means of ligature round the neck, constricting force being the weight of the body (complete hanging) or a part of the body weight (partial hanging). The various Medicolegal queries which arise in case of death due to hanging are whether death is caused due to hanging like in situations where allegations of postmortem suspension of body are made, whether it is suicidal, homicidal or accidental, what is time since death, how to differentiate it from ligature strangulation etc. To answer these queries and to arrive at conclusion, detailed external and internal postmortem examination of the dead body becomes essential. The typical external findings that should be observed in a case of hanging death are the ligature mark, mode of application of ligature, knot position, color of the face, glove and stocking pattern of post-mortem lividity, dribbling of saliva, tongue position, eye open or closed etc. The internal examination of neck structures is done to look for the appearance of subcutaneous tissue under the ligature mark which is usually dry, white and glistening, any damage to intima of carotid arteries usually around the region of the sinuses with extravasation of blood in their walls particularly in long drops, any fracture of hyoid bone or thyroid cartilage. A complete profile of such findings is helpful as in majority of cases partial examination or missing of some trivial but important finding leads to derivation of an inconclusive opinion.

medicolegal practice, wherein a detailed and meticulous autopsy plays a significant role to solve the case while the scene investigation and collection of samples have their own significance. Present study was undertaken to investigate features of asphyxial deaths in the Allahabad region of north India and to compare them with other studies.

#### **Material and Methods**

Cases for the present study were selected from dead bodies brought to the mortuary of Swaroop Rani Nehru Hospital MLN Medical College Allahabad, for medico legal autopsy examination, from the various police stations of Allahabad and surrounding areas. Total 2654 cases were autopsied during the study period from 01/05/2016 to 31/4/2017. 184 cases (6.93%) were of violent asphyxial death. Among them a total of 120 cases including hanging (94) and strangulation (26) were selected for study.

The present study comprises detailed observation and analysis of –

- 1. Epidemiological details.
- 2. Medico legal aspects.
- 3. Gross forensic pathological features of the cases of hanging and strangulation.

## **Result and Discussion**

We studied a total number of 94 cases of deaths due to hanging; among them complete hanging was present in 78 (65%) cases and partial hanging was seen in 12 (10%) cases which is in accordance with the findings of the several other studies, conducted by Saisudheer (2012) (4), whereas Ballur (2016) (5) reported that atypical ligature marks with partial hanging outnumbered typical ligature mark with complete hanging in their study. Such a high incidence of complete hanging might be ascribed to firm motive of an individual to commit suicide. Similarly, Bhosle SH et al, (2015) in Maharashtra observed that 32(38.09%) victims were died due to partial hanging and in 34(40.47%) victims complete hanging was seen (6). Patel (2013) in Gujarat observed that only 4 (1.25%) victims were died in partial hanging, while complete hanging were present in 316 (98.75%) cases (1). Meera (2011) in Manipal observed that (88.10%) victims were died in complete hanging and 8.33% victims were in partial hanging (7). Bakkannavar SM (2015) in Manipal found that the 316(98.75%) victims were died in complete hanging. and 4 (1.25%) victims were in partial hanging (8). Wagmare (2014) in Mumbai study the pattern of ligature mark and found that it was

Asphyxial death is a common incident in

Int J Eth Trauma Victimology 2019; 5(1):18.

completely encircling the neck in all cases; hanging was complete in almost all cases (9).

Most cases presented with atypical hanging; wherein the commonest position of knot was on the right side of neck in 42(35.0%) and on the left side in 22(18.33%) cases of complete hanging. Position of knot on occipital region was found in 11(9.16%) cases. The position of knot was on the front of neck in 5 (4.16%), while in 2 cases it could not be ascertained.



**Fig. 1**. Incidence of Hanging and Strangulation among total number of violent asphyxia death cases during period 1 year.



**Fig. 2**. Distribution of cases of hanging among various age Groups



Fig. 3. Distribution of cases of strangulation among various age groups

**Table 1**: Distribution of cases of Hanging amongtheir respective age groups.

Age		Hanging	
Groups	М	F	Total
0-10yr	0	0	0
11-20yr	11(9.16%)	10(.83%)	21(17.5%)
21-40yr	36(30%)	29(24.16%)	65(54.0%)
41-60yr	07(5.83%)	01(0.83%)	8(6.66%)
61-80yr	0	0	0
Total	54(45%)	40(33.33)	94(78.33%)

Table	<b>2</b> :	Sex	differentiation	among	cases	of
Hangir	ησ					

	)			
Sov	Hangin	Strangulati	Tota	Percentag
JEX	g	on	Ι	е
Male	54	15	69	57.5%
Femal	40	11	51	42.5%
Total	94	26	120	100%

Int J Eth Trauma Victimology 2019; 5(1):19.

Positio	Comple	percenta	partial	percenta
n of	te	ge	hangi	ge
knot	hanging		ng	
Right	42%	35%	7%	5.83%
side				
Left	22%	18.33%	5%	4.16%
side				
Front	05%	4.16%	0%	0%
of				
neck				
Occipit	11%	9.16%	0%	0%
al				
region				
Not	02%	1.66%	0%	0%
known				
Total	82%	68.33%	12%	10%

**Table 3**: Distribution of cases of hanging on the basis of position of knot.

 Table 4: Distribution of cases of hanging on the basis of type of knot.

Type of	Comple	Percenta	Partial	Percenta
knot	te	ge	Hangi	ge
	Hangin		ng	
	g			
Fixed	62	51.66%	12	10%
knot				
Runnin	13	10.83%	4	3.33%
g				
noose				
Unkno	3	2.5%	0	0%
wn				
Total	78	65%	16	13.33%

Table 5: Distribution of	cases o	of Hanging	the	basis
of Ligature material.				

Ligature	Comple	Percenta	Parti	Percenta
Material	te	ge	al	ge
Rope/ra	7	5.83%	3	2.5%
ssi				
Dupatta	37	30.83%	4	3.33%
Sari	09	7.5%	4	3.33%
Gamcha	25	20.83%	5	4.16%
Other	0	0%	16	13.33%
Total	78	65%	16	13.33%

 Table 6: Distribution of cases of Hanging on the basis of external finding.

External finding	Hanging	Percentage
Cyanosis	94	70%
Bloody discharge	30	25%
from mouth and		
nose		

Horner syndrome 07 5.83% Dribbling of saliva 71 59.16% of Protrusion 35 29.16% tongue Seminal 27 22.5% ejaculation Fecal soiling 14 11.66%

**Table 7**: Distribution of cases of Hanging on thebasis of characteristics of ligature mark.

External findings	Hanging (N=94)
Complete	2(2.13%)
Incomplete	92(97.87%)
Horizontal	1(1.06%)
Oblique	93(98.94%)
Faint mark	22(23.40%)
Prominent mark	72(76.60%)
On or below thyroid cartilage	0(0.0%)
Above thyroid Cartilage	94(100%)

Our study signifies that noose was fixed in 74 (62.28%) cases of hanging, while running noose was used in 17 (14.66%) cases and in 3(2.5%) cases the type of noose could not be determined. Similarly, Bhosle SH (2015) in Maharashtra found that fixed knot 30(35.71%) and running noose 29(34.52%) were present in his study (6).Patel (2013) in Gujarat observed that in hanging, the fixed knot were present in 148 (46.25%) cases and running knots were seen in 172(53.75%) cases. On the other hand; Bhausaheb NA (2015) in Indoor observed fixed knot in 68.25% cases and running noose in 31.15% cases (1).

In Manipal Meera (2011) observed 73.81% of the victims committed suicide indoor places and 57.14% of them used ropes as ligature material. Complete atypical hanging constituted 88.10% of the cases. 85.75% of the victims had fixed knots with a single turn and 10.71% had slip knots. (6) On the other hand Mukherjee (2016) observed slip knot in 22.73% cases in their study (13).

Considering the information gathered from the relatives of the deceased, from the police investigations and from examination of the ligature material, wherever it has been sent along with the dead body it was observed that the maximum people used soft ligature material like Dupatta, Saree, Muffler and Lungi (62.3%) whereas 37.64% cases used hard ligature materials like nylon rope, jute rope, and electric wire. In our study; Dupatta was most commonly used material

Int J Eth Trauma Victimology 2019; 5(1):20.

among soft ligatures and nylon rope among hard ligatures. The probable reason could be that Dupatta is a very common dress material used by Indian females in almost all families and Nylon rope is a cheap and easily available material due to common use for various domestic purposes. However, the ligature material used by the victim for hanging may be anything available at that moment, which includes any household article or belongings of the victim. This view is further strengthened by the findings in our study which showed that other ligature materials used for hanging were sari, bedsheet, lungi, jute rope, and electric wire. Contrary to this Sahoo et al mentioned that the most commonly employed material was hard ligatures as compared to soft ligatures but he also signifies that Dupatta was most commonly used material among soft ligatures (14).

In present study it was observed that the most common type of ligature material in both complete and partial hanging were Dupatta (n=41; 34.16%) followed by Gamcha ((n=30: 25%). Sari (n=13; 10.83%) and Rope/Rassi (n=10; 8.33%) cases. However, in Pondicherry, Udhayabanu (2015) found sari to be used for hanging (n=74; 47.74%) followed by nylon rope in 25 (16.12%) and dhoti in 21 (13.04%) cases. In Maharashtra (15); Bhosle (2015) observed that the commonest ligature material was nylon rope (53.01%), Handkerchief (6.03%) and Chunari (6.03%) (6). Meera (2011) in Manipal, observed that the ligature material were rope in 10 cases dupatta in 6 cases and sari in 5 cases and electric wire in 1 cases (7). Mukherjee (2016) observed that the ligature material was rope in 10 cases dupatta in 6 cases and sari in 5, electric wire in 1 case 2 (53.75%) were present in his study (13).

Similar to other studies; in present study also, majority cases used cloth material as a ligature; this could be because of the fact that clothes are usually the most easily available ligature material in a household at the material moment.

Among other features, cyanosis was present in 84(76.66) cases of hanging and bloody discharge from mouth was present in 30 (25%) cases. Dribbling of saliva was seen in 71 (59.6%) cases of hanging. Saiyed et al (2013) in Ahmadabad was found that Dribbling of saliva was present in (38.37%) of cases and Cyanosis was present in (34.88%) cases. Mukherjee (2016) oobserved that in 54 (70.12%) cases cyanosis were present, dribbling of saliva or dried salivary stains over cloths were present in 37 (48.05%) of cases (13).

As far as other features / external findings are concerned; it was observed that the complete ligature mark was present only in 2 (2.13%) cases, in maximum cases it was incomplete (n=92; 97.87%). Almost exclusively, the ligature mark was oblique, seen in 93(98.94%) cases and in only 1 incidence it was horizontal (n=1; 1.06%). Further in all 94 (100%) cases of hanging the ligature mark was present above the thyroid cartilage.

## Conclusions

Our observations conclude that most of the victims are died due to hanging, 21- 40 years' age victims were most commonly involved group. In most cases knot was seen on the right side and fixed in nature, the ligature mark was oblique. Soft ligature material (Dupatta) was most commonly used. The most common external finding was cyanosis followed by Dribbling of Saliva.

Most of Asphyxial deaths were in young males and suicidal in manner which can be prevented by education, counseling, addressing the problems and improving the quality of life.

## **Conflict of interest**

None declared.

Funding None declared.

## **Ethical approval**

As per Institutional Ethical Committee.

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