

Socio-Demographic Profile and Gross Findings in Hanging and Strangulation Victims: An Autopsy based Study

¹Malvika Lal, ²Ravdeep Singh, ³Harvinder Singh Chhabra,
⁴Rajiv Joshi, ⁵Ashwani Kumar

¹Assistant Professor, Department of Forensic Medicine, Guru Gobind Singh Medical College, Faridkot,

²Associate Professor, Dept. of Forensic Medicine, Guru Gobind Singh Medical College, Faridkot,

³Assistant Professor, Dept. of Forensic Medicine, Himalayan Institute of Medical Sciences Dehradunm,

⁴Professor, Dept. of Forensic Medicine, Guru Gobind Singh Medical College, Faridkot,

⁵Professor, Dept. of Forensic Medicine, AIMS, Mohali

How to cite this article: Malvika Lal, Ravdeep Singh, Harvinder Singh Chhabra, Rajiv Joshi, Ashwani Kumar. Socio-Demographic Profile and Gross Findings in Hanging and Strangulation Victims: An Autopsy based Study. Medico-Legal Update / Vol 25 No. 3, July - September 2025

Abstract

Introduction: Hanging and strangulation are forms of violent asphyxial death and are commonly encountered in day-to-day autopsy. The need to differentiate between the two is extremely crucial especially in cases of suspicious deaths. Thorough examination of the external and internal findings including ligature mark helps to establish the crucial facts in such cases.

Methodology: The present observational study was carried out on 100 autopsy cases of hanging and strangulation, in the Department of Forensic Medicine and Toxicology, G.G.S Medical College & Hospital, Faridkot, Punjab during a period from April, 2021 to October, 2022

Results: A total of 100 cases of hanging and strangulation were studied. Males accounted for majority of cases of hanging while females accounted for majority of cases of strangulation. Various other factors like age distribution, ligature material used, nail marks, parchmentation, tongue bite were studied. Data was statically analysed.

Conclusion: A meticulous forensic examination in hanging and strangulation is of great importance to differentiate between them. This study highlights that the ligature mark needs to be evaluated and correlated along with external findings, internal findings and histopathological findings of neck structures.

Keywords: Hanging, Ligature mark, Strangulation, Antemortem, Postmortem

Introduction

Hanging is one of the most common methods of suicide worldwide. it can be homicidal or accidental

also. Suspicion of manner of death arises in those cases in which the knot or noose is too tight, use of atypical knot, too many turns, case of complete ligature mark, in unusual position like sitting,

Corresponding Author: Ravdeep Singh, Associate Professor, Dept. of Forensic Medicine, Guru Gobind Singh Medical College, Faridkot

E-mail: ravdeepsingh011@gmail.com.

Submission: May 11, 2025

Revision: June 13, 2025

Published date: August 14, 2025

kneeling etc. Strangulation is another form of asphyxial death which is caused from constriction of the neck by a ligature without suspending the body¹. Occlusion of the neck veins leading to asphyxia is almost solely responsible for the classic signs of congestion, cyanosis and petechiae above the level of neck constriction². Ligature mark which is an imprint abrasion is one of the characteristics finding in cases of death due to hanging and ligature strangulation. Thus, a thorough and complete examination of the ligature mark is a must, to differentiate between hanging and strangulation and give a proper cause of death along with its manner. Hanging and Strangulation can be differentiated on the basis of local findings at neck and its underlying structure. Grossly the most important findings of ligature mark to look for are number of turns whether single or multiple, level of ligature mark whether it is above or below the thyroid cartilage. Discontinuity of ligature mark is almost present in cases of hanging and absent in strangulation and cutaneous alteration of colors and textures whether reddish brown, or pale or parchment like, these changes are more commonly seen in hanging than strangulation, inward fracture of hyoid bone are more common in case of manual strangulation whereas outward fracture of hyoid bone is seen in cases of hanging in elderly person above 40 yrs of age³. Microscopic examination of the ligature mark may confirm about the tissue reaction to rule out antemortem or postmortem nature of hanging or strangulation. These may produce a scientific corroboration of circumstantial evidence⁴.

Further studies are needed to identify specific injury patterns that could aid in distinguishing between hanging and strangulation, especially in cases where the external evidence is not conclusive. The present study was planned to investigate in depth the gross and microscopic findings of neck structures in cases of hanging and strangulation, and correlate it with earlier similar studies.

Material and Methods

Objectives: To observe and analyze demographic profile and the gross findings of injuries to neck structures in deaths due to hanging and strangulation.

Study Design: Observational study based on data collected from autopsy carried out in mortuary.

Study sample and site: The present observational study was carried out in Department of Forensic Medicine and Toxicology, G.G.S Medical College & Hospital, Faridkot, Punjab during the period from April 2021 to October 2022. A total of 100 cases of hanging and strangulation were studied.

Inclusion Criteria

1. The known cases of Hanging and Strangulation brought for Medico-legal Postmortem examination

Exclusion Criteria

1. Putrefied bodies.
2. Subjects with cases of neck injuries due to any cause other than hanging and strangulation.
3. Asphyxial death cases other than hanging and strangulation.

Methodology

After taking informed consent from relative of deceased, a thorough external examination was conducted in the mortuary. External findings in relation to general asphyxial features were noted. Emphasis was made over ligature mark and material. Thus, after completing external examination autopsy was performed with dissection of thoraco-abdominal and cranial cavities followed by dissection of neck to render neck field as bloodless with 'Y' shaped incision. The neck dissection was performed in a layer wise technique starting with subcutaneous tissue and proceeding with muscle layers, vital vessels and other deeper structures like hyoid bone and thyroid cartilage in the neck beneath ligature mark. The skin and muscles underneath the ligature and hyoid bone and thyroid cartilage was studied grossly and the findings were noted.

The data obtained was subjected to statistical analysis.

Results

A total of 100 cases were studied during the period of April 2021 to October 2022, out of which

90 cases were of hanging and 10 cases were of strangulation. All the hanging cases were of suicide and all strangulations cases were of homicide.

Table 1. Comparison of cases on the basis of age group

Age Group	Hanging		Strangulation	
	Frequency	Percent	Frequency	Percent
11-20 years	15	16.7	1	10.0
21-30 years	51	56.7	7	70.0
31-40 years	22	24.4	2	20.0
41-50 years	02	02.2	0	00.0
Total	90	100.0	10	100.0

Majority of hanging and strangulation cases were seen in age group of 21-30 years (Hanging 56.7%, strangulation 70%) followed by age group of 31-40 years.

Table 2. Comparison of cases on the basis of gender

Gender	Hanging		Strangulation	
	Frequency	Percent	Frequency	Percent
Male	60	66.7	3	30.0
Female	30	33.3	7	70.0
Total	90	100.0	10	100.0

Most of the hanging cases were seen in the males (66.7%) in comparison to strangulation where females were seen in 70% of cases.

Table 3. Comparison of cases on the basis of ligature material used

Ligature Material	Hanging		Strangulation	
	Frequency	Percent	Frequency	Percent
Dupatta	32	35.6	2	20.0
Plastic rope	27	30.0	2	20.0
Bedsheet	15	16.7	1	10.0
Electric wire	03	03.3	0	00.0
Cotton rope	13	14.4	2	20.0
NA	00	00.0	3	30.0
Total	90	100.0	10	100.0

Table 3 shows that for hanging dupatta (35.6%) was most commonly used as ligature material followed by plastic rope (30%), bed sheet (16.7%) and

cotton rope (14.4%), while for strangulation dupatta, plastic rope and cotton rope has same frequency (20%)

Table 4. Comparison of cases on the basis of parchmentation

Parchmentisation	Hanging		Strangulation	
	Frequency	Percent	Frequency	Percent
Present	90	100.0	00	00.0
Absent	00	00.0	10	100.0
Total	90	100.0	10	100.0

Parchmentisation was seen in all (100%) cases of hanging (Fig 1) while it was absent in all cases of strangulation (0%).

**Figure 1: Parchmentization of ligature mark skin****Table 5. Comparison of cases on the basis pale glistening white subcutaneous tissue under ligature mark**

Pale glistening white tissue	Hanging		Strangulation	
	Frequency	Percent	Frequency	Percent
Yes	90	100.0	00	00.0
No	00	00.0	10	100.0
Total	90	100.0	10	100.0

All (100%) cases of hanging showed pale white glistening band below ligature mark, in comparison to strangulation, where it was absent in all (100%) cases.

Table 6 shows that nail mark injury was absent in all cases of hanging (100%) (Fig 2), in comparison all cases of strangulation (Fig 3) showed nail mark injuries (100%).

Table 6. Comparison of cases on the basis of finger nail mark injury

Abraded contusion nail marks	Hanging		Strangulation	
	Frequency	Percent	Frequency	Percent
Present	00	00.0	10	100.0
Absent	90	100.0	00	00.0
Total	90	100.0	10	100.0



Figure 2: Finger nail marks in case of hanging



Figure 3: Finger nail marks in a case of strangulation

Table 7 shows the comparison of cases on the basis of tongue bitten / protruded. Only 20% of hanging cases showed tongue bitten/protruded (Fig 4) while it was absent in all cases of strangulation.

Table 7. Comparison of cases on the basis of tongue bitten/protruded

Tongue bitten / Protruded	Hanging		Strangulation	
	Frequency	Percent	Frequency	Percent
Present	18	20.0	00	00.0
Absent	72	80.0	10	100.0
Total	90	100.0	10	100.0

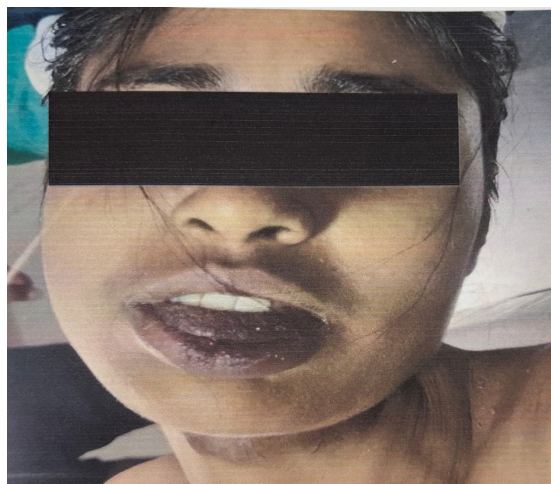


Figure 4: Protrusion of tongue bite/Protruded

Table 8. Comparison of cases on the basis of dribbling of saliva mark

Dribbling of saliva mark	Hanging		Strangulation	
	Frequency	Percent	Frequency	Percent
Present	14	15.6	00	00.0
Absent	76	84.4	10	100.0
Total	90	100.0	10	100.0

15.5 % (n=14) of hanging cases showed dribbling of saliva while it was absent in all cases of strangulation

Table 9 shows the comparison cases on the basis of facial congestion. It was completely absent in hanging (100%) cases whereas in strangulation cases, 90%(n=9) showed facial congestion.

Table 9. Comparison of cases on the basis of facial congestion

Facial congestion	Hanging		Strangulation	
	Frequency	Percent	Frequency	Percent
Present	00	00.0	09	90.0
Absent	90	100.0	01	10.0
Total	90	100.0	10	100.0

Discussion

In the present study, deaths due to hanging and strangulation was seen from 11 to 50 years of age (table 1). The majority of cases belonged to the age group of 21-30 years old, in which of hanging were 56.7% and strangulation were 70% followed by age group of 31-40 years old, (Hanging 24.4%, strangulation 20%). Our results are comparable to study done by Joshi R et al⁵, Verma S.K et al⁶, Sharma BR et al⁷, TK Reddy et al⁸. The reason can be increasing age aggression and frustration, The emotional and mental turmoil due to burden of responsibilities, unemployment, depression, marital disharmony and feeling of worthlessness resulting in taking such measures to end life.

In our study 63% of subjects were males and 37% were females (table 2). Hanging cases represent a greater number of males (66.7%) in comparison to strangulation cases where females constitute majority of cases (70%). Joshi R et al⁵, Uzün I et al⁹, Zátoková L et al¹⁰, Bhausahab NA et al¹¹, Singh B et al¹² and TK Reddy et al⁸ reported similar incidence. Increased incidence of males in hanging cases may be due to the burden of responsibilities, unemployment and financial crisis. Satish kumar

Khalko SK et al., found females and males were 1 (50%) and 3 (60%) respectively in cases strangulation. Naik SK et al¹³ reported increased incidence of strangulation among females, similar to this study. The main reason may be that females are physically weaker than males and easily overpowered and strangled.

The material used for ligature in maximum cases of hanging was dupatta (35.6%), followed by plastic ropes (30%), bedsheet (16.7%), cotton rope (14.4%) and electric wire (3.3%). In strangulation cases, dupatta (20%), plastic rope (20%) and cotton rope (20%) showed equal distribution among cases (table 3). In studies done by Reddy TTK et al⁸ and Sharma BR et al⁷, cloth material - chunni (dupatta) was found to be the commonest ligature material followed by nylon rope and saree. Thus it depicts that in particular incident whatever material was available around, it has been used by the victims or assailant as the ligature material.

In the present study all cases of hanging (100%) presented with parchmentization and pale white glistening band of subcutaneous tissue, in comparison, no case of strangulation showed the same finding (table 4). Sharma N et al,

also noted parchmentisation in 56(56%) cases of hanging and 2(50%) cases of ligature strangulation¹⁴. Parchmentisation is seen because of continuous pressure over the neck by the ligature in cases of hanging where victim is suspended for a longer period of time and the constricting force is the body weight while in cases of strangulation the constricting force is for lesser period and is other than the body weight hence these findings are generally not noted.

All of the hanging cases (100%) in the study show nail marks while it was absent in all cases of strangulation (100) (table 6). Dribbling of saliva were present in 15.6% of hanging cases while all (100%) of strangulation cases showed absence of dribbling saliva mark (table 8). 20% of hanging cases showed protruded or bitten tongue while absent in all (100%) cases of strangulation (table 7). 90% (n=9) of strangulation cases showed facial congestion while the same was absent in all (100%) cases of hanging (table 9). The findings are similar to other studies^{8,15,16,17}. Pressure by the ligature on the submandibular glands lead to dribbling of saliva and is considered as surest sign of antemortem hanging. Constricting force of the ligature put pressure on the neck structure leading to elevation of the tongue. Abraded contusion nail marks are usually seen more in cases of strangulation because the victim tries to save himself and fights back by drawing the ligature material away from him which results small abrasions and contusions around the ligature mark which should be examined carefully.

Our study highlights the high prevalence of strangulation in females (70%), use of dupatta as ligature material in hanging (35.6%) and strangulation (20%). Most of the cases of strangulation were due to marital disharmony.

Conclusion

A meticulous forensic examination in hanging and strangulation is of great importance to differentiate between them. This study is in concordance with previous similar studies and tries to highlight that the ligature mark needs to be evaluated and correlated

along with external findings, internal findings and histopathological findings of neck structures below ligature mark i.e epidermis, dermis, connective tissue, muscle and bones. Thus if this method is followed in the routine practice of postmortem examination, the formulation of final opinion in doubtful cases will become easy.

Limitation of Study

1. Suicidal or homicidal hanging and strangulation are relatively rare this region, limiting the number of cases available for study
2. Single-center study: As the study was conducted at a single institute, external validation across multiple centers and varying conditions is recommended

Funding Sources: self

Ethical Clearance/Statement of Ethics: ethical clearance taken from ethical committee of Guru Gobind Singh Medical College, Faridkot, dated 22/04/2021.

Conflicts of Interest: nil

References

1. Reddy N. Mechanical Asphyxia. The essentials of forensic medicine and toxicology. 34th edition. Vol 1. New Delhi; Jaypee Brothers Medical Publishers. 2017: 328
2. Siegel JA, Saukko PJ. Encyclopedia of forensic sciences. Academic Press; 2012 :28.
3. Gargi J, Gorea R K, Chanana A, Mann G. Violent asphyxial deaths. J.Indian Acad. Forensic Med. 1992; 12(4):174-175.
4. Sharma N, Shrivastava A, Vyas PC. A study of morphology and histopathology of ligature marks in asphyxial deaths by compression of neck in jodhpur region. JMSCR. 2018; 06:924-927.
5. Rajeev J, Ashok C, Hakumat R. Incidence and Medico-legal importance of Autopsy study of fracture of Neck structure in hanging and strangulation. Medico legal update. 2007 ;7(4):105-9.
6. Satish K. Verma, Sone Lal, Strangulation deaths during 1993-2002 in East Delhi (India), Legal Medicine.2006;8(1): 1-4.

7. Sharma BR, Harish D, Sharma A, Sharma S, Singh H. Injuries to neck structures in deaths due to constriction of neck, with a special reference to hanging. *J Forensic Leg Med.* 2008;15(5):298-305.
8. Reddy TTK, Krishnamurthy V, Rao NP, Prakash KR, Kumar KS. A study of various patterns of ligature mark produced in cases of hanging brought to the mortuary, GGH, Guntur. *Int. J. Clin. Diagn.* 2019; 2(2):33-37.
9. Uzün I, Büyük Y, Gürpınar K. Suicidal hanging: fatalities in Istanbul retrospective analysis of 761 autopsy cases. *J Forensic Leg Med.* 2007 ;14(7):406-9.
10. Zátoková L, Janík M, Urbanová P, Mottlová J, Hejna P. Laryngohyoid fractures in suicidal hanging: A prospective autopsy study with an updated review and critical appraisal. *Forensic science international.* 2018 Sep 1;290:70-84.
11. Bhausahab NA, Baburao CS, Banerjee KK, Kohli A. Pattern of external and internal findings in deaths owing to hanging-a study in northeast Delhi. *Int J Med Sci Public Health.* 2015 Nov 1;4(11):1536-9.
12. Singh B, Ghosh M, Sangal A, Srivastava AK. A Postmortem medicolegal study of violent asphyxial deaths-An autopsy based study. *Int Arch BioMed Clin Res.* 2017 ;3(2):104-7.
13. Naik SK, Patil DY. Fracture of Hyoid Bone in cases of Asphyxial deaths resulting from constricting force round the neck. *Journal of Indian Academy of Forensic Medicine.* 2005;27(3):149-53.
14. Navneet S, Shrivastava A, Vyas PC. A study of morphology and histopathology of ligature marks in asphyxia death by compression of neck in Jodhpur region, Rajasthan. *JMSCR.* 2018;6(6):923.
15. Manoj Kumar Sharma, Jaspinder Pratap Singh, Kuldip Kumar, Ashok Chanana. Ten Year Autopsy Study of Differentiating Features Between Hanging and Strangulation. *Med. Legal Update,* 2020;20(4): 323-328.
16. K. Jyothi Prasad., et al. LigatureMark in Hanging - Gross and Histopathological Examination with Evaluation and Review. *J Addict Depend.* 2016;2(1): 65-71.
17. Patel AP, Bhoot RR, Patel DJ, Patel KA. Study of violent asphyxial death. *IJMFM.* 2013;3(2):48-57.