



International Journal of Allied Medical Sciences and Clinical Research (IJAMSCR)

ISSN:2347-6567

IJAMSCR /Volume 6 / Issue 4 / Oct - Dec - 2018
www.ijamscr.com

Research article

Medical research

Medico-legal study of strangulation cases in Varanasi district

Satish Kumar Khalkho¹, Manoj Kumar Pathak²

¹Junior Resident (JR-III), Department of Forensic Medicine, Institute of Medical Sciences, Banaras Hindu University, Varanasi, Uttar Pradesh

²Professor Department of Forensic Medicine, Institute of Medical Sciences, Banaras Hindu University, Varanasi, Uttar Pradesh

*Corresponding Author: Satish Kumar Khalkho

Email id: satishkhalkho81@gmail.com

ABSTRACT

Introduction

The term asphyxia may be defined as a state in which the body lacks of oxygen, because of some mechanical interference with the process of breathing. Strangulation is a form of violent asphyxial death caused by constricting the neck by means of ligature or by any other means without suspending the body.

Materials and methods

The study was conducted in Department of Forensic medicine, Institute of Medical Sciences, Banaras Hindu University, Varanasi, Uttar Pradesh. It is a prospective study. The study was conducted during October 2016 to March 2018.

Results

Total 150 out of 2976 medico-legal deaths were identified to be due to violent asphyxia with incidence rate of 5%. Most common age group involved was 21-30 years. Strangulation was the most common method of asphyxial homicidal death constituting 4.67%.cases & smothering 0.67% cases. Fracture of hyoid bone is noted in 2 cases.

Conclusion

Ligature strangulation is more frequently used method of homicidal asphyxial death. If hyoid bone fracture is detected, it has to be confirmed whether it is ante-mortem fracture or an artefact of post-mortem fracture occurred during autopsy, as it has medico legal importance while giving the opinion regarding the cause of death.

Keywords: Mechanical asphyxia, Ligature strangulation, Manual strangulation, Hyoid bone.

INTRODUCTION

Strangulation is a form of violent asphyxial death caused by constricting the neck by means of ligature or by any other means without suspending the body. Strangulation is considered to be a form of mechanical asphyxia. The term strangulation is specifically used to indicate the external pressure

applied to the neck either by means of a ligature or the hands. The mechanisms of death in strangulation include airway occlusion, resulting in hypoxia; occlusion of the neck vessels or compression of the carotid arteries, leading to cerebral ischemia; and carotid sinus reflex, leading to cardiac arrest. [1]

Homicidal asphyxial death most commonly includes strangulation & smothering. [2] Ligature strangulation is usually homicidal in nature, involves women, children, and the elders, but accidental and suicidal occur as well. Manual strangulation is the most common form of strangulation used in the domestic violence cases. [3]

Strangulation occupies less than 1% of all the medico-legal deaths and 5-10% of criminally violent deaths [4]. In a study from 2009 to 2012 in Peshawar, ligature strangulation was the most common method of violent asphyxia. [5]. Strangulation cases were also on the rise in honour killing victims in a study done by Human Rights Commission [6]. Fracture of hyoid bone and thyroid cartilage may be seen in some cases. However, hyoid fractures are not common because the level of ligature is below the hyoid bone and traction on the thyro-hyoid ligament is not much acting. Moreover, if broad ligature material is used with considerable force, hyoid bone or thyroid cartilage may be fractured [7] [8]. Similarly, the hyoid bone or thyroid horns may be fractured,

especially where the ligature rides at the level of the thyro-hyoid ligament or above. [1] So observation of hyoid bone becomes one of the most important parts of examination during autopsy of mechanical asphyxial deaths due to pressure over the neck.

MATERIALS AND METHODS

The present study was conducted in Department of Forensic Medicine, Institute of Medical Sciences, Banaras Hindu University; Varanasi for medico-legal autopsies done on bodies brought from the various Police Stations of Varanasi and surrounding areas. Total 07 cases of asphyxial death due to strangulation were studied during October 2016 to March 2018, and percentage study was done on that. For this study those cases were selected which were died due to violent asphyxial death and were confirmed to be so after the post-mortem examination. Also, those cases which were reported by police as not being the case of violent asphyxial death but came out so after post-mortem examination, were also included in present study.

OBSERVATION AND RESULTS

Table 1: Incidence of Violent Asphyxial Deaths amongst all Autopsied cases (October 2016 to March 2018)

	No. of Autopsy	Percentage (%)
Asphyxial deaths	150	5
Other	2826	95
Total	2976	100

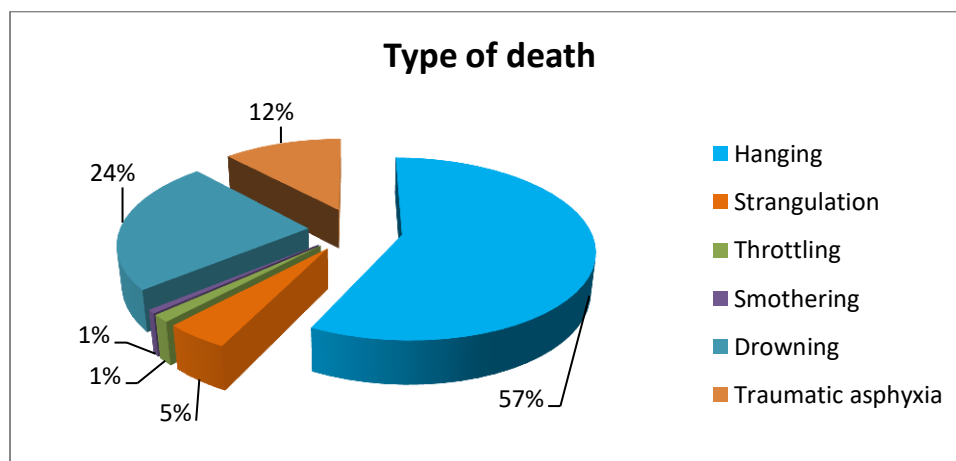


Figure 1: Distribution of cases of Violent Asphyxia Death on the basis of the type of death.

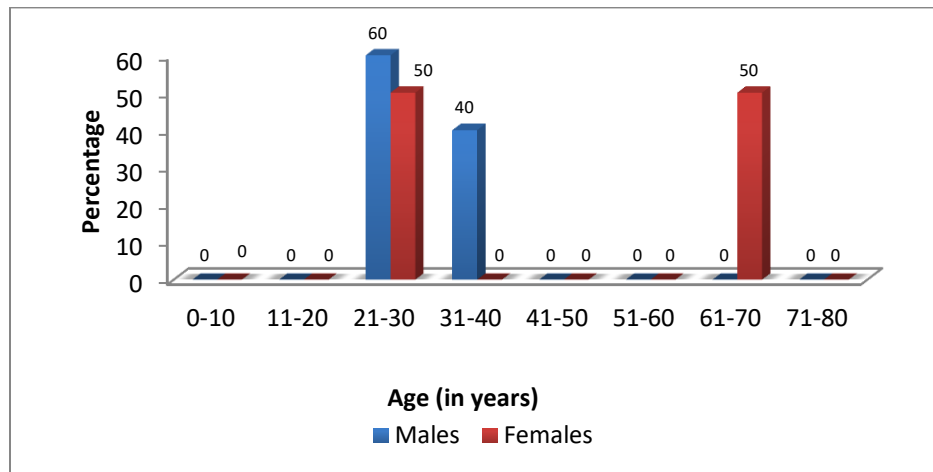


Figure 2: Age and sex wise distribution of victims of Strangulation



Photograph-1: showing localized multiple contusions over left side of face, along with congestion suggestive of strangulation (with/without ligature)



Photograph-2: showing left lateral view– Multiple enlarged, focal contusions with crescentic abrasion over nose adjacent left cheek and chin face suggestive of struggle during Strangulation with ligature



Photograph-3: showing intensely congested eyes with subconjunctival haemorrhage suggestive of Strangulation



Photograph-4: showing horizontal ligature mark over neck at thyroid cartilage level



Photograph-5: showing horizontal ligature mark all around neck, at the level of thyroid cartilage along with abrasion around the ligature mark and bruised neck muscles



Photograph-6: showing intensely congested eyes with Sub-Conjunctival haemorrhage



Photograph-7: showing congested face due to manual strangulation along with haemorrhages over neck and chest wall



Photograph-8: showing manual strangulation – Internal neck dissection in an attempt to examine hyoid bone fracture as this was a case of manual strangulation (Throttling)

Table 2: Incriminating factors as observed in Homicidal death.

Factors	Frequency	Percentage (%)
Property / Money Quarrel	3	30
Family Quarrel	4	40
Sexual Jealous	0	0
Sexual Assault	1	10
Not Known	2	20
Total	10	100

Table 3: Types of strangulation

Type	Number	Percentage (%)
Ligature strangulation	5	71.43
Manual strangulation	2	28.57
Total	7	100.00

Table 4: Place of incidence of strangulation cases

Places	Males		Females		Total	
	No.	%	No.	%	No.	%
Home	2	66.67	1	33.33	3	42.86
Work place	2	100	0	0	2	28.57
Forest	1	50	1	50	2	28.57

Table 5: Characteristic features of ligature mark

Features	Number	Percentage (%)
Continuous	7	100
Above thyroid cartilage	1	14.24
At thyroid cartilage	5	71.43
Below thyroid cartilage	1	14.24
Not visible	0	0
Ecchymosis	7	100

Table 6: Observation of neck structures

Neck structure	Number of patients	Percentage (%)
Laryngeal congestion	7	100
Tracheal congestion	7	100
Fracture of hyoid bone	2	28.57
Sterno-cleidomastoid muscle contusion	5	71.42
Laryngeal contusion	6	85.71
Tracheal contusion	6	85.71
Nail marks / Abrasion	3	42.86
Contusion / Laceration wound	5	71.42

Table 1: Incidence of violent asphyxial death in our study was 5%, the total number of autopsies conducted during the study period was 2976, out of which 150 were mechanical asphyxial death

Figure 1: The incidence of various types of violent asphyxial deaths was recorded and, out of 150 asphyxial death cases, hanging was found to be the commonest of all, 86 cases (57.3%), followed

by drowning 36 (24.0%), strangulation 7(4.67%), throttling 2(1.33%), smothering 1 (0.67%) respectively and accidental finding of relatively higher proportion of traumatic asphyxia, 18 (12%) number of cases.

Figure 2: Age and sex wise distribution of victims of Strangulation – The study cases were distributed on the basis of their age and gender. 4

(57.14%) subjects belonged to age group 21-30 years were commonest to be found where, females and males were 1 (50%) and 3 (60%) respectively. This was followed by 2 (28.58%) subjects in 31-40 age groups with 2 (40.0%) males and 17 and no females. 1(14.28%) subjects were observed 61-70 years of age group.

Table 2: Incriminating factors for homicidal deaths- Precipitation factors in homicidal deaths were observed. Family quarrel was commonest in 4 (40%) subjects followed by property quarrel in 3 (30.0%) subjects. Factor of death in 2 (20.0%) was not known

Table 3: Types of strangulation: Maximum cases presented with ligature strangulation, 5 (71.42 %) in number followed by manual strangulation 2 (28.57%) in number respectively.

Table 4: Place of incidence of strangulation cases: In the present study, maximum death of strangulation cases occurred at home which were 3 (42.85%) in number followed by at work place and forest in 2 (28.57%) cases each

Table 5: Characteristic features of ligature mark In our study, Maximum incidence of strangulation case, ligature mark was present at level of thyroid cartilage (overriding) 5 (71.43%) followed by above thyroid cartilage 1(14.24%) & 1 (14.24%) present below thyroid cartilages. Ecchymosis present in 7(100%) cases.

Table 6: Observation of neck structures: In our study, laryngeal and tracheal contusions were found in 6 (85.71%) cases, laryngeal and tracheal congestion in 7 (100%) cases, sterno-cleido-mastoid muscle contusion in 5 (71.42%) cases, and fracture of hyoid bone was found in 2 (28.97%) cases.

DISCUSSION

Table no.1 comprises the data about the incidence of violent asphyxial death in our study which was 5%, the total number of autopsies conducted during the study period was 2976, out of which 150 were mechanical asphyxial death. Similar observations were reported by **Sharma et al** (2008) (5%) [9], **Singh A et al** (2003) (5.26%) [10], **Patel A et al** (2013) (5.63%) [11], **Arif M** (2015) (5.9%) [12], **Tirmizi S Z et al** (2012) (7.08%) [13] **Murty OP et al**, (2000) (10%) [14] And **Ajay Kumar S et al** (2013) (10.50%). [15]

Figure 1 depicts the data about the incidences of strangulation deaths in our study was constitutes

4.7% of all asphyxial deaths. Similar findings were observed in the study done by **Sharma et al** in a 10 year retrospective study on unnatural deaths in northern India (Chandigarh) that strangulation constitutes 0.6% of all unnatural deaths.[9] **Azma D** studied asphyxial deaths during the period of 21 year from 1984 to 2004 in turkey. Strangulation death constitutes 2% to 3% of all asphyxial deaths. [16] **Singh et al.**, reported that incidences of strangulation and hanging is 42% and 51% respectively. [17] **Verma and Lal** reported that strangulation constitutes 1.17% cases of out of 8385 Forensic autopsies in a retrospective study between 1993 and 2002 in Delhi. [18] **Satish et al.** conducted a 10 year retrospective study about violent asphyxia deaths in East Delhi and found that incidences of strangulation in all violent asphyxia deaths contributes 14.33% cases with overall incidence of strangulation at 1.2% in total autopsies. [19]

Figure 2 shows the age and gender-wise distribution among cases of strangulation In our study, cases were distributed on the basis of their age and gender. 4 (57.14%) subjects belonged to age group 21-30 years were commonest to be found where, females and males were 1 (50%) and 3 (60%) respectively. This was followed by 2 (28.58%) subjects in 31-40 age groups with 2 (40.0%) males and no females. 1(14.28%) subjects were observed 61-70years. Similar findings were observed in the study done by **Dimaio V J (2000)** in America, has reported 41 deaths due to manual strangulation out of which 27 were females and 14 males.[20] **Azma D** studied asphyxial deaths during the period of 21 year period from 1984 to 2004 in turkey, 20.8% of the cases were aged between 30 and 39 years and males constitute 79.8% of all the cases.[16] **Chandrasekhara rao P et al.** Highlighted in their study that the incidences of mechanical asphyxial death is highest in the second decade (20-29 years of age) in both sexes. The incidence was lowest in 6th decade of life (age group 60-69 years). [21] In study done by **Chand et al.** Maximum numbers of cases (51.72%) were seen in the age group of 20-29 years followed by 30-39 years of age group (15.51%) in both the sexes. The minimum numbers of cases were seen in extremes of age, i.e., below 10 years and above 60 years. Male predominance was seen in most of the age groups except age group below 10 years. Male-to-female ratio is 2:1. During the study, one case

was seen kinner in 20-29 years of age. [22] The findings of present study are different from the study of **Singh et al** the study reflected female predominance in ligature (63.63%) and manual strangulation (75%). This is in accordance with a study from Patiala, India which reported that female victims constituted 66.66% of violent asphyxial deaths caused by ligature. [17]

Table no. 2 concludes the data about the incriminating factors for homicidal deaths- In our study, family quarrel was commonest in 4 (40%) subjects followed by property quarrel in 3 (30.0%) subjects. Factor of death in 2 (20.0%) was not known. These findings were similar to study done by **Srivastava and Rajesh K** who reported a fairly equal distribution among various motives with maximum contributions from family quarrel and dispute over property. [4][23] **El-Hady, et al.** reported that the most common motives for homicide were robbery and defence for honour, 3 cases of each (20%), followed by psychological problems of the assailant, revenge, family problems and after the rape, 2 cases of each (13.3%). [24]

Table no 3 emphasises the type of strangulations In our study, maximum cases presented with ligature strangulation, 5 (71.42 %) in number followed by manual strangulation 2 (28.57%) in number respectively. Similar findings were observed in the study done by **Suffla et al** Ligature strangulation is reported as the more frequently recorded method of asphyxial homicide.[25] **Ambade et al** conducted retrospective study during 1996 to 2005 on homicidal asphyxia deaths in south Delhi and found that ligature strangulation makes the most frequently used method (67.2%). [26] In the study done by **Chand et al**, only 6.84% of cases manual strangulation and 1.36% of cases of ligature strangulation contribute to deaths due to asphyxia. [22] **Arif M (2014)** Ligature strangulation (36.97 %) was the leading cause of violent asphyxial deaths in the study. [12]

Table no 4 highlights the Places of incidence of strangulation cases: In the present study, maximum death of strangulation cases occurred at home which were 3 (42.85%) in number followed by at work place and forest in 2 (28.57%) cases each. Similar observations were reported by **Punitha et al.**, that place of occurrence was indoor in 27 cases (79.4%) and outdoor in 04 cases (11.7%). [27] In study by **Wahlsten P** majority of

the offences (59%) took place in a private residence. [28] In a study conducted by **Mohanty M.K.**, majority of homicides took place outdoors on in contrast with our study results. [29]

Table no 5 summarises the features of ligature marks in strangulation: In our study, in maximum number of strangulation cases, ligature mark was present at level of thyroid cartilage (overriding) 5 (71.43%) followed by above thyroid cartilage 1(14.24%) & 1(14.24%) present below thyroid cartilages. Ecchymosis was present in 7(100%) cases. Similar findings were observed in the study done by **Gordon et al**, ligature strangulation, usually the level of constricting force is at the level of or below the level of thyroid cartilage.[30] **Sharma et al** reported the presence of ligature above the level of thyroid in 58% of cases, 27.3% of cases at the level of the thyroid cartilage, and in 15.2% of cases below the level of thyroid cartilage.[9] **Chand et al** the ligature mark was present above the level of thyroid cartilage in 50% of cases, at the level of thyroid cartilage in 48.07% of cases and 1.92% below the level of thyroid cartilage. [22]

Table no 6 concludes the data about the internal injuries in case of strangulation: In our study, laryngeal and tracheal contusions were found in 6(85.71%)cases, laryngeal and tracheal congestion in 7 (100%) cases, sterno-cleidomastoid muscle contusion in 5 (71.42%) cases, and fracture of hyoid bone was found in 2 (28.97%) cases. Similar findings were observed in the study done by **Dinesh Rao (2016)** 70.83% ($n=187$) of cases damage to neck muscle fibres and haemorrhage at the Sternal end of the Sterno-cleidomastoid muscle were present.[31] According to **Polson CJ, Nandi A and V.V. Pillay**, in cases of throttling, as the constricting force is more in magnitude involving larger area and directly acting upon the hyoid bone itself, hyoid bone is most vulnerable to fracture. [7][32][2] In study done by **Nikolic S**, the incidences of fractures of hyoid bone varies in different studies from 0% to 68%, which also varies with types of mechanical asphyxia like hanging, strangulation and throttling.[33] In study done by **Uzun et al.**, found muscle haemorrhage only in 13.79% of total cases, including all the cases of manual strangulation and 5.76% of cases of hanging.[34] These incidences are lower than that reported in literature, 55.8% by **Suárez-Peñaranda et al.**[35] 42% by **Sharma et al.**[9] and 100% by

Uzunet al.[34] In study done by **Chandrasekhara Rao et al** fractured hyoid bones were noted in throttling. Out of 6 cases of throttling, fracture of hyoid bone were noticed in 5 cases amounting to 83.3%. No fractures were seen in cases of ligature strangulation with zero fractures out of 9 cases of ligature strangulation and very few fractures were noticed in cases of hanging that is 2 hyoid bone fractures in total of 75 hanging cases. [21] In the study done by **Dinesh Rao** hyoid bone was damaged in 6.06% ($n = 16$) of the victims. [31] According to **Chand et al.** hyoid bone fracture occurs in all the cases of strangulation. In manual strangulation cases, 3(60%) out of 5 cases showed presence of hyoid bone fracture, and all cases of ligature strangulation showed this finding. [22]

In a study **Chand et al.** highlighted that fractures of both greater cornua of the right and left sides were seen in 2 (50%) cases of manual strangulation. The fracture left greater cornu was seen in 2 (50%) cases, one in Manual Strangulation, and one in Ligature Strangulation.[22] The results were comparable to other Indian study by **Naik S K**, with fractures of hyoid bones 4 out of 5 in throttling. [36]

CONCLUSION

Medico-legal autopsies provide an important statistical data related to criminal incidents of that particular area. The violence in the form of asphyxia also contributes to the increased number of deaths in this world (about 10% overall) and in our context it was the fourth commonest cause of unnatural death after Road Traffic Accident, burn and poisoning.

Strangulation is that form of asphyxia which is caused from constriction of the neck by a ligature without suspending the body. Pulling a U-shaped ligature against the front and sides of the neck while standing at the back can cause death. It is of two types: (1) strangulation by a ligature, and (2) manual strangulation or throttling. (3) Garroting. (4) Mugging. (5) Bansdola.

If hyoid bone fracture is detected, it has to be confirmed whether it is ante-mortem fracture or an

artefact of post-mortem fracture occurred during autopsy, as it has got immense medico-legal importance while giving the opinion regarding the cause of death.

Strangulation with or without ligature as well as manual strangulation (Throttling) is quite a common method of homicide after firearm and stab wound, in our place as well as in our country. How-so-ever strangulation of all types is always homicidal unless proved otherwise.

Acknowledgement

Authors would like to thank faculty and staff of department of Forensic Medicine IMS, BHU; Varanasi for their valuable support and full help in data collection from the autopsied cases. I would also like to pay sincere tribute to all the victims whose details have been incorporated in the present study after their sad demise.

Conflict of Interest: Nil

Source of Funding: This research was not financially supported by any funding agencies.

Ethical Clearance

The present study was approved by "Institutional Ethical Committee" of Institute of Medical Sciences, Banaras Hindu University; Varanasi. All the information has been taken under consideration of medical ethical committee

Statement of Informed Consent

As this case report was prepared from medico-legal autopsy done at our departmental mortuary, hence we had statutory authorization to do post-mortem examination as well as to publish the findings in the field of scientific journals for literary benefit of young and budding Forensic Science as well as Forensic Medicine aspirants. As per the rules of consent described in Forensic medicine textbooks as well as different scientific literatures of Forensic Medicine, informed consent is needed only in pathological autopsy not in medico-legal autopsy.

Statement of Human and Animal Rights: No human right and animal right is violated in this case.

REFERENCES

- [1]. Saukko P, Knight B. Suffocation & asphyxia, fatal pressure on the neck, immersion deaths. In: Knight's Forensic Pathology. Arnold, London. 3, 2004, 352-411.

- [2]. Pillay VV. Text book of Forensic medicine & Toxicology. Paras medical publisher; Hyderabad. 16, 2011, 260-275.
- [3]. McClane GE, Strack GB, Hawley D. A review of 300 attempted strangulation cases part 2: Clinical evaluation of the surviving victim. *Journal of Emergency Medicine*, 21(3), 2001, 311-315.
- [4]. Srivastava A.K. Study of violent asphyxial deaths in medico-legal autopsies, MD thesis, Dept of Forensic medicine, IMS, Banaras Hindu University, Varanasi 1984
- [5]. Khalil ZH, Naeem M, Adil M, Khan MZI, Abbas SH, Alam N. Asphyxial deaths : a four year retrospective study in Peshawar. *J Potgrad Med Inst* 28(1), 2014, 24-6.
- [6]. Nasrullah M, Haqqi S, Cummings KJ. The epidemiological patterns of honour killing of women in Pakistan. *Eur J Public Health* 19, 2009, 193-7.
- [7]. Polson CJ, Gee DJ, Knight B. *The Essentials of Forensic Medicine*. New York, NY: Pergamon; 1985, 357-388.
- [8]. Vij k, *Textbook of Forensic Medicine and Toxicology*. Reed Elsevier India Pvt. Ltd New Delhi 5, 2011, 125-129
- [9]. Sharma BR, Harish D, 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* 15, 2008, 298-305
- [10]. Singh A. A study of demographic variables of violent asphyxial death. *Journal of Punjab Academy of Forensic Medicine and Toxicology*. 3, 2003, 32-34.
- [11]. Patel A P, Bhoot R R, Patel D J, Patel K A. Study of Violent Asphyxial Death. *International Journal of Medical Toxicology and Forensic Medicine*. 3(2), 2013, 48-57.
- [12]. Arif M. Ligature mark on the neck; How elucidative? *Professional Med J*. 22, 2015, 798-803
- [13]. Trimizi SZ, Mirza FH, Paryar HA. Medicolegal investigation of violent asphyxial deaths – an autopsy-based study. *J Dow Uni Health Sci*,; 6, 2012, 86-90
- [14]. Murty OP, Agnihotri AK. Homicidal Deaths in South Delhi. *J Ind Acad Forensic Med*. 22, 2000, 9–11.
- [15]. Ajay K, Handan V, Rudresh YC, Govindaraju HC, Gouda S Study of violent asphyxial deaths in Chitradurga district of Karnataka *IJBAR*. 4(12), 2013, 868-871
- [16]. Azmak D. Asphyxial deaths: a retrospective study and review of the literature. *AM j Forensic Med Pathol* (2), 2006, 134-144
- [17]. Singh A, Gorea RK, Dalal JS, Thind AS. A study of demographic variables of violent asphyxia death. *JPFMAT* 3, 2003, 22-25
- [18]. Verma SK, Lal S. Strangulation deaths during 1993-2002 In East Delhi (India); *Leg Med (Tokyo)* 8, 2006, 1-4.
- [19]. Satish VK, Sonne L. Strangulation deaths during 1993- 2002 in East Delhi (India). *Leg Med*. 8(1), 2006, 1-4
- [20]. DiMaio VJ. Homicidal asphyxia. *Am J Forensic Med Pathol*. Mar 21(1), 2000, 1-4
- [21]. Chandrasekhararao P, Krishnamurthy V, Reddy TTK, Sivakameswara R. A study of hyoid bone fractures in Mechanical asphyxial deaths, *International Journal of Contemporary Medical Research*; 3(11), 2016, 3316-3319
- [22]. Chand S, Rishi S, Aggrawal A, Dikshit PC, Ranjan R. Neck structures post mortem finding in asphyxia death, *International Journal of Scientific Study* 5, 2017, 248-256.
- [23]. Rajesh K R, Tripathi S K, Manoj K, A study of violent asphyxial death case, MD thesis Dept of Forensic medicine, IMS, Banaras Hindu University, Varanasi, 199, 2010.
- [24]. El Hady RH, Thabet HZ, Ghandour NM. Medico-legal study of violent asphyxia in assist governorate (Egypt), *Journal of Forensic, Toxicology and Medicolegal Analysis*, 1(2), 2016, 34-39.
- [25]. Suffla S, Niekerk AV, Arendse N. Female homicidal strangulation in urban South Africa: *BMC Public Health* 8, 2008, 363.
- [26]. Ambade VN, Godbole HV, Kukde HG. Suicidal and homicidal deaths: A comparative and circumstantial approach. *J Forensic Leg Med* 14, 2007, 253-60.
- [27]. Punitha R, Pradeep Kumar M.V, Jagadeesh N.H, Jayapakash. A cross sectional study on homicidal asphyxial deaths. *JKAMLS*. 26(1), 2017, 9-12.
- [28]. Wahlsten P, Koironen V, Saukko P. Survey of Medico legal Investigation of Homicides in the City of Turku, Finland. *Journal of Clinical Forensic Medicine*, 14(5), 2007, 243-252.
- [29]. Mohanty M.K. Variants of Homicide - A Review. *Journal of Clinical Forensic Medicine*. 11(4), 2004, 214-218.
- [30]. Gordon I, Shapiro HA, Berson SD, *Forensic medicine – A guide to principles*. New York Churchill Livingstone; 3, 1988, 95-127.

- [31]. Dinesh Rao. An autopsy study of death due to Suicidal Hanging – 264 cases. *Egyptian Journal of Forensic Sciences* 6, 2016, 248–254.
- [32]. Nandi A. Principles of forensic medicine, New central book agency Ltd. 2nd edition. 2007, 315-343.
- [33]. Nikolic S, Micic J , Atanasijevic T. Djokic V, Djonic D. Analysis of neck injuries in hanging. *Am J Forensic Med Pathol* 24, 2003, 179-82.
- [34]. Uzun I, BuYuk Y, Gulpiner K. Suicidal hanging: Fatalitirs in Istanbul Retrospective analysis of 761 autopsies. *J Forensic Leg Med* 14(7), 2007, 406-409.
- [35]. Suárez-Peñaranda JM, Alvarez T, Miguéns X, Rodríguez-Calvo MS, de Abajo BL, Cortesão M, *et al.*, Characterization of lesions in hanging deaths. *J Forensic Sci* 53, 2008, 720.
- [36]. Naik S K. A study of fracture of hyoid bone in cases of asphyxial deaths resulting from constricting force around neck. *Journal of Indian Academy of Forensic Medicine*. 27(3), 2005, 149-153.

How to cite this article: Satish Kumar Khalkho, Manoj Kumar Pathak. Medico-legal study of strangulation cases in Varanasi district. *Int J of Allied Med Sci and Clin Res* 2018; 6(4): 929-939.

Source of Support: Nil. **Conflict of Interest:** None declared.