Original Research Article

An analysis of asphyxial deaths in western Mumbai region - A Two-year prospective study

Sachin S Sonawane[1*], Rajesh B Sukhdeve[2], Shivkumar R Kolle[3]

[1]Associate Professor, [2]Professor, [3]Assistant Professor, Department of Forensic Medicine, H. B. T. Medical College, Juhu, Mumbai, Maharashtra, INDIA.
Email: sachinsonawane105@gmail.com

Abstract

Background: the study is conducted to determine i) epidemiology of violent asphyxia deaths in the western Mumbai region, ii) variation in types of asphyxia deaths in relation to age and gender and iii) to evaluate the key features of autopsy findings in different types of asphyxial deaths. **Methods:** It is prospective two year study conducted at mortuary of H. B. T. Medical College and cooper Hospital, Mumbai for period of January 2015 to December 2016. During study period total 3114 of medico-legal autopsies were conducted of which 187(6%) were asphyxial death which are included in this study. **Result:** 187 out of 3114 medicolegal autopsies were of asphyxial death making incidence rate 5.87% of asphyxial death. Age group most commonly involved in asphyxial death was 21-30 years constitutes 28.8% cases. Male victims constitute of 60.42% cases and female victims were 39.58% cases. Drowning is common in age group 1-20 years constitutes 94.4% of all drowning deaths. Age group 1-10 years all the asphyxial deaths were due to drowning. Hanging is commonest in age group 21-30 years and it constitutes 41.22% of hanging case. **Conclusion:** males and young age group population between 11–40 years are more susceptible victims of violent asphyxial deaths. Hanging and drowning was most common cause in this age group. Both these types of asphyxial deaths in young population are preventable and needs to be rectified.

Key Words: Asphyxial deaths, hanging, drowning, ligature strangulation, unnatural deaths

[*]**Address for Correspondence:**
Dr. Sachin S. Sonawane, Associate Professor Department of forensic medicine, H. B. T. Medical College, Juhu, Mumbai, Maharashtra, INDIA.
Email: sachinsonawane105@gmail.com
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INTRODUCTION

The term asphyxia commonly means 'lack of oxygen'. However, etymologically, the term has been translated from the original Greek, implying 'pulselessness/absence of pulsation'. How the lack/absence of oxygen is related to pulsation may be explainable on the fact that the air (pneuma) necessary for maintaining life is carried through the blood (i.e., through the oxy-Hb) and therefore, this movement of air obviously will come to a standstill when movement of blood ceases, i.e. pulselessness occurs. Hence, failure or interruption of one function is inevitably linked to the each other.[1]Asphyxia is defined as a condition caused by interference with respiration or due to lack of oxygen in respired air due to which the organs and tissues are deprived of oxygen (together with failure to eliminate co2), causing unconsciousness or death. In mechanical asphyxia the body lacks of oxygen because of some violent mechanical interference with the process of breathing. So, they are also known as violent asphyxial deaths. Violent asphyxial deaths have significant contribution to unnatural deaths (suicidal, homicidal and accidental). There are various types of violent asphyxial deaths like hanging, strangulation, smothering, throttling, traumatic asphyxia, choking and drowning. The hanging is most common type of asphyxia death and it is one of the leading methods of committing suicide. Hanging there is suspension of the body by a ligature material compressing the neck externally and the constricting

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force is the weight of the body itself. Hanging is always considered suicidal except accidental hanging in sexual perverts, homicidal hanging in lynching and justifiable judicial hanging [2].Strangulation is one of the forms of asphyxial death where compression of neck structures caused by a constricting force other than the body's own weight. The constricting force exerted by different means such as ligature (ligature strangulation), by hand (throttling), by elbow (mugging) and by bamboos (bansdola) [3]In drowning, access of air to lungs is prevented by submersion of body in water or fluid medium. Drowning is most commonly accidental in nature. There are two types of drowning fresh or sea water depending upon the water in which the person is drowned. [1] Study conducted by United Nations World Health Organization reveals that in South Asia, about 90,000 people are drowned to death every year. Most South Asian countries have higher drowning death rates than the world average. [4]Traumatic asphyxia" or Crush asphyxia" is other form of mechanical asphyxia where asphyxiation is caused due to mechanical fixation of chest and abdomen by restricting respiratory movements and thus prevents inspiration. It provides the most extreme demonstration of the 'classic signs' of asphyxia i.e. cyanosis, petecheal haemorrhages and congestion. It was termed 'traumatic' because gross mechanical forces are usually the reason for the fixation of the thoracic cage. Traumatic asphyxia occurs in two main conditions building collapse and stampede [5] Considering the facts that different types of asphyxia deaths are related to various manners of unnatural deaths (suicides, homicides and accidental), the present study is conducted to aim diagnose and differentiate between different asphyxial deaths. In addition study evaluates the incidence of post-mortem findings in violent asphyxial deaths in respect to important features which helps in differentiating between different asphyxial deaths. The socio- demographic factors of the deceased include in this study will help to know the incidence of asphyxial deaths amongst the population of western Mumbai region.

MATERIAL AND METHODS

The present prospective study of violent asphyxia deaths were conducted at mortuary of the department of forensic medicine and toxicology at H.B.T. medical college and Cooper Hospital for the period of two years i.e. 1st January 2015 to 31st December 2016. Total 3114 autopsies were conducted in this two year period of which 187(5.87%) deaths were due to asphyxia. The data includes cases of asphyxia deaths referred for post mortem by police station from western Mumbai (western suburbs) region which comes under the jurisdiction of H. B. T. medical college. The study includes the asphyxia deaths of victim with age more than year (infant deaths exclude) and case of asphyxia deaths due to environment suffocation. The preformed proforma was used to record the various parameter of study like age, sex, type of asphyxia death, post mortem findings and cause of death. The information of cases was obtained from police inquest, ADR forms, statement of relatives of victims, hospital papers, and history obtained from relative, friends accompanying with deceased person. All autopsies of asphyxial deaths were meticulously conducted.

OBSERVATIONS AND RESULTS

Table 1: Total number of autopsy and its relation to asphyxia death autopsies

Period	Total autopsies	Asphyxia deaths (%)
Jan 2015- Dec 2015	1524	91(5.7%)
Jan 2016- Dec 2016	1590	96(6.03%)
Total	**3114**	**187(5.87%)**

Total 3114 autopsies were conducted in period of two year i.e. Jan 2015- Dec. 2016 out of which total 183 (6%) cases were of asphyxial deaths.

Table 2: Age and sex wise distribution of asphyxia deaths

Age group	Male	Females	Total	Percentages (%)
1-10 years	16	10	26	13.90
11-20 years	27	18	45	24.00
21-30 years	31	21	52	28.80
31-40 years	21	14	35	18.70
41-50 years	15	09	24	12.80
51- and above	03	02	5	02.60
Total (%)	**113(60.42%)**	**74(39.58%)**	**187**	**100%**

The study reveals the predominance of male victims 113(60.42%) over female victims which account for 74 cases (39.58%). Maximum number of victims 52 (28.80%) were found in the age group of 21-30 years , followed by age group

of 11-20 years accounts for 45 (24%) of cases . Together age group of 11-30 years accounts for more than half of cases 97 (52.8%) and 31-40. 35(18.7%) of cases were belong to 31-40 years age group. Least numbers of cases 5(2.6%) seen in age group of 51 years and above.

Table 3: Distribution of asphyxia deaths on the basis of its types

Type of asphyxia deaths	No. Of cases	Percentages (%)
Hanging	114	60.9
Drowning	54	28.8
Ligature Strangulation	11	05.8
Manual strangulation (throttling)	3	01.6
Smothering	2	01.0
Traumatic asphyxia	3	01.6
Total	**187**	**100%**

Hanging is found to be most common type of asphyxial death and accounts for more than half (114 cases, 60.9%) asphyxial deaths, followed by drowning which accounts for 28.8 %(54) of cases and ligature strangulation 5.8% (11). Least number of cases seen were of smothering 1%(2).

Table 4: Distribution of asphyxia deaths as per their manner

Manner	No. Of cases	Percentages (%)
Suicidal	114	60.96
Homicidal	16	08.55
Accidental	57	30.48
Total	**187**	**100**

Suicide is observed as most common manner of deaths (114 cases, 60.96 %) in violent asphyxial deaths, followed by accidental manner which accounts for 57(30.48%) of cases. Homicide account for least common manner of death and accounts for 16 (8.55%) deaths. All the cases of hanging were of suicidal in nature. Drowning and traumatic asphyxial deaths were of accidental in nature. However ligature strangulation, throttling and smothering were homicidal in nature.

Table 5: Distribution of cases on the basis of sex and type of asphyxia

Type of asphyxia	Male (%)	Females (%)	Total
Hanging	68(59.64)	46(40.36)	114
Drowning	33(61.11)	21(38.89)	54
Ligature Strangulation	07(63.63)	04(36.37)	11
Throttling	02(66.66)	01(33.34)	03
Smothering	01(50.00)	01(50.50)	02
Traumatic asphyxia	02(66.66)	01(33.34)	03

It is observed all types of asphyxia deaths common in males compared to female except smothering which accounts for same number of cases.

Table 6: Distribution of cases on the basis of age and type of asphyxia

Age group/ Type of asphyxia	Hanging (%)	Drowning (%)	Ligature Strangulation (%)	Throttling (%)	Smothering (%)	Traumatic asphyxia (%)
1-10 years	-	26 (48.14%)	-	-	-	-
11-20 years	19 (16.66%)	25 (46.29%)	-	-	-	1(33.33%)
21-30 years	47 (41.22%)	2 (3.70%)	2 (18.18%)	1(33.33%)	-	-
31-40 years	28 (24.56%)	1 (1.85%)	5 (45.45%)	1(33.33%)	-	-
41-50 years	18 (15.78%)	-	4 (36.36%)	-	-	2(66.66%)
51- and above	2 (1.75%)	-	-	1(33.33%)	2 (100%)	-
Total	**114 (100%)**	**54 (100%)**	**11 (100%)**	**3(100%)**	**2(100%)**	**3(100%)**

Study reveals that maximum number asphyxia deaths due to hanging were in the age group of 21-30 years and accounts for 41.22% of hanging cases followed by 24.56% cases of hanging seen in age group of 31- 40 years. All the asphyxial deaths in age group of 1-10 years were due to drowning alone and it accounts for 48.14% of drowning cases. Age group of 1-20 years accounts for total 94.44 %(51) of drowning cases. Maximum number of ligature strangulation seen in age group of 31-40 years followed by age group 41-50 years and accounts for 45.45% and 36.36% cases of ligature strangulation respectively.

Table 7: Internal findings in cases of hanging and strangulation

Internal findings	Hanging (no. Of cases)	Strangulation (no. Of cases)
Subcutaneous tissue White glistening	114(100%)	00
Fracture of thyroid	00	00
Fracture of hyoid	01	02
Haemorrhages in strap muscles	02	11 (100%)
Intimal tear of carotid artery	03	00

In 1case of age group 51 and above fracture of hyoid bone seen in hanging.

DISCUSSION

During the study period total 3114 autopsies were conducted of which 187 were of asphyxial deaths accounting 5.87% of total autopsy done over period of two year i.e. Jan 2015 to Dec 2016. Finding of this study was consistent with study of Neha Chaurasia , SK Pandey1 and Amarnath Mishra study which accounts 6.95% of asphyxial death in the city of Varanasi [6] , study conducted by Bhim Singh, Mithun Ghosh *et al* reveals that the asphyxial deaths accounts for 8.87 % of total autopsies in the city of Meerut[7] . Mangesh R. Ghadge, Dinesh R. Samel study of 10 year duration in thane region reveals that 12.8% of total autopsies were of asphyxial deaths.[8] Patel Ankur P., Bhoot-Rajesh R *et al*. Study of violent asphyxial death in the Ahmedabad shows Incidence of violent asphyxia deaths is 5.63% of total autopsies and consistent with present study [9]. Srinivasa Reddy P, Rajendra Kumar R, Rudramurthy study of asphyxial deaths at District hospital, Tumkur, Karnataka shows that total 19.14% autopsies were of asphyxial deaths.[10] Syed Zubair, Ahmed Tirmizi, Farhat Hussain Mirza and Hamid Ali Paryar study of Medico legal investigation of violent asphyxial deaths in Karachi Pakistan shows the incidence of asphyxial deaths 7.08% of total autopsies conducted [11]. Zahid Hussain Khalil, Mohammad Naeem *et al*. four year retrospective study of asphyxial deaths in Peshawar , Pakistan reveals the incidence rate of asphyxial deaths was 3.98% of total autopsies conducted [12]. Present study shows male predominance in asphyxial deaths comprising of 60.42% of all asphyxial deaths and female constitutes 39.58% of asphyxial deaths. Most common age group involved is 21-30 years constitutes 28.80% of cases followed by 11-20 years comprising 24 %. Age group 11-30 together constitutes 52.80% of cases. Neha Chaurasia *et al*[6] study in Varanasi reveals predominance of male victims 60.89% and females were 39.11% of total violent asphyxial death and most common age group involved in violent asphyxia death was 21-30 years (35.79%), followed by 11-20 years (20.30%) which is consistent with our study. Bhim Singh *et al* [7] study of asphyxial deaths in Meerut city revealed male victims comprising of 68.03% and female victims 31.96% showing predominance of male victims and most common age group involved was 11-30 years constituting 41.55% of asphyxial deaths ,this is in consistent with present study. Mangesh R. Ghadge *et al* [8] study in thane region also shows predominance of male victims which constitute 64.2% of cases and female were of 26.8% of cases and most common age group involved was 21-30 years (37.9%) followed by age group 31-40 years(17.4%). Patel Ankur P[9] study of 388 asphyxial deaths in Ahmadabad region reveals predominance of male victims male to female ratio was 1.69:1 and most common age group involved was 21-30 years 32.99% cases these findings are constituent with present study however second common age group was 31-40 years not constituent present study where second common group was 11-20 years. Srinivasa Reddy P [10]study of asphyxial deaths in Tumkur shows predominance of male victims 59.14% and female victims were of 40.86% ,most common age group involved was 21-30 years comprising of 34.93% of cases followed by age group 11-20 years constituting 20.105 of case. These findings are consistent with present study. Syed Zubair *et al* [11] study in Karachi reveals the male victims were of 75.68% case and females were of 24.32% of cases. Most common age group involved was 15-25 years (33.1%) followed by age group 25-35 years (27.7%)]. Zahid Hussain Khalil *et al.*[12] study in Peshawar also shows predominance of male victims in asphyxial deaths(68.46%) and female victims comprising of 32.64% case and most common age group 20-40 years 64.5% case.Srinivasa Reddy P [10] study of asphyxial deaths in Tumkur shows in 90.42% cases manner of asphyxial death was suicidal in nature followed by 9.58%

case manner was homicidal .in present study most common manner of death was suicidal followed by accidental.In present study commonest type of asphyxial death found was hanging 60.9% cases followed by drowning 28.8% cases and ligature strangulation 5.8%. Neha Chaurasia *et al* [6] study in Varanasi reveals most common type of asphyxial death was hanging 52.21% followed by drowning 45.02% and strangulation 2.21% these finding constituent with present study. Bhim Singh *et al* [7] study of asphyxial deaths in Meerut city shows similar finding with most common method of asphyxia was hanging 60.73% cases followed by drowning 19.63% cases, ligature strangulation 9.13% cases and manual strangulation 5.47% cases. Mangesh R. Ghadge *et al* [8] study in thane region also reveals most common type of asphyxial death was hanging 62.5% case followed by drowning 31.2% cases. Patel Ankur P *et al* [9] study in Ahmadabad region found most common type of asphyxial death was hanging comprising of 82.48% cases followed by drowning 14.43% cases and ligature strangulation 3.09% . Srinivasa Reddy P *et al*. [10] study of asphyxial deaths in Tumkur reveals most common method of asohyxial death was hanging constituting 61.19% of cases followed by drowning 31.96% cases and ligature strangulation 4.34% cases. Findings of study in Pakistan, Karachi region by Syed Zubair *et al* [11] also similar to present study showing most common type of asphyxial death was hanging 36.48% cases followed by drowning 32.43% cases and ligature strangulation 16.21% cases. However Findings of study in Pakistan, Peshawar region by Zahid Hussain Khalil *et al*.[12] inconsistent with present and other study discussed above showing most common method of asphyxial death was ligature strangulation comprising of 69.2% cases followed by smothering 10.8% cases. Cause of this inconsistent finding may be difference in geographical region/ country. In present study major types of asphyxial deaths i.e. hanging (59.64%), drowning (61.11%) and strangulation (63.6%) were common in males compared to females. Neha Chaurasia *et al* [6] study also shows similar finding hanging (54.5%) and drowning (68.6%) was common in males. Mangesh R. Ghadge *et al* [8] study reveals hanging (74%) and drowning (81%) was common in males however ligature strangulation was common in females (84%). Patel Ankur P *et al* [9] study found hanging (60%) and drowning (85.7%) was common in males however strangulation was common in females (66%). Srinivasan Reddy P *et al*. [10] study found hanging (57.83%) and drowning (69.28%) was common in males however strangulation was common in females (78.9%). Syed Zubair *et al* [11] study shows hanging (72.2%), drowning (97.9%) and ligature strangulation (58.3%) was common in males compared to females. Present study found drowning is common in age group 1-20 years constitutes 94.4% of all drowning deaths. However in the age group 1-10 years all the asphyxial deaths were due to drowning. Hanging is commonest in age group 21-30 years and it constitutes 41.22% of hanging cases. Bhim Singh *et al* [7] study also found that drowning was commonest in age group 1-10 years and hanging was commonest in age group 21-30 years. Mangesh R. Ghadge *et al* [8] study found that the drowning is commonest among the age group 1-20 years and it constitutes 42.2 % of drowning cases. Hanging is common in the age group 21-30 years and it constitutes 43.8% of hanging cases. Finding of this study is consitent with present study. Patel Ankur P *et al* [9] study reveals that drowning was common in age group 1-20 years and constitutes 49.23% of drowning cases, hanging was common in age group 21-30 years and it constitutes 40% of all hanging cases. Syed Zubair *et al* [11] study shows drowning was common in age group of 25-35 years and it constitutes 35.5% cases of drowning, hanging was common in age group 15-25 years and it constitutes 37.03% of hanging cases.In present study Subcutaneous tissue White glistening was seen all cases of hanging (114) ,Fracture of hyoid seen in 1 case of hanging Intimal tear of carotid artery seen in 3 cases of hanging .however Fracture of thyroid and Haemorrhages in strap muscles not seen in cases of hanging. Haemorrhages in strap muscles seen in all cases (11) of ligature strangulation and fracture of hyoid bone seen in 2 cases. However Subcutaneous tissue White glistening, Fracture of thyroid cartilage and intimal tear of carotid artery not seen in strangulation cases. Patel Ankur P *et al* [9] study reveals Subcutaneous tissue White glistening was seen all cases of hanging(320) neck muscle contusion seen in 20 cases , however fracture of thyroid cartilage , hyoid bone and intimal tear of carotid artery not seen in hanging cases. Haemorrhages in strap muscles and subcutaneous tissue under ligature seen in all cases (12) of ligature strangulation and fracture of hyoid bone seen in 8 cases However Subcutaneous tissue White glistening, Fracture of thyroid cartilage and intimal tear of carotid artery not seen in strangulation cases.

CONCLUSIONS

Present study reveals that males and young age group population between 11–30 years are more susceptible victims of violent asphyxial deaths. Suicidal deaths as a result of hanging and accidental deaths as a result of drowning in this age group are the major causes of asphyxial deaths constituting 79% cases in present study. This young adult group is most active group of population and more exposed to external environment and stress and strain of life which leads to suicide by means of hanging in this age group. However accidental deaths by drowning

are second common cause of asphyxial deaths in young group indicates lack of supervision and carelessness. Both these types of asphyxial deaths part of young population are preventable and needs to be rectified.

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