

Research Article

Socio-demographic factors in mechanical asphyxial deaths in Thane region, Maharashtra, India

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ABSTRACT

Background: This study was done to analyze the various socio-demographic variables of the subjects who died of Mechanical Asphyxia and had undergone post mortem examination, over the last 10 years, at the FMT Department of Rajiv Gandhi Medical College and Chhatrapati Shivaji Maharaj Hospital, Thane, Maharashtra, India.

Methods: After IEC approval, a descriptive, complete enumeration study of recorded data from PM register from 1st January 2006 to 31st December 2015 (n=5128) was carried. Of these, deaths due to mechanical asphyxial causes were segregated and analyzed.

Results: Of the total 654 autopsies conducted from mechanical asphyxial deaths in the last 10 years, majority (248, 37.9%) were in age group 21-30 years. Of the different types of mechanical asphyxial deaths, maximum were cases of hanging (409, 62.5%), followed by drowning (204, 31.2%), Suffocation (32, 4.9%) and strangulation (9, 1.4%).

Conclusions: Drowning and hanging were common in males whereas strangulation was common in females. A high proportion of subjects who died due to drowning were less than 10 years old (21.6%). We did not find any role of religion as a factor in asphyxial death.

Keywords: Mechanical asphyxial deaths, Violent death, Strangulation, Hanging, Drowning, Suffocation

INTRODUCTION

Mechanical Asphyxia is a condition that occurs from mechanical interference with respiration that leads to reduced oxygen tension in the blood and failure to eliminate CO₂ and other gases from the body.¹

Forms of Mechanical Asphyxia

1. Pressure over the neck caused by;
a) Hanging b) strangulation
2. Drowning; i.e. blockage of respiratory passages by water or any fluid.
3. Suffocation, i.e. interference with respiration by means other than hanging, strangulation or drowning

- Smothering i.e. Closure of external respiratory orifices
- Choking i.e. closure or obstruction of respiratory passages from inside
- Breathing in confined spaces or vitiated atmosphere i.e. environment deficient in oxygen or filled with irrespirable gases
- Traumatic asphyxia which result from arrest of respiratory movements

More than 96% of drowning deaths occur in developing countries. Every year 70,000 deaths due to drowning are reported in India.² These accidents are accentuated by lack of health infrastructure and unavailability of first

aids. Child drowning is estimated to exceed 300,000 deaths every year. Hanging is the most common mode of suicide in Asian region. The Impact of mechanical asphyxial deaths is tremendous.

There is health impact on the society (in terms of pain and sufferings and physical illnesses in the near relatives of the deceased. There is social, psychological, economic and legal impact of such violent asphyxial deaths. According to the WHO, decreasing deaths due to mechanical asphyxia requires scientific approach for providing careful analysis and interpretation of good data and setting up targets and plans.

This study has been attempted to generate data about the socio-demographic background of the subjects and to analyze these data to get information about the various correlates and their impact on the incidence of various types of asphyxial deaths. This compilation of data by various agencies across different areas and time zones will not only help in investigation of such deaths but can assist in devising interventions for prevention of such tragedies in future.

Objectives

- To study the socio-demographic profile of subjects brought to the FMT department for medico-legal autopsies.
- To study the causes of mechanical asphyxial deaths in the subjects autopsied
- To study the correlation between different socio-demographic factors and cases of asphyxia.

METHODS

It was a descriptive study of recorded data which was carried out from the Post mortem records of Forensic Department of Rajiv Gandhi Medical College located in a Thane Region. The Department covers areas falling under jurisdiction of Kalwa, Mumbra, Maharashtra, India and Shil- Diaghar Police stations and deaths occurring in the Hospital attached to the Medical College, where cause of death certificate is not issued. Ethical approval was obtained from the Institutional Ethics Committee. Secondary data from Institutional PM register and case records were used. The study is a complete enumeration study. All the autopsies conducted from 1st January 2006 to 31st December 2015 were included. Of the total number of autopsy records, those related to asphyxia deaths were considered for further analysis. A total of 654 records of deaths due to asphyxia were analyzed.

Operational definition: Asphyxial deaths- deaths caused by mechanical interference with respiration or due to lack of oxygen.

Analysis: Categorical data were presented as frequencies and continuous data as mean±standard deviation (SD). Statistical significance of difference was calculated by Chi Square test.

RESULTS

A total of 5128 medico legal autopsies were conducted by the department in 10 years period from 1st January 2006 to 31st December 2015.

Table 1: Age- sex composition of the subjects.

Age Group	Female*	%	Male*	%	T	%
≤ 1	2	1.0	0	0	2	0.3
1-5	11	5.6	23	5.0	34	5.2
6-10	9	4.6	17	3.7	26	4.0
11-20	37	18.8	74	16.2	111	17.0
21-30	96	48.7	152	33.3	248	37.9
31-40	19	9.6	95	20.8	114	17.4
41-50	11	5.6	58	12.7	69	10.6
51-60	4	2.0	18	3.9	22	3.4
> 60	6	3.0	16	3.5	22	3.4
Unknown	2	1.0	4	0.9	6	0.9
Total	197	100	457	100	654	100

(* z=2.63, p < 0.05, difference in proportion is significant)

Of this 654 (12.8%) autopsies were conducted for deaths due to Mechanical asphyxia. Table 1 shows age distribution of the subjects gender-wise. Of all the subjects autopsied for asphyxial deaths, males were 457 (64.2%) and females were 197 (26.8%). As per Table 1, if we consider the age groups, maximum number of asphyxial death, and 248 (37.9%) are seen in 21 to 30

years group. Second common age group was 31-40 years, in which 114 (17.4%) deaths took place. In fact, 473 (72.3%) deaths were recorded in age groups from 11 to 40 years. If we consider the gender, almost half, i.e. 96 (48.7%) of the deaths amongst females occurred in 21-30 years age group. Table 2: Shows the frequencies of different types of asphyxial deaths:

Autopsies conducted for hanging were 409 (62.5%), the commonest cause of all asphyxial deaths and 8% of total medico legal autopsies, second most common cause of violent asphyxia was drowning, i.e., 204 (31.2%). Of the deaths due to suffocation there were 32 (4.9%) autopsies and suffocation were 9 (1.4%) autopsies from total violent asphyxial death. Suffocation included causes like choking, smothering, traumatic asphyxia and breathing in vitiated atmosphere. Strangulation included throttling and strangulation by ligature.

Table 2: Frequencies of different types of asphyxial deaths.

Types	Frequency	%
Drowning	204	31.2
Suffocation	32	4.9
Hanging	409	62.5
Strangulation	9	1.4
Grand Total	654	100.0

Table 3 shows the regional background of subjects dying of mechanical asphyxia. Maximum bodies of asphyxial deaths were from Satellite areas of Thane city like Kalwa, Mumbra, Diva (497, 76%). Some cases were from surrounding cities like Mumbai, Navi Mumbai, Kalyan-Dombivali (9.8%). Some subjects cases were from far off places, in Maharashtra (Jalna,) and in India like Kerala, India. In 48 cases, the identification could not be done. Table 4 shows the gender-wise distribution of asphyxial deaths. Drowning and Hanging are common in males than in females (83.3% and 66 % respectively) whereas,

strangulation was common in females (88.9%) than among males. The proportion of females who committed suicide by hanging is significantly higher than those committed suicide by drowning.

Table 3: Regional background of subjects dying of mechanical asphyxia.

Region	Frequency	%
Thane City	28	4.3
Satellite areas of Thane	497	76.0
Thane District	11	1.7
Mumbai	12	1.8
Kalyan Dombivali City	9	1.4
Navi Mumbai	43	6.6
Rest of Maharashtra	4	0.6
Rest of India	2	0.3
Unknown	48	7.3
Total	654	100.0

Table 4: Gender-wise distribution of asphyxial deaths.

	Males	%	Females	%	Total
Hanging	270	66	139	34*	409
Drowning	170	83.3	34	16.7*	204
Suffocation	16	50	16	50	32
Strangulation	1	11.1	8	88.9	9
Total	457	69.9	197	30.1	654

(* Chi square = 20.15, p<0.001, highly significant)

Table 5: Age wise distribution of causes of asphyxia.

Age group (years)	Drowning	%	Suffocation	%	Hanging	%	Strangulation	%	Grand total	%
≤ 1	1	0.5	1	3.1	0	0	0	0	2	0.3
1-5	25	12.3	8	25	1	0.2	0	0	34	5.2
6-10	18	8.8	4	12.5	4	0.98	0	0	26	4
11-20	43	21.1	2	6.25	63	15.4	3	33.3	111	17
21-30	36	17.6	14	43.8	194	47.4	4	44.4	248	37.9
31-40	44	21.6	2	6.3	68	16.6	0	0	114	17.4
41-50	22	10.8	1	3.2	44	10.8	2	22.2	69	10.6
51-60	5	2.5	0	0	17	4.2	0	0	22	3.4
> 60	6	2.9	0	0	16	3.9	0	0	22	3.4
Unknown	4	2.0	0	0	2	0.5	0	0	6	0.9
Total	204	100	32	100	409	100	9	100	654	100

Table 5 shows the age wise distribution of causes of asphyxia. Hanging is common in age group 21-30 years (47.4%). If we consider the age group of 11-40, 79.4% hanging cases took place. Drowning was most common in age group of 11-20 and 31-40, the age group 11-40 collectively contributing to almost 60% cases. However,

if we consider the under-five age group, 26 deaths have taken place. Strangulation is common in 11-30 age groups (77.7%). Referring table No 1, if we consider the 473 deaths in age group 21-30 years, then 325 (68.7%) were due to hanging and 123 (26%) were due to drowning. In Table 5, we see a bimodal distribution in

drowning, in age groups 11-20 and 31-40 years. Suffocation, hanging and strangulation is common in age group 21-30 years. If we consider the modal frequency age group, of the 194 cases of hanging, the male: female

ratio is 1.47 (115 males, 78 females). In case of drowning, the M:F ratio is 3.5:1 and in case of strangulation, all were females.

Table 6: Gender-wise distribution of cases as per the religion.

Religion	Female	%	Male	%	Total	%
Hindu	151	76.6	326	71.3	477	72.9
Muslim	36	18.3	91	19.9	127	19.4
Others	1	0.5	1	0.2	2	0.3
Unknown	9	4.6	39	8.5	48	7.3
Total	197	100.0	457	100.0	654	100.0

Table 6 shows the gender-wise distribution of cases as per the religion. Out of total autopsies, 72.9% were conducted on Hindus, 127 (19.4%) were on Muslims, and 7.3% victims were unknown. IF we consider the proportions of Hindus and Muslims among females and males, it is almost the same.

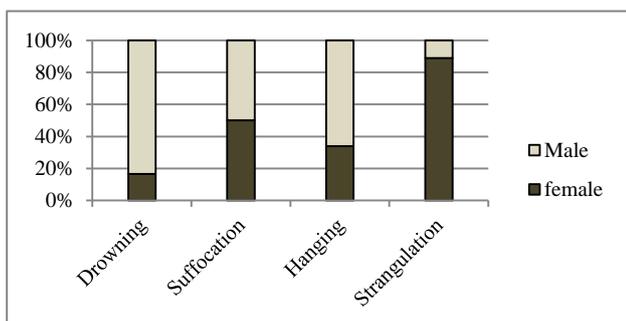


Figure 1: Forms of asphyxia: gender wise distribution.

If we consider the proportion of women cases among Hindus (31.7%) and among Muslims (28.3%), the difference is not statistically significant (chi square=0.51, p>0.1). In 48 subjects, the religion was not known. Other socio-demographic data like marital status, educational level and socio-economic status could not be analyzed as data was inadequate in most cases. Improved data recording by adding more information at the time of recording the case can be useful.

DISCUSSION

Asphyxial deaths constitute an important proportion of medico legal deaths and will continue to do so due to stressful and competitive lifestyles. The proportion of asphyxial deaths to total medico legal deaths was 12%. Other authors like Chaurasia N and Patel got lower proportion.^{3,4} The areas covered by our department for PM services are on outskirts of Mumbai and draws a large crowd of migrant workers who can get affordable rental housing (usually without basic amenities). Crime

rate and groupism is high. As a result violent deaths are common in these regions.

The male:female composition of subjects: The ratio of male: female subjects in our study was 2.32:1. Males being natural breadwinners of the family are expected to be outdoors most of the time and therefore more exposed to the dangers of violence and accidents. Barute ME reported a ratio of 2.75 in Marathwada region.⁵ Some authors have reported lesser M:F ratio of 1.5:1 to 2:1.^{3,4,6,7}

However, since the areas covered by our department are mainly slum areas inhabited by male migrant workers, the ratio in our study is skewed in favor of males. The most common age group for mechanical asphyxial deaths was 21-30 years. These findings are similar to many other authors who have considered that this being the most active age group is most exposed to external violent factors.^{3,4,6,8} This is the age group identity crisis and love affairs are common. Azmak and Bhagora LR has reported a high ratio of 5:1 and 5.2:1 respectively.^{8,9}

Table 2 shows the breakup of mechanical asphyxial deaths into different types. In our study, hanging constitutes the highest incidence (62.5%). If we consider all the MLCs in this study decade, hanging constitutes 8%. Samanta AK has reported 7.15%.¹⁰ Many authors like Sharma, Patel have reported a high incidence of hanging. Ambade has reported 4.1%.^{4,7,11} In India the M:F ratio of drowning is 2.3:1 (NRCB,2012).¹² Amandeep Singh has recorded a Male: female ratio in drowning as 3.12:1 and for hanging it is 1.45:1. In our study, drowning constituted 31.2 % of total Asphyxial deaths, which is high.¹³

Table 3 shows regional background of the cases. Thane being situated as entry point to Mumbai and with connections to other important cities in the vicinity, we get cases for post mortem from a large area. However, since some of the cases also go to civil hospital for PM, hence these figures could not be used for interpretation of incidence of asphyxial deaths in these areas.

Table 4 shows that strangulation which is homicidal is common in females. Drowning and hanging is common in males. These findings are similar to Chaurasia N³. However, the proportion of females who died of hanging is significantly higher than proportion of females who died of drowning. Mumbra and Kalwa areas, being traditional and conservative, the female population seldom ventures out in the locality. Hanging is convenient and can be done in privacy of the house rather than going to the shore for drowning. Accidental drowning is also less in females. Byrard RW noted that 90% of all 10-18 years hanging cases were suicidal.¹⁴

Table 5 shows the breakup of different types of Mechanical Asphyxial deaths as per the age groups. Small children (< 5 years) constituted 5.5 % of the total. Infants and young children are exposed to relatively limited range of circumstances that may result in accidental asphyxial deaths¹⁵. Also, drowning deaths in <10 years children constitutes 21.6%, which is a huge loss to the community.

Risk for drowning includes increased access to water and unprotected watery bodies, children living near open water sources, floods, unsupervised children, consumption of alcohol and drugs and absence of safety skills. Mumbra region is traversed by Thane creek. Many shanties have been erected right on the banks of the creek. Large proportion of migrant population and unskilled labor work leaves many children unsupervised. Thus drowning (accidental and suicidal), especially in children is common. Suffocation is equally common in both sexes. Of the 32 cases, there were 3 cases of choking. One child of 3 years was accidentally choked due to obstruction of trachea by a peanut. In another case, an adult male, a known case of seizures suffered from convulsions and to prevent the tongue bites by bystanders put a plastic pen cap between teeth, which was sucked in trachea. Another adult, who was under the influence of alcohol, was choked by massive food bolus.

There were 2 cases of smothering. One of the cases was homicidal smothering. The lady was hanged by ligature to feign suicidal hanging. An accidental smothering was reported where the farmer who was epileptic got a fit, fell into a mud pit and was smothered by mud. Few cases of traumatic asphyxia reported were due to building collapse.

Strangulation which is homicidal is common in young females because Mumbra and Kalwa being low socio economic areas, the social status of females is poor and they are often subjected to abuse. Such young women are easy prey to criminal minds who find it easier to terminate the lives of their victims by strangulation.

Table 6 shows that asphyxial deaths are common in almost equal proportion in all religions. Most probably, the asphyxial deaths depends more on the social and economic factors than the religious factors. There are a

large number of unidentified cases whose religion could not be ascertained.

CONCLUSION

A ten year records of mechanical asphyxial deaths autopsied by the department of Forensic Medicine and Toxicology Department of Rajiv Gandhi Medical College, Thane, showed that young adults, especially 21-30 years old are more vulnerable. A sizeable proportion of small children have died due to drowning. Strangulation was common in young women. Because of socio-cultural reasons, males are more exposed to the risk factors contributing to such deaths.

This avoidable loss of valuable manpower causes big harm to India's social, cultural and economic stability and progress. Compilation of such primary data originating from the Postmortem departments from various regions and different times could give us a deep insight into various trends and predisposing factors contributing to it, and as such help us in devising interventions to decrease the incidence of Mechanical Asphyxial Deaths in our community.

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Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee

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