

Death due to Mechanical Asphyxia: - A Medico-Legal Retrospective Study at the Department of Forensic Medicine and Toxicology, KEMU, Lahore.

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Abstract:

Objectives: This is a study of one year to find out the pattern of deaths due to mechanical asphyxia found on scrutiny of the record of autopsies conducted during 1-1-2016 to 31-12-2016.

Methodology: Out of a total of 785 autopsies conducted during the period of study, All the cases that fulfill the inclusion criteria were selected and these were 25 cases where death was attributed to mechanical asphyxia and analysis of these cases was made with respect to Age, Sex, Address, Type of Mechanical Asphyxia, Manner of death, Level of Ligature Mark, Presence of Non-Specific Signs of Asphyxia and Fracture of the Hyoid Bone.

Results: Cases of mechanical asphyxial deaths constituted 3.18% of all the autopsies conducted during 2016 at Department of Forensic Medicine and Toxicology, King Edward Medical University, Lahore. Cases of compression of neck constituted 84% while of smothering and gagging had a combined incidence of 16%. In the fatal compression of neck, Hanging constituted 33%, Ligature Strangulation 57% and Throttling 10% of the total cases. Victims were predominantly between the ages of 21-40 years (61.90%) with a female to male ratio of 2.125: 1.

Conclusion: Mechanical asphyxial deaths are mostly due to compression of neck with ligature strangulation being the predominant method. Victims are more commonly Females. Manner of death is predominantly suicidal.

Key words: *Mechanical Asphyxia, Hanging, Strangulation, Suicide*

Introduction:

The term 'asphyxia' literally means lack of oxygen, though etymologically, asphyxia means 'absence of pulsations'.^[1] Serious deprivation of oxygen for 5-10 minutes can result in permanent damage to CNS and CVS, resulting death.^[2] In the 1800s, the most likely cause of death due to hanging was believed to be asphyxiation.^[3] Forensic Medicine deals with mechanical asphyxia which is

mechanical constriction of the neck that causes obstruction of the air passages in an unnatural way from without or blocking them from within.^[4] It is of several types like hanging, throttling, strangulation, choking, drowning, gagging, smothering and traumatic asphyxia. A study indicated 5.63% incidence of deaths due to mechanical asphyxia.^[5] In another study about trends of unnatural deaths, mechanical asphyxia constituted 9.83% of total unnatural deaths.^[6] Manner of death by mechanical asphyxia include: Suicidal, homicidal or accidental. In majority of suicidal mechanical asphyxial deaths, hanging was found to be exclusively predominant method in a study, conducted in the Department of

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Forensic Medicine and Toxicology, KEMU, Lahore.^[7] Furthermore, high gender-based homicidal strangulation against females was noted.^[8] Manual strangulation and smothering are the methods of homicide usually adopted by criminals who are physically strong as compared to their victims.^[9] A research paper on histopathological study of carotid trauma in strangulation deaths suggests perivascular and lymph node changes, due to direct trauma, followed by intimal hemorrhages due to traction forces.^[10] In a study, ligature mark in case of hanging was found to be above the level of thyroid cartilage in 72.09% cases, and at the level of thyroid in 27.91% cases; while in all cases of ligature strangulation, the mark was below the thyroid cartilage.^[11] Involvement of hyoid bone has been observed to be most prevalent in cases of throttling by M.Z. Bashir et al.^[7]

In Pakistan, several deaths due to mechanical asphyxia are being reported but there is paucity of availability of data in this regard, hence this study was designed to find the incidence of deaths by mechanical asphyxia.

Materials and Methods

It was a Retrospective Descriptive Observational Study conducted at Department of Forensic Medicine and Toxicology, KEMU, Lahore from April 2017-May 2017. A sample of 25 Cases was collected by Non- Probability Purposive Sampling.

All the cases where death was attributed to mechanical asphyxia were included in the study that were found on scrutiny of the record of autopsies conducted during 1-1-2016 to 31-12-2016.

All other cases, where the cause of death was other than mechanical asphyxia, were excluded.

Data Collection Procedure

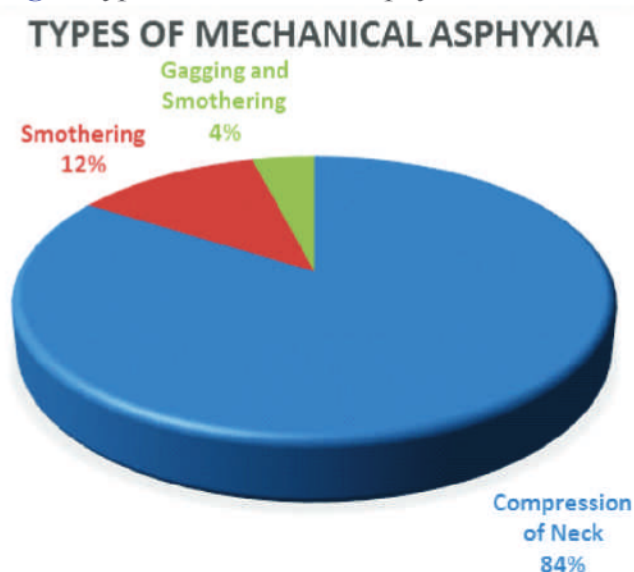
Various parameters were noted from autopsy reports, police inquest reports and death certificates. These parameters include Age, Sex, Address, types of mechanical Asphyxia, types of compression of neck, Manner of Death, Level of Compression of Neck in Fatal Neck Injuries, Associated Injuries on the Neck and other relevant details.

Results

The 25 cases of death due to mechanical asphyxia constituted 3.18% of the total 785 autopsies conducted during the period under study.

The frequency of occurrence of different types of mechanical asphyxia is shown in fig. 1. Incidence of compression of neck was the highest being 84% of total mechanical asphyxia cases.

Fig. 1: Types of Mechanical Asphyxia



Ligature strangulation was the predominant

Table 1: Types of Compression of Neck

Type of Compression of Neck	Frequency	Percent (%)
Hanging	7	33.0
Ligature Strangulation	12	57.0
Throttling	2	10.0
Total	21	100.0

method of compression of neck constituting 57% of cases as evident from Table no. 1.

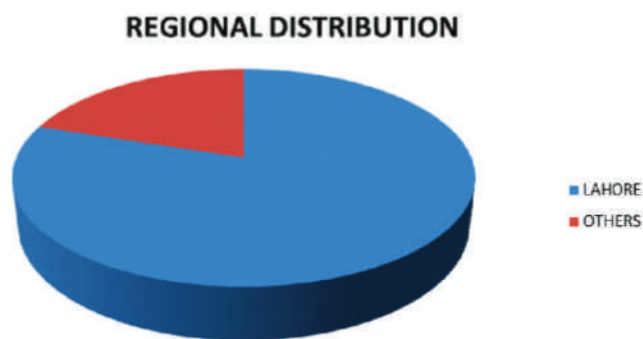
The cumulative representation of the distribution of the victims of mechanical asphyxia based on age and sex is represented in table no. 2. The victims were predominantly between the ages of 21-40 years (60.0%). Third decade showed the maximum incidence having a total of 10 cases (40.0%).

Females were more commonly the victims (68.0%) showing an overall female to male ratio of 2.125: 1. The gender difference was most marked in the third decade of life, showing a ratio of 4: 1.

Table 2: Age and Sex Distribution of Victims of Mechanical Asphyxia

AGE AND SEX DISTRIBUTION OF VICTIMS OF MECHANICAL ASPHYXIA																	Total				
Hanging					Ligature Strangulation				Throttling				Smothering and Gagging								
Sex					Sex					Sex					Sex				Sex		
Age	Female	%age	Male	%age	Female	%age	Male	%age	Female	%age	Male	%age	Female	%age	Male	%age	Female	Male	%age		
0-10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
11-20	2	66.67	1	33.33	0	0	0	0	0	0	0	0	0	0	0	0	2	1	12		
21-30	2	20.0	0	0	3	30.0	2	20.0	1	10.0	0	0	2	20.0	0	0	8	2	40		
31-40	0	0	0	0	3	60.0	1	20.0	1	20.0	0	0	0	0	0	0	4	1	20		
41-50	0	0	0	0	1	33.33	0	0	0	0	0	0	2	66.67	0	0	3	0	12		
51-60	0	0	2	50.0	0	0	2	50.0	0	0	0	0	0	0	0	0	0	4	16		
>60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
Total	28%				48%				8%				16%				17	8	100		

Victims of hanging were primarily in second decade of life and of ligature strangulation in the third and fourth decades. Victims of throttling, which presented only two cases, fell under third and fourth decades of life. Victims of smothering and gagging were in the third and fifth decades of life. (Table no. 2)

Fig. 2: Regional Distribution of the Victims of Fatal

Neck Injuries

80% of the victims belonged to Lahore. Only 20% of the cases were of the areas other than Lahore as shown in the Figure no. 2

In the present study, Homicide, Suicide and Accident related deaths were exclusively found as no natural death results from mechanical asphyxia. Out of a total of 25 cases, 36% were homicidal, 60%

were suicidal, and only 4% were accidental in nature. No autopsy was labeled undetermined during the period of study as depicted in table no. 3.

Table 3: Manner of Death in Fatalities Caused by Mecha-nical Asphyxia

Manner of Death	Frequency	Percent (%)
Homicidal	9	36.0
Suicidal	15	60.0
Accidental	1	4.0
Total	25	100.0

Out of a total of 21 cases studied for level of compression of neck, 18(85.71%) cases had the compression above the level of thyroid cartilage, 3(14.28%) cases below the level of thyroid and none at the level of thyroid cartilage.

Injuries in the form of abrasions and bruises were found in 15 out of 21 cases. Abrasions were found in 3(14.28%) cases while bruises were found in 12(57.14%) cases. 6(28.57%) cases had no signs of associated neck injuries. (Table no. 4)

Out of 21 cases, fracture of hyoid bone was present in only 4 cases which makes only 19% of the total. The remaining 17 cases had the hyoid intact; and these cases account for 81% of the total as shown in table no. 4.

Injuries other than neck were present in 9 (42.85%) cases out of 21 cases studied for the fatal compression of neck. 12 (57.54%) had no injuries other than neck. (Table no. 4)

Table 4: *Level of Compression of Neck in Fatal Neck Injuries associated with fracture of hyoid bone and other injuries on neck*

		Frequency	Percentage (%)
Level of compression of neck	Above the level of thyroid cartilage	18	85.71
	Below the level of thyroid cartilage	3	14.28
	Total	21	100
Associate neck Injuries	Abrasions	3	14.28
	Bruises	12	57.14
	None	6	28.57
	Total	21	100.0
	Present	4	19.05
Fracture of hyoid bone	Absent	17	80.95
	Total	21	100
Injuries other than neck	Present	9	42.85
	Absent	12	57.14
	Total	21	100

Table 5: *Lip and Teeth injuries in the Case of Smothering and Gagging*

		Frequency	Percent (%)
Lip and Teeth injuries in case of smothering	Yes	2	50.0
	No	2	50.0
	Total	4	100.0

Inquest was also made into the cardinal signs of asphyxial deaths i.e. congestion, cyanosis, and petechial hemorrhages in all the 25 cases autopsied for mechanical asphyxial deaths. Congestion was noted in total of 15 cases (60% of total); petechial hemorrhages in 13 cases (52% of total); Cyanosis in 2 cases (8% of total); while 9 out of 25 cases had no

cardinal signs (36% of total). (Table No. 6)

Table 6: *Non-specific Signs of Asphyxia*

Non-Specific Signs of Asphyxia	Frequency	Percent (%)
Congestion	3	12.0
Petechial Hemorrhages	1	4.0
Congestion and petechial hemorrhages	10	40.0
Congestion, cyanosis and petechial hemorrhages	2	8.0
None	9	36.0
Total	25	100.0

Discussion

In our study, death due to mechanical asphyxia constituted 3.18% of the total autopsies performed during the year 2016. This is comparable to 3.58% found by Khalil ZH et al.^[12] Out of the 25 cases in this study, 12% were of smothering which is high, compared to 2.02% incidence found by Tirmizi, Mirza and Paryar.^[13] Deaths by compression of neck were found to be 84% of total deaths due to mechanical asphyxia. Hanging constituted 33% which correlates well with 36. 48% found by Tirmizi, Mirza and Paryar^[13] but is lesser to the findings of other authors.^{[5], [6], [7], [14], [15]} Ligature strangulation constituting 57% was the most common method observed, like that found by SH Khalil ZH et al^[12] but stands in contrast to other studies.^{[5], [6], [7], [12], [13], [14], [15]}

The occurrence of throttling was found to be less compared to the incidence found by Pakistani authors^{[7], [13]} but was found to be more than that given by Singh A, Gorea RK, Dalal JS, Thind AS, Walia D.^[12] In this study incidence of mechanical asphyxia was found to be more in females(68%) as compared to males(32%) which contradicts with the studies of other authors.^{[6], [7], [12], [13], [14], [15]} The occurrence of hanging was more in females in contrast to that found in other studies.^{[5], [7], [13], [14], [15]} Peak incidence of hanging was in 2nd decade of life similar to that found by M.Z Bashir, A R Malik, S A Malik et al^[7] and contrast to 4th decade found by Singh, Gorea and Dalal et al.^[14] Incidence of suicide was more than homicide which is comparable to

other studies.^{[5],[7],[13],[14]} Occurrence of suicide was found to be more in females as compared to males which is against the studies by other authors.^{[7],[12],[13],[14]} In most of the cases, level of ligature mark was found above thyroid cartilage which is in contrast to the study by M.Z Bashir, A R Malik, S A Malik et al in which level of ligature mark was predominantly at the level of thyroid cartilage.^[7] Fracture of hyoid bone was present in only 4 cases that is 19% which is similar to 21% found by M.Z Bashir, A R Malik, S A Malik et al^[7] but is high compared with 2.06% incidence of hyoid bone fracture found by SH Khalil ZH et al.^[12] This may be the result of large sample size in their study. In our study, congestion constituted 60% of the total nonspecific signs of mechanical asphyxia compared with 74% cases by M.Z Bashir, A R Malik, S A Malik et al.^[7] These differences may be attributed to the duration of study, resulting sample size, time and region of study.

Conclusion

Deaths by compression of neck accounts for largest form of mechanical asphyxia. Incidence of ligature strangulation is high among the types of compression of neck. Deaths due to mechanical asphyxia are greater in females as compared to males. Suicide is the manner of death in most cases. Occurrence of hanging and suicide is found to be more in females as compared to males. Ligature mark above thyroid cartilage indicates hanging while below indicates strangulation. These conclusions should help the organizations working for socio economic justice and security to reduce the incidence of mechanical asphyxia.

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