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STUDY OF VIOLENT ASPHYXIAL DEATHS IN CENTRAL INDIA REGION

Forensic Medicine

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ABSTRACT

Asphyxial deaths are commonly encountered in forensic practice and determination of manner of death is of utmost importance. Present study was carried out in the department of Forensic Medicine, GMC, Nagpur from January 2016 – October 2017. Cases of hanging, strangulation (ligature and manual), choking and smothering were included in study. Advanced decomposed bodies were not included in study. Out of 4877 medico legal autopsies conducted during this period, incidence of violent asphyxial deaths was 10.9% (n=531). Males (78.3%) outnumbered females (21.7%) with approximate male to female ratio of 3.6:1. Most affected age group was 21-30yrs among both the sexes. Hanging (69.7%) was most common method of asphyxiation followed by drowning (27.7%) and suicide (75.9%) was most common manner of death followed by accident (22.6%). Homicide was seen in 1.5% cases. Majority of cases (n=269, 50.7%) belong to low socio economic class. Domestic problem was most common reason in 40.5% cases. Soft material was used as ligature in 78.9% cases of hanging and 25% cases of strangulation while hard material was used in 21.08% of hanging and 75% cases of strangulation.

KEYWORDS

Violent Asphyxial death, Hanging, Drowning, Strangulation, Choking, Smothering.

Introduction:

The term mechanical asphyxial is applied to circumstances in which interference either (a) impedes access of air to the lungs or (b) reduces the blood supply to the head and neck or (c) causes sudden cardiac arrest, due to stimulation of the carotid sinus-vagal reflex mechanism[1]. For practical purposes, asphyxia falls into one of the following categories: 1. Compression of the neck, with or without block age of the airway, as in: (a) Hanging (b) Strangulation 2. Obstruction of the airway, as in: (a) Smothering (b) Aspiration of foreign material (c) Swelling of the lining membranes of the throat, as in some allergic and inflammatory reactions, inhalation of superheated air or following a blow to the neck d. Postural asphyxia, also known as positional asphyxia or traumatic asphyxia 3. Compression of the chest interfering with respiratory movements. 4. Exclusion of oxygen due to depletion and replacement by another gas or as a result of chemical interference with its uptake and utilization (a) Carbon dioxide poisoning (b) Carbon monoxide poisoning (c) Cyanide poisoning[2]. Meticulous autopsy in such cases will not only help in determining manner of death but also aid the investigating agencies in solving the case.

Materials and methods

This study was carried out in the department of Forensic Medicine, Government Medical College, Nagpur from January 2016 to October 2017. Out of 4877 medico legal autopsies conducted during this period, 531 cases were of violent asphyxia deaths which were included in our study. Data was collected from inquest papers, post-mortem reports and statement of witnesses. The cases were studied to know the incidence, socio demographic profile, type, manner and autopsy findings of different types of asphyxial deaths.

Observation and Results

Table 1. Incidence of Asphyxial deaths

Total no. of autopsies conducted from Jan 2016-Oct 2017	Number of asphyxial deaths	Percentage
4877	531	10.9

Table no.1 depicts incidence of violent asphyxia deaths. A total 4877 autopsies were conducted during the study period, out of which 531 cases (10.9%) were due to violent asphyxia death.

Table 2. Age and sex wise distribution of cases

Age	Male	Percentage	Female	Percentage	Male:Female ratio
0-10 yrs	8	1.5	5	0.9	1.6:1
11-20 yrs	49	9.2	32	6.02	1.5:1
21-30 yrs	133	25	35	6.6	3.8:1
31-40 yrs	89	16.7	20	3.8	4.5:1
41-50 yrs	69	12.9	8	1.5	8.6:1
51-60 yrs	44	8.3	6	1.1	7.3:1
61-70 yrs	14	2.6	3	0.6	4.7:1
>70 yrs	10	1.8	6	1.1	1.7:1
Total	416	78.3%	115	21.7%	3.6:1

Table 2 depicts age and sex wise distribution of cases. Most affected age group was 21-30yrs in both sexes. Asphyxial deaths in male (n=416, 78.3%) outnumbered the females (n=115, 21.7%) with an approximate male: female ratio of 3.6:1.

Table 3. Methods of Asphyxiation, Age and Gender

Age Group	Hanging		Drowning		Choking		Ligature strangulation		Manual strangulation		Smothering		Total
	M	F	M	F	M	F	M	F	M	F	M	F	
0-10 y	0	0	5	2	3	1	0	0	0	0	0	2	13(2.4%)
11-20y	31	27	18	5	0	0	0	0	0	0	0	0	81(15.3%)
21-30y	101	28	31	7	0	0	1	0	0	0	0	0	168(31.6%)
31-40y	62	16	27	3	0	0	0	0	0	0	0	1	109(20.5%)
41-50y	53	2	15	6	1	0	0	0	0	0	0	0	77(14.5%)
51-60y	33	3	8	3	1	0	1	0	1	0	0	0	50(9.4%)
61-70y	9	0	5	1	0	0	0	2	0	0	0	0	17(3.2%)
>70 y	5	0	5	6	0	0	0	0	0	0	0	0	16(3%)
Total	294	76	114	33	5	1	2	2	1	0	0	3	531(100%)

*M-Male, F-Female

Table 3 depicts distribution of cases according to method of asphyxiation, age and gender. Most commonly affected age group was 21-30yrs (n=168, 31.6%). In hanging most commonly affected age group was 21-30 yrs (n=129, 24.3%) followed by 31-40yrs (n=78, 14.7%). In drowning most commonly affected age group was 21-30yrs (n=38, 7.2%) followed by 31-40yrs (n=30, 5.6%). Most affected age group in ligature strangulation was 61-70yrs (n=2, 0.4%), 1 case of manual strangulation was found in the age group 51-60yrs and 2 out of 3 cases of smothering were found in age group 0-10yrs.

Table 4. Methods of Asphyxiation and Manner of death

Method of Asphyxiation	Case		Manner of death		
	Number	Percentage	Accident	Suicide	Homicide
Hanging	370	69.7	0	370	0
Drowning	147	27.7	114	33	0
Choking	6	1.1	6	0	0
Ligature Strangulation	4	0.8	0	0	4
Manual Strangulation	1	0.2	0	0	1

Smotheri ng	3	0.6	0	0	3
Total	531	100.0	120(22.6%)	403(75.9%)	8(1.5%)

Table 4 depicts distribution of cases according to method of asphyxiation and manner of death. Most common method of asphyxiation was hanging (n=370, 69.7%) followed by drowning (n=147, 27.7%). Manner of death was suicidal in 75.9% cases, accidental in 22.6% cases and homicidal in 1.5% cases of asphyxial deaths. 100% cases of hanging were suicidal, 77.5% cases of drowning were accidental and 22.5% were suicidal. All cases of ligature strangulation, manual strangulation and smothering were homicidal.

Table 5. Distribution of cases according to Socio economic status		
Socio economic status	**Number of cases**	**Percentage**
Upper	12	2.3
Upper middle	34	6.4
Middle	84	15.8
Lower Middle	132	24.9
Lower	269	50.7

Table 5 depicts distribution of cases according to socio economic status. Majority of cases (n=269, 50.7%) belong to lower class followed by lower middle (n=132, 24.9%). Least affected were upper class (n=12, 2.3%).

Table 6. Distribution of cases according to Religion					
Type of Asphyxial death	**Religion**				
	Hindu	**Muslim**	**Others**	**Not known**	**Total**
Hanging	313	12	15	30	370
Drowning	137	6	1	3	147
Choking	3	1	0	2	6
Ligature Strangulation	2	1	0	1	4
Manual Strangulation	1	0	0	0	1
Smothering	2	1	0	0	3
Total	458(86.3 %)	21(3.9%)	16(3.01%)	36(6.8%)	531

Table 6 depicts distribution of cases according to religion. Majority of cases were Hindu (n=458, 86.3%) followed by Muslim (n=21, 3.9%).

Table 7. Distribution of cases according to Marital status				
Type of Asphyxial death	**Unmarried**		**Married**	
	Male	**Female**	**Male**	**Female**
Hanging	124	18	170	58
Drowning	27	10	87	23
Choking	3	1	2	0
Ligature Strangulation	0	0	2	2
Manual Strangulation	0	0	1	0
Smothering	0	2	0	1
Total	154(29%)	31(5.8%)	262(49.3%)	84(15.8%)

Table 7 depicts distribution of cases according to marital status. Majority of cases were married males (n=262, 49.3%) followed by unmarried males (n=154, 29%). Unmarried females were least in number (n=31, 5.8%).

Table 8. Reason behind death					
Type of Asphyxial death	**Personal**	**Domestic Problem**	**Debts**	**Accidental**	**Revenge**
Hanging	109	213	48	0	0
Drowning	33	0	0	114	0
Choking	0	0	0	6	0
Ligature Strangulation	0	0	0	0	4
Manual strangulation	0	0	0	0	1
Smothering	0	2	0	0	1
Total	142(26.2 %)	215(40.5%)	48(9%)	120(22.6%)	6(1.1%)

Table 8 depicts distribution of cases according to reason behind death. Domestic problem (n=215, 40.5%) were the most common reason behind death followed by personal problem (n=142, 26.2%), accidental (n=120, 22.6%) and debts (n=48, 9%). Revenge was reason in only 1.1% cases.

Table 9. Place of hanging		
Place of Hanging	**Number of cases**	**Percentage**
Open place	9	2.4
Closed place	361	97.6
	370	

Table 9 depicts distribution of cases according to place of hanging. Closed place was most common place of hanging (n=361, 97.6%). Hanging in open place was found in 2.4% cases.

Table 10. Type of knot in Hanging and strangulation			
Type of knot	**Hanging**	**Strangulation**	**Total**
Fixed	163(44.05%)	4(100%)	169(45.2%)
Running	207(55.9%)	0	207(55.3%)
Total	370	4	374

Table 10 depicts distribution of cases according to type of knot in hanging and strangulation. Most common type of knot was running (n=207, 55.9%). Fixed knot was found in 45.2% cases.

Table 11. Type of Hanging		
Type of Hanging	**Number of cases**	**Percentage**
On basis of position of knot		
Typical	6	1.60%
Atypical	364	98.40%
On basis of degree of suspension		
Complete	370	100%
Partial	0	0

Table 11 depicts type of hanging according to position of knot and degree of suspension. Atypical hanging (n=364, 98.4%) was most common type of hanging according to position of knot. Complete hanging was most common type on the basis of degree of suspension (n=370, 100%).

Table 12. Ligature material used for hanging and strangulation			
Ligature material	**Hanging**	**Strangulation**	**Total**
SOFT MATERIAL			
Bed sheet	48(12.9%)	0	48(12.8%)
Dupatta	241(65.1%)	1(25%)	242(64.7%)
Saree	3(0.8%)	0	3(0.8%)
SUBTOTAL	292(78.9%)	1(25%)	293(78.3%)
HARD MATERIAL			
Rope	77(20.8%)	3(75%)	80(21.3%)
Wire	1(0.2%)	0	1(0.2%)
SUBTOTAL	78(21.08%)	3(75%)	81(21.6%)
Total	370(100%)	4(100%)	374(100%)

Table 12 depicts distribution of cases of hanging and strangulation according to ligature material used. Dupatta was used most commonly (n=241, 65.1%) as ligature material for hanging followed by rope (n=77, 20.8%). Rope was commonly used material for strangulation (n=3, 75%).

Table 13. Postmortem external and internal findings in Hanging and strangulation		
External Findings	**Hanging**	**Strangulation**
a) Ligature mark	Oblique(100%)	Transverse(100%)
b) Level of Ligature mark		
Above laryngeal prominence	38(10.3%)	0
At and above the level of laryngeal prominence	332(89.7%)	0
Below laryngeal prominence	0	4(100%)
c) Congestion of face	291(78.6%)	4(100%)
d) Dribbling of saliva	268(72.4%)	0
e) La facie sympathique	0	0
f) Subconjunctival haemorrhage	175(47.3%)	3(75%)
g)Position of Tongue		
Inside mouth	113(30.5%)	4(100%)
Protuded and bitten	257(69.5%)	0
h) Post-mortem lividity	Oblique(100%)	Transverse(100%)
Glove and stock pattern	59(16%)	0
On back	311(84%)	4(100%)

i)Ecchymosis along ligature mark	114(30.8%)	4(100%)
j)Seminal discharge	45(15.3%)	0
k)Purging	67(18.1%)	0
l)Struggle marks	0	4(100%)
INTERNAL FINDINGS		
a)Subcutaneous tissue		
White glistening	370(100%)	0
Contused	0	4(100%)
b)Fracture of thyroid	0	4(100%)
c)Fracture of hyoid	0	2(50%)
d)Neck muscle contusion	9(2.4%)	4(100%)
e)Intimal tear of carotid artery	0	0
f)Sub pleural haemorrhage	181(48.9%)	2(50%)
g)Sub pericardial haemorrhage	168(45.4%)	0
h)Cervical spine injury	2(0.8%)	0

Table 13 depicts distribution of cases according to post-mortem external and internal findings. Ligature mark was oblique in all cases of hanging and transverse in all cases of strangulation. In majority of hanging cases level of ligature mark was At and above level of laryngeal prominence (n=332, 89.7%). In all cases of strangulation level of ligature mark was below laryngeal prominence. Congestion of face was found in 78.6% of hanging cases and in all cases of strangulation. Dribbling of saliva was seen in 72.4% of hanging cases and not in strangulation. La facie sympathique was not seen in hanging or strangulation in present study. Position of tongue was protruded and bitten in 69.5% cases of hanging and was inside mouth in all cases of strangulation. Postmortem lividity typical of hanging was seen in 16% cases only while it was found on back in all cases of strangulation. Ecchymosis along the ligature mark was noted in 30.8% of hanging cases and in all cases of strangulation. Seminal discharge was found in 15.3% cases of hanging. Purging was seen in 18.1% cases of hanging and absent in strangulation. Struggle marks were absent in hanging while it was present in all cases of strangulation. On dissection of neck, subcutaneous tissue was white glistening in all cases of hanging while it contused in all cases of strangulation. Fracture of thyroid was seen in all and fracture of hyoid in 50% cases of strangulation, while it was absent in hanging. Neck muscle contusion was seen in all cases of strangulation and in 2.4% of hanging cases. Subpleural haemorrhage was seen in 48.9% cases of hanging and 50% cases of strangulation. Sub pericardial haemorrhage was seen in 45.4% of hanging and absent in strangulation. Cervical spine injury was found in 0.8% cases of hanging while it was absent in strangulation cases.

Table 14. Place of Drowning		
Place of incident	**Number of cases**	**Percentage**
River	52	35.4
Well	34	23.1
Canal	28	19.0
Drain	18	12.2
Pond	12	8.2
Water tank	3	2.0
Total	147	100.0

Table 14 depicts distribution of case of drowning according to place of incident. Most common site of incident was river (n=52, 35.4%) followed by well (n=34, 23.1%), Canal (n=28, 19%).

Table 15. Postmortem findings in drowning		
External examination	**Number of cases**	**Percentage**
Froth at mouth	122	82.9%
Cadaveric spasm	0	0
Cutis anserine	110	74.8%
Washer man's hand/feet	147	100%
Internal Examination		
Mud/water in trachea	147	100%
Mud/water in Stomach	147	100%
Water in pleural cavity	147	100%
Lungs oedematous with indentation of ribs	147	100%

Table 15 depicts post-mortem findings in drowning cases. Froth at mouth was seen in 82.9% cases, cutis anserine in 74.8% cases and washerwoman's hand and feet in all cases of drowning deaths. Cadaveric spasm was not found in present study. On internal examination, Mud/water in trachea and stomach, water in pleural cavity, oedematous lungs with indentation of ribs were seen in all cases of drowning.

Discussion

In present study incidence of violent asphyxial death was found to be 10.9%. This finding is in accordance with the study carried out by **Gupta et al[3], Lalwani et al[4], Kumar et al[5]**.

Asphyxial deaths in Males (78.3%) outnumbered females (21.7%) in present study. Similar findings were reported by **Gupta et al[3], Kumar et al[5], Chaurasia et al[6].** Male to female ratio is in hanging is 3.9:1 which contrast to the study by **Singh et al[7].** However Male: Female ratio in drowning is 3.5:1 which is in accordance with the study of **Singh et al[7].** In Strangulation the ratio is 1.5 (contrast to **Singh et al[7]**). In present study all cases of smothering were reported in females.

Most affected age group was 21-30yrs (31.6%) followed by age group 31-40yrs (20.5%) which is in accordance with the study carried out by **Pawale et al[8], Dakhankar et al[9], Ghadge et al[10]. Reddy et al[11]** reported most affected age group as 21-30 yrs (34.93%) followed by 11-20 yrs (20.10%) and 31-40yrs (17.8%).

In present study Hanging (69.7%)was most common type of asphyxial death followed by drowning (27.7%), which is consistent with studies of **Kumar et al[5], Chaurasia et al[6], Reddy et al[11], Patel et al[12], Tirmizi et al[13],.** However **Azmak D et al[14]** reported hanging in 41.8% followed by Strangulation in 30.5% and drowning in 5.2%. **Singh et al[7]** reported high incidence of drowning deaths (59.4%) followed by hanging (24.3%), strangulation (9.9%). **Vadgama et al[15]** reported drowning as most commonly encountered violent asphyxial death (52%).

In present study all cases of hanging were suicidal in nature. No case of accidental or homicidal hanging were recorded. 77.5% cases of drowning were accidental and 22.5% were suicidal. All cases of ligature strangulation, manual strangulation and smothering were homicidal. This finding is in accordance with the study by **Azmak et al[14]** who demonstrated that homicidal hangings are virtually nonexistent. However **Gambhir Singh et al[16]** demonstrated homicidal hanging cases in their study. **Vadgama et al[15]** reported 94.59% of hanging as suicidal, 2 cases of homicidal hanging and 48.07% of drowning cases as accidental.

Most affected were people from low socio-economic status (50.7%) followed by lower middle class (24.9%). Least affected were upper class (2.3%). This finding is similar to the study by **Rahman et al[17]** in which lower class were 62.5%, middle 25% and upper class were 12.5%.

Maximum number of victims were Hindus (86.3%) followed by Muslims (3.9%). This finding is consistent with the study of **Kumar et al[5], Ghadge MR et al[10].**

Married males (49.3%) were most affected followed by unmarried males (29%), married females (15.8%) and unmarried females (5.8%). This finding is consistent with the study of **Kumar et al[5].**

Domestic problem was the most common reason behind death in 40.5% cases followed by personal reasons (26.2%). **Patel et al[12]** demonstrated personal reason in 34.51% cases and domestic problems in 22.68% cases of asphyxial death cases.

In 97.6% cases hanging were found in closed place. This finding is consistent with the study of **Patel et al[12], Bakkannavar et al[18].** Type of knot was running in 55.9% cases and fixed in 44.05% cases of hanging. This is consistent with study of **Patel et al[12].** However **Sharma et al[20]** reported slip knot in 42% and fixed knot in 58% cases. Hanging was Atypical in 98.4% cases complete in 100% cases in present study. **Patel et al[12]** reported 97.5% of atypical hanging and complete hanging in 98.75% cases. **Pawale et al[8]** reported Typical hanging in 76.1% cases and complete in 92.12% cases. **Sahoo et al[19]** reported Typical hanging in 42.86% and complete hanging in 88.32% cases.

Soft ligature material was used in 78.9% cases of hanging and 25% of strangulation cases while hard ligature material was used in 21.08% cases of hanging and 75% of strangulation cases. Dupatta (65.1%) was most common ligature material used for hanging and rope (75%) was

most common ligature material used for strangulation. This is consistent with the study of **Patel et al[12]. Sharma et al[20]** reported use of soft ligature material in 56.36% cases and had material in 43.64% cases. However **Sahoo et al[19]** reported use of hard material as ligature in 51.95% cases and soft material in 48.05% cases.

In present study ligature mark was oblique in all cases and was above laryngeal prominence in 10.3% cases and at and above laryngeal prominence in 89.7% cases of hanging. While it was below laryngeal prominence in all cases of strangulation. This is consistent with the study of **Patel et al[12]**. However **Sahoo et al[19]** reported 69% cases in which ligature mark was above thyroid cartilage and 23% cases where mark was at and above thyroid cartilage.

Congestion of face (78.6%), dribbling of saliva (72.4%), subconjunctival haemorrhages (47.3%), ecchymosis along ligature mark (30.8%), seminal discharge (15.3%), purging (18.1%), protruding tongue (69.5%) were other external findings of hanging in present study. Typical post-mortem lividity was found in only 16% cases. However, congestion of face, ecchymosis along ligature mark and signs of struggle were seen in all cases of strangulation. Subconjunctival haemorrhage was seen in 75% cases of strangulation. The external findings are consistent with the study of **Patel et al[12]**. **Sahoo et al[19]** reported dribbling of saliva in 38.96% cases and seminal discharge in 16.88% cases. **Pawale et al[8]** reported dribbling of saliva in 65.06%, congested face in 92.95%, subconjunctival haemorrhage in 53.11%, protruded tongue in 66.93% and typical post-mortem lividity in 32.8% cases of hanging.

White glistening subcutaneous tissue (100%), neck muscle contusion (2.4%), sub-pleural haemorrhage (48.9%), sub-pericardial haemorrhage (45.4%), cervical spine injury (0.8%) were internal findings in hanging. In strangulation, subcutaneous tissue and neck muscle were contused; thyroid cartilage was fractured in 100% cases while fracture of hyoid bone and sub-pleural haemorrhage was seen in 50% cases. In study by **Patel et al[12]** neck muscle was contused in 100% cases, hyoid bone fractured in 66.6% cases and no fracture of thyroid cartilage was reported in strangulation.

In present study river (35.4%) was the most common place of incident in drowning followed by well (23.1%). **Patel et al[12]** reported river as site of incident in 28.56% cases followed by pond (21.43%). **Bakkannavar et al[18]** reported river as most common site of drowning followed by sea and well.

Froth at mouth (82.9%), cutis anserine (74.8%) and washer man's hand/feet (100%) were external findings in drowning deaths. Mud/water in trachea and stomach, water in pleural cavity and oedematous lungs with indentation of ribs were found in all cases of drowning deaths in present study. This is consistent with the study of **Patel et al[12]**.

Conclusion

Hanging is most common type of violent asphyxial death in our study with males outnumbering the females. Present study reveals suicide as the commonest manner of death. Low socio-economic class is commonly affected wherein domestic problems are most common reason behind the suicides. Choking was found to be always accidental. Homicidal deaths were predominantly due to strangulations followed by smothering. Revenge was found to be the common motive behind these homicidal incidences. Asphyxial deaths are many a times occult and manner of death is camouflaged. Hence a meticulous medico-legal autopsy along with careful analysis of crime scene is necessary in determining the cause and manner of death.

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