

Two-year prospective study of deaths due to suicidal hanging in western Mumbai region

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Abstract

Background: the present study was conducted with aims to determine i) various epidemiological factors of death due to hanging in the western Mumbai region, ii) variation in types of hanging deaths and iii) to evaluate the key features of external and internal post mortem findings in cases of death due to hanging. **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 114 (3.6%) autopsies were of death due to hanging. These cases were included in this study. **Result:** 114 out of 3114 medicolegal autopsies were of death due to hanging making incidence rate 3.6% of hanging. Age group most commonly involved in hanging was 21-30 years constitutes 41.22% cases of hanging deaths. Male victims constitute of 59.64% cases and female victims were 40.36% cases. In 96.5% cases place of hanging was closed place inside room 3.5% cases hangings takes place in open place. Most common ligature material used for hanging was dupatta/odani constitute 46.5% cases followed by rope in 20.17% cases. Most common external autopsy finding found was cyanosis seen in 79.82% cases followed by congestion of face seen in 59.44% cases. most common internal autopsy finding found was white glistening of subcutaneous tissue under ligature mark in all cases followed by hemorrhages at the base of tongue seen in 6.14% case. **Conclusion:** Young age group population between 21–40 years are more susceptible victims of suicides by hanging constitutes 65.78% cases. Proper parental and social guidance and support could prevent suicides in this age group. Timely counselling of such vulnerable group victims could preventable. Effective prevention strategies are needed to promote awareness of prevention of suicides in young age group.

Key Words: hanging, ligature mark, external autopsies findings, internal autopsies findings

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INTRODUCTION

Hanging is the form of asphyxial death which is caused by suspension of the body by a ligature material compressing the neck externally and the constricting force being the weight of the body itself. Hanging is

always considered suicidal except accidental hanging in sexual pervers, homicidal hanging in lynching and justifiable judicial hanging.¹ The most common method of self-suspension involves attaching the suspending material (rope, string, sari, *chunni*, wearing apparel, etc.) to a high point such as fan or ceiling beam, etc., and the lower end may be formed into a 'fixed loop or running noose' and is placed around the neck. The victim stands on the chair/stool/table or some other support and either jumps or kicks away the support and gets suspended. The hanging is most common type of asphyxia death and it is one of the leading methods of committing suicide². The present study was conducted with aims to study the variation in epidemiological factors in hanging deaths, types of hangings and to evaluate the various external and internal autopsy findings of hangings deaths.

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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 114(3.66%) deaths were due to hanging. The data includes cases of hanging referred for post mortem by police station from western Mumbai (western suburbs) region which comes under the jurisdiction of H. B. T. medical college.

Inclusion criteria

1. The study includes the deaths due to suicidal hanging.
2. Victims of the age more than one year.

Exclusion criteria

1. Accidental and homicidal hanging case.
2. Infant deaths.

The preformed proforma was used to record the various parameter of study like age, sex, type of hanging, and post mortem findings. 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 were meticulously conducted. Crime scene investigation is done as per case merit in most of cases photograph of crime scene and spot panchanama of cases were provided by investigation officer. External features of ligature mark were noted and photographed. In all cases the neck was meticulously dissected layer by layer lastly after enmasse removal of thoraco- abdominal organs and cranial structures.

OBSERVATIONS AND RESULT

Table 1: Total number of autopsies and its relation to deaths due to hanging

Period	Total autopsies	Hanging autopsies
Jan 2105-Dec 2015	1524	53(3.47%)
Jan 2105-Dec 2015	1590	61(3.83%)
Total	3114	114(3.66%)

Total 3114 autopsies were conducted in period of two year i.e. Jan 2015- Dec. 2016 out of which total 114 (3.66%) cases were of suicidal hanging.

Table 2: Age and sex wise distribution of hanging cases

Age group	Male	Female	Total (%)
1-10 years	-	-	-
11-20 years	11	8	19 (16.66%)
21-30 years	29	18	47(41.22%)
31-40 years	16	12	28(24.56%)
41-50 years	11	7	18(15.78%)
51- and above	1	1	2(1.75%)
Total	68(59.64%)	46(40.36%)	114(100%)

The study reveals no single case of suicidal hanging in age group of 1-10 years. Predominance of male victims 68 (59.64%) observed over female victims account for 46 cases (40.36%). Maximum number of victims 47 (41.22%) were found in the age group of 21-30 years, followed by age group of 31-40 years which accounts for 28 (24.56%) of cases. Together age group of 21-40 years accounts for more than half of cases 75 (65.78%). Age group 41-50 years accounts for 15.78% (18) cases of suicidal hangings.

Table 3: Distribution of cases based on marital status

Marital status	No. of cases	Percentage
Married	53	46.49%
Unmarried	61	53.51%
Total	114	100%

The study found that suicidal hanging was common in unmarried person and accounts for 61 (53.51%) case compared to married person which accounts 53(46.49%) cases.

Table 4: Distribution of cases based on place of hanging

Place	No. of cases	percentage
closed place	110	96.5%
Open space	4	3.50%
Total	114	100%

The study shows that the preferred place for committing suicidal hanging was closed place seen in 110 (96.5%) case. Suicidal hanging was committed in open place seen in 4(3.5%) cases.

Table 5: Distribution of cases of hanging based position of knot

Position of knot	Left side of neck	Right side of neck	occiput/back	Front of neck/ Chin	Total
No. of cases (%)	45 (39.5%)	55(48.24%)	11(9.65%)	3 (2.6%)	114(100%)

The position of knot was known from direction of ligature mark and features of ligature mark. Commonest position of knot found was right side of neck and seen in 48.24% cases. The knot was on left side of neck in 39.5% cases. The knot was on occiput in 9.65% cases. Least common position of knot was on front of neck/ below chin in 2.6% cases.

Table 6: Type of hanging based on position of knot

Type of hanging	no. of cases	percentage
Typical	11	9.65%
Atypical	103	90.35%
Total	114	100

Typical hanging was observed in 9.65% where the knot was present on occiput. About 90.35% cases were of atypical hanging.

Table 7: Type of hanging based on the suspension of body

Type of hanging	No. of cases	percentage
Complete	75	65.78%
Partial	39	34.22%
Total	114	100%

65.78% cases were of complete hanging and remaining 34.22% cases were of partial hanging

Table 8: Type of ligature material used

Ligature material	No. of cases	Percentages
Dupatta/ Odhani	53	46.5%
Sari	18	15.78%
Bed sheet	11	9.64%
Rope	23	20.17%
Cable wire	5	4.38%
Lungi	4	3.5%
Total	114	100%

Present study reveals the commonest ligature material used for suspension of body in hanging was *Dupatta/ Odhani* (46.5%). The rope was the second common ligature material (20.17%). Ligature material sari accounts for 15.78%cases, bed sheet for 9.64% cases, cable wire for 4.38% cases and lungi for 3.5% cases of hanging.

Table 9: Distribution of cases based on external autopsy findings

External PM findings	No. of cases	Percentage
cyanosis	91	79.82%
Congestion of face	68	59.64%
Dribbling of saliva	47	41.22%
Subconjunctival haemorrhages	24	21%
Protrusion of tongue	43	37.71%
Emission of semen	23	20.17%
Faecal discharge	17	14.91%

The most consistent external autopsy finding in hanging cases was cyanosis (79.82%). Congestion of face (59.64%), dribbling of saliva (41.22%), protrusion of tongue (37.71%), subconjunctival haemorrhages (21%), emission of semen (20.17%). The least internal finding was the faecal discharge (14.91%).

Table 10: Distribution of cases based on position of ligature mark

Position of ligature mark	No of cases	Percentage
Above thyroid	99	86.84%
At thyroid	9	7.89%
Below thyroid	6	5.2%
Total	114	100%

The commonest position of ligature mark on neck was above the thyroid cartilage (86.84%). Ligature mark was at the level thyroid cartilage in 7.89% cases and below the level of thyroid cartilage in 5.2% cases.

Table 11: Distribution of cases based on internal post-mortem findings

Internal findings	No. of cases (%)
White glistening of subcutaneous tissue under LM	114(100%)
Contusion Subcutaneous tissue under LM	2(1.75%)
Haemorrhages at base of tongue	7(6.14%)
Fracture of thyroid	00
Fracture of hyoid	01(0.87%)
Haemorrhages in strap muscles	02(1.75%)
Intimal tear of carotid artery	03(2.63%)

The most consistent internal autopsy finding was the white glistening of subcutaneous tissue under ligature mark observed in all cases of hanging. Second common internal autopsy finding consistently observed in hanging cases was the haemorrhages at base of tongue and it was observed in 6.14% cases. Carotid artery intimal tear was reported in 2.63% cases. Contusion of the subcutaneous tissue under ligature mark and haemorrhages in strap muscle was observed in 1.75% cases. The least occurred finding consistently observed in hanging cases was fracture of hyoid bone seen in 0.87% case.

DISCUSSION

This prospective study is conducted over a two-year period from January 2015 to December 2016. During this period, a total of 3114 autopsies were conducted of which 114 deaths were of hanging constituting 3.66% cases of all autopsies. A similar study conducted by Dinesh Rao over years 2010 to 2013 at Bangalore showed an incidence rate of 3.31% cases of total autopsies conducted³ which was consistent with the present study. Two-year study by Dekal V, Shruthi P shows the incidence rate of hanging rate 27.9% of total autopsies.⁴ Dr. Amit Yadav, Dr. Divyesh Saxena *et al.* study in Indore for a period of 2012-2013 shows the incidence rate of hanging deaths 30.28% of total autopsies.⁵ Mohit Shrivastava1, P.S. Thakur *et al* study, conducted between 2017-2018 reported the incidence of hanging death 9.2%.⁶ A 10-year study between the period in 2003-2013 by Der EM, Dakwah IA, Derkyi-Kwarteng L *et al* reveals the incidence of hanging death 0.34% in Ghana.⁷ The present study reported the typical hanging in 9.65% and atypical hanging in 90.35% of total cases, complete hanging found in 65.78% cases and partial hanging in 34.22%. Other studies like Dinesh Rao³ found the complete hanging in 88% of cases and partial hanging in 12% cases. Dekal V, Shruthi P study⁴ reported the typical hanging in 4.4% cases and atypical hanging in 95.6% cases, complete hanging in 90.3% cases and partial hanging cases 9.7% cases. Dr. Amit Yadav, Dr. Divyesh Saxena *et al*⁵ study shows typical hanging in 4.7% cases and atypical hanging in 95.3% cases, complete hanging in 92% cases and partial hanging in 8% cases. In Mohit Shrivastava1, P.S. Thakur *et al*⁶ study, the typical hanging was detected in 12.3 % cases and atypical hanging in 87.7% cases. Ambade VN, Tumram N *et al* study⁸ study in Nagpur

reveals the typical hanging in 10.2% cases and atypical hanging in 89.8% cases, complete hanging in 67.7 % cases and partial hanging cases 32.3% cases. Dr. S. Ranjan Bajpai⁹ study in Nashik region shows 21 cases of complete and 41 cases of partial hanging however in 134 cases type of hanging not known. Chand S, Solanki R *et al.*¹⁰ Study result shows the typical hanging in 11.53% cases and atypical hanging in 88.46% cases, complete hanging in 98.07 % cases and partial hanging in 1.92% cases. Patel-Ankur P, Bhoot-Rajesh *et al.*¹¹ study in Ahmadabad found the typical hanging in 2.5% cases and atypical hanging in 97.5% cases, complete hanging in 98.75 % cases and partial hanging in 1.25% cases. The present study found a predominance of male victims (59.64%) over female victims (40.36%) and the most common age group affected was 21-30 years (41.22%) followed by 31-40 years (24.56%). Findings in the present study are consistent with Mohit Shrivastava1, P.S. Thakur *et. al.*⁶ study and which also found the predominance of male victims (67.5%) over female victims (32.5%) and the most common age group affected was 21-30 years (35.9%) followed by 31-40 years (25.1%). Additionally, findings of Der EM, Dakwah IA *et. al.*⁷ study shows the predominance of male victims over female victims and the most common age group affected was 20-29 years (28.7%) followed by 30-39 years (25.1%). Dr. S. Ranjan Bajpai⁹ study reveals the similar findings and shows the predominance of male victims and the most common age group affected was 21-30 years followed by 31-40. Another study by Patel-Ankur P, Bhoot-Rajesh *et al.*¹¹ shows the similar findings to the present study showing the predominance of male victims (64%) and the most common age group affected was 21-30 years (42.66%). Similar findings was observed

in Ravdeep Singh, Anupinder Thind *et al.*¹² study is consistent with the present study showing the predominance of male victims and the most common age group affected was 21-30 years (35.42%) followed by age group 31-40 years (33.33%). However, findings of the present study are not consistent with Dinesh Rao³ study which shows the predominance of female victims and most common age group affected was 31-40 years followed by 21-30 years. The unmarried victims constitute 53.51% cases and married victims constitute 46.49% cases of hanging in the present study. Findings of this study were not consistent with Dinesh Rao³ study shows 70.45% of victims were married and 29.55% victims were unmarried. In 96.5% cases, the location of hanging was a closed place while in 3.5% cases the place of hanging was in open space. Findings of this study are consistent with Dinesh Rao³ study which suggests the most common place of hanging was the closed place (91.85) compared to open space (8.15%). Mohit Shrivastava1, P.S. Thakur *et al.*⁶ study revealed the most common place of hanging was the closed place (95.6%) compared to open space (4.4%). Ravdeep Singh, Anupinder Thind *et al.*¹² study found 95.83% cases hanging occurred in closed place 4.17% case occurred at an open place. Findings of this study are varying from Ambade VN, Tumram N *et al* study⁸ which shows that 68.7% hanging cases occurred at a closed place and in 31.35% cases hanging takes place at the open place. The most common position of knot found in the present study was the right side of the neck (48.29%) and the least common position of the knot was in front of neck/below the chin (2.6%). Finding of this study was consistent with Dekal V, Shruthi P⁴ study, Dr. Amit Yadav, Dr. Divyesh Saxena⁵ study, Mohit Shrivastava1Thakur *et al*⁶ study, Chand S, Solanki R *et al.*¹⁰ Study which found similar evidence of common position of knot on right side of the neck. However, Ambade VN, Tumram N *et al* study⁸ reveals the most common position of the knot was on the left side of the neck. The most common ligature material used for the hanging was a dupatta (46.5%) followed by a rope (20.17%). These findings are consistent with Dinesh Rao³ study which mentioned the most common ligature material was the dupatta followed by the sari. Patel-Ankur P, Bhoot-Rajesh R¹¹ study found that the most common ligature material used was dupatta followed by the bedsheet. Findings in the present study are not similar to Mohit Shrivastava1Thakur *et al*⁶ study which described the most common ligature material used was the rope followed by sari. Der EM, Dakwah IA, Derkyi Kwarteng L *et al.*⁷ study found that the most common ligature material was the rope followed by an electric cable wire. Ambade VN, Tumram N⁸ *et al.* study reveals the most common material was nylon rope followed by a dupatta.

The typical external post mortem finding of hanging in the present study was cyanosis which is seen in 79.82% cases, congestion of face (59.64%), dribbling of saliva (41.22%), subconjunctival hemorrhage (21%) and semen emission (20.17%). Findings are consistent with Mohit Shrivastava1, P.S. Thakur⁶ study which shows the frequency of typical finding of hanging was cyanosis (76.8%), protrusion of tongue (56.6%), salivary stains (26.1%) cases, subconjunctival hemorrhages (22.1%), semen ejaculation (34.45). Patel-Ankur P, Bhoot-Rajesh R¹¹ study shows the congestion of face in 77.5% cases, dribbling of saliva in 77.2% cases, semen ejaculation in 17.5% cases. Ravdeep Singh, Anupinder Thind¹² observed that the dribbling of saliva in 39.58% cases. Dekal V, Shruthi P⁴ study reported the salivary stains in 34.1% cases Dr. Amit Yadav, Dr. Divyesh Saxena *et al.*⁵ study reported the similar rate i.e. the salivary stains in 33% cases. Shaikh MM, Chotaliya H J¹³ study observed the findings like congestion and cyanosis in 34.88% cases, dribbling of saliva in 38.37% and semen ejaculation in 11.62% cases. The most common position of ligature mark in the present study was above thyroid cartilage (86.84%) followed by at thyroid cartilage (7.89%) and the least common position of ligature mark was below the thyroid cartilage (5.2%). Findings of the present study are consistent with Rao D³ study which reported the common position of ligature mark above thyroid in 82.58%, at the level of thyroid in 10.22% cases and below thyroid in 7.20% cases. Dekal V, Shruthi P⁴ study found the place of ligature mark above the thyroid cartilage in 84.95%, at the level of thyroid in 8.41% cases and below the thyroid cartilage in 6.64% cases. Dr. Amit Yadav, Dr. Divyesh Saxena⁵ study found the place of ligature mark above the thyroid cartilage in 87.2%, at the level of the thyroid cartilage in 7% cases and below the thyroid cartilage in 5.6% cases. Chand S, Solanki R, Aggrawal A¹⁰ study found the place of ligature mark above thyroid in 50%, at the level of the thyroid cartilage in 48.07% cases and below the thyroid cartilage in 1.92% cases. Ravdeep Singh, Anupinder Thind¹² study found ligature mark above the thyroid cartilage in 73.95%, at the level of the thyroid cartilage in 26.04 % cases. The typical external post mortem finding of hanging in present study was white glistening of subcutaneous tissue under ligature mark noticed in all cases (100%), the haemorrhage at the base of tongue in 6.14% cases, carotid artery intimal tear in 2.63% cases, contusion in subcutaneous tissue under ligature mark in 1.75% cases. Findings in the present study are consistent with Patel-Ankur P, Bhoot-Rajesh R¹¹ study which observed the white glistening under ligature mark in all cases (100%), neck muscle haemorrhage in 6.25% case. Rao D³, Dekal V, Shruthi P⁴, Chand S, Solanki R, Aggrawal A¹⁰,

Ravdeep Singh, AnupinderThind¹² and Shaikh MM, Chotaliya¹³ study observed the fracture of hyoid bone in 6.06%, 15.48%, 9.5%, 7.79% and 11.63% cases respectively.

CONCLUSION

Young age group population between 21–40 years are more susceptible victims of suicides by hanging which constitutes about 65.78% of total cases. Proper parental and social guidance and support could prevent suicides in this age group. Timely counseling of such vulnerable group of victims could prevent suicide. Effective prevention strategies are needed to promote awareness of the prevention of suicides in the young age group.

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