

## A Study of pattern of neck injuries in the victims autopsied at tertiary care medical college and hospital of North Karnataka

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### Abstract

**Introduction:** Death due to neck injuries are invariably encountered in medicolegal work. Injuries to neck causing death can occur in different manner and different circumstances.

**Objectives:** To know about the neck wounds, neck structures (organs) commonly involved, agents, manner and cause of death due to neck injuries.

**Material and Methods:** 208 victims of neck injuries were autopsied at Al-Ameen Medical College Mortuary and District Hospital Mortuary, Bijapur (Karnataka) from June 2011 to May 2014. It was a one year retrospective and two years prospective study.

**Results:** Out of 208 victims of neck injuries autopsied, most vulnerable age group was 21-30 yrs (30.76%) followed by age group 31-40yrs (27.88%). Cervical vertebrae fracture and dislocation was the most common skeletal injury in neck region (18.26%). It was found that Suicide by hanging (40.38%) was the most common manner of death followed by road traffic accidents (31.73%). Major cause of death was mechanical asphyxia (53.84%).

**Conclusion:** Neck injuries constitute a potential factor in increasing the amount of mortality and morbidity. The conclusions evolved from the present study may be useful in medicolegal work and if possible to make suggestions for prevention and safety measures.

**Keywords:** Manner, Agents and Cause of death, Neck organs involved.

### Introduction

Trauma is one of the leading preventable causes of death in developing countries and is posing major health and social problem. Death related trauma rank third after cardiovascular diseases and cancer. Trauma may lead to short or long term disability. Since neck contains the vital organs like thyroid gland, parathyroid glands, thymus, larynx, trachea, esophagus etc, great vessels and supporting tissue, trauma to this region challenges the integrity and even the viability of the individual.<sup>1</sup> The size and anatomical position of the neck makes it a major site of trauma in suicide, homicide, road accidents, machinery accidents and fall from height etc. Neck trauma causes 10-15% of all mortalities. In case of neck, trauma can produce a wide spectrum of injuries extending from the fracture of bones like hyoid bone, thyroid cartilage, vertebrae etc and injuries of neck structures like contusions, lacerations, abrasions etc.<sup>2</sup>

It is learnt from literature that neck injuries are encountered with different manner (suicide, homicide, accident). Sometimes homicidal neck injuries are pleaded or disguised as suicide e.g. murdered victims placed on railway track and even accidental neck injuries are disguised as homicidal to bring false charge of offence on enemies. Meticulous examination of neck injuries can give clues to settle these challenges (Suicidal, homicidal or accidental). Over all, suicide is the major cause of neck injury because of social, economic, work pressure, love failure; failure in exams, unemployment, marital disharmony and depression etc. Accidental deaths are an unplanned event occurring suddenly unexpectedly as unforeseen circumstance. The exponentially increasing number of automobile vehicles,

poor adherence to traffic rules and regulations, abuse of alcohol and drug are the cause of accidents. Accidents tragically are not often due to ignorance, but are also due to carelessness, thoughtlessness and due to over confidence. Incidence of road traffic accidents has been increasing at the alarming rate throughout the world. Due to narrow roads and excess motor vehicles, road traffic accidents result leading to blunt neck trauma. Neck injuries are one of the major causes of death despite optimal use of available treatment facilities.

Homicides are also on rise because of increasing population, unemployment, industrialization, easy availability of the weapons and stressful living conditions. Besides that, there are many natural household objects like lathi, kitchen knife, screwdriver, razor blade, broken bottles, stone, axe and scissors. The incidence of neck trauma has increasing significantly due to development of rapid means of transport and rising the level of violence in the society in general. About 100 to 130 cases of homicides takes place every day in India. The Studies specific to neck injuries are not being done in this region. In view of this, the present study is undertaken. The conclusions evolved from present study may be useful in similar medicolegal work and if possible, to make suggestions for prevention and safety measures.

### Materials and Methods

The present study was done for one-year retrospective and two years prospective study from June 2011 to May 2014 at Al-Ameen medical college mortuary and District hospital mortuary, Bijapur. (Karnataka)

All the cases autopsied were screened for neck injuries resulting from deaths due to road traffic accidents, machinery accidents, assault, firearm injuries, fall from height and suicide etc. A detailed information and data pertaining to the cases were collected. After receiving the details, post-mortem examination was conducted and cause of death was determined.

Information pertaining to agent and manner of death was sought from the police personnel investigating the case. Some of the particulars of the victim were also obtained from the direct interrogation with relatives, friends and others along with the police. Following points were noted with respect to age, sex, manner of death, agents causing the injury, frequency of organs involved, relationship with fall from height and the cause of death.

All the findings thus obtained were noted down in a separate performa for each case. Then the master chart was prepared. The statistical analysis of the data collection was done and presented in the form of tables. Photographs were taken wherever necessary.

#### Inclusion Criteria

All the victims of neck injuries autopsied at Al-Ameen Medical College mortuary and District hospital mortuary, Bijapur. (Karnataka)

#### Exclusion Criteria

All the victims autopsied at Al-Ameen Medical College mortuary and District hospital mortuary, Bijapur other than victims of neck injury.

#### Results and Discussion

The present study was done for one-year retrospective and two years prospective study from June 2011 to May 2014 in Al-Ameen medical college and District hospital Mortuary, Bijapur. (Karnataka). During this period, 1504 cases were brought for postmortem examination. 208 autopsied cases were of neck injuries but 146(70.19%) victims died due to

neck injury proper and 62(29.80%) victims died due to associated injuries with non-fatal neck injuries. Out of 208 autopsied cases, 166 were males and 42 were females. The male and female ratio was M: F=3.95:1. The mean average age was 33.88 years.

In our study, out of 208 autopsied cases of neck injuries, 146 victims died due to neck injuries proper and 62 (29.80%) victims died due to associated injuries with non-fatal neck injuries. Our present study result was compared and discussed with other studies as follows: - Almost similar finding i.e.10.50 % of total number of autopsied cases was documented by Ajay Kumar S et al.<sup>3</sup> Patel Ankur P et al<sup>4</sup> in their study revealed incidence of asphyxial death to be 5.63% of total autopsies (6880 cases) which was inconsistent with our findings. The reason may be due to total number of autopsies were more in their study.

The present study reveals most vulnerable age group is 21-30 years (n=64, 30.76%) followed by 31-40 years (n=58, 27.88%) and minimum death in the age group of 0-10years (n=10, 4.80%) and >60 years (n=10, 4.80%). The average mean age was 33.88yrs.

These findings were in agreement with studies done by Sharma BR et al<sup>5</sup>, Ajay Kumar S et al<sup>3</sup>, Patel Ankur P et al<sup>4</sup>.

In comparison with study done by Dharmaraya Ingale et al<sup>6</sup>, their finding agrees as far as vulnerable age was concerned (21-30 yrs). In their study, next vulnerable age group was 11-20 yrs., which was in contrast with our results wherein next vulnerable age group in our study was 31-40yrs.

Age group of 21-40yrs was the most functional group of any population. They are primary bread earners of the family, more active, have tendency to take more undue risks, thereby subjecting themselves to the hazards of accidents and injuries. The minimum cases were seen in children and late years. Children are taken care of the elders and those aged 60yrs and above could be due to generally less mobility of these population groups.

**Table 1:** Showing percentage of neck injury victims out of 1504 autopsied cases

Total number of autopsies	No. of neck injury cases	Percentage
1504	208	13.82%

**Table 2:** Showing percentage of death due to neck injury proper:

Death	Total	Percentage
Death due to neck injuries proper	146	70.19%
Death due to associated injuries with non-fatal neck injuries.	62	29.80%

**Table 3:** Age- wise distribution of the victims

Age group (years)	No. of Victims		Total	Percent
	Male	Female		
0 – 10	06	04	10	4.80
10 – 20	12	12	24	11.53
20 – 30	52	12	64	30.76
30 – 40	50	08	58	27.88
40 – 50	18	00	18	08.65
50 – 60	18	06	24	11.53
>60	10	00	10	04.80
Total	166	42	208	100

**Table 4:** Sex- wise distribution of the victims

Sex	No. of victims	Percentage
Male	166	79.80
Female	42	20.19
Total	208	100

**Table 5:** Agents causing injuries

Agents	Types of agents	No of cases	Percentage	
1.Constriction force(n=88)	Ligature material	1. Saree	14	15.90
		2. Nylon rope	08	09.09
		3. Rope	26	29.54
		4. Dupatta	10	11.36
		5. Dhoti	08	09.09
		6. Telephone cable	02	02.27
		7. Lungie	08	09.09
		8. Cotton rope	06	06.81
		9. Electric wire	06	06.81
2.Compression force(n=24)	1.Manual strangulation	04	16.66	
	2.Ligature strangulation	20	83.33	
3.Blunt force (n=66)	1.RTA	60	90.90	
	2.Fall from height	06	09.09	
4.Penetrating force(n=24)	1.Sharp weapon	08	33.33	
	2.Fire arm	02	08.33	
	3.Heavy sharp cutting weapon	14	58.33	
5. Explosion& roof fall (n=02)		02	100	
6.Machinery agents (n=04)	1.Machine belt	02	50.00	
	2.Cutting machine	02	50.00	

**Table 6:** Types of neck organs involved:

Neck organs involved	No. of cases	Percentage
Sternocleidomastoid	18	08.65
Strap Muscles	22	10.57
Hyoid Bone	16	07.69
Thyroid Cartilage	14	06.73
Cricoid Cartilage	14	06.73
Neck vessels	24	11.53
Larynx/Trachea(LT) (including 4Tracheostomy cases)	28	13.46
Mouth, pharynx, esophagus (MPO)	18	08.65
LT + MPO	38	18.26
Cervical vertebrae	42	20.19

**Table 7:** Relationship with fall from height

Height in feet	No. of cases	Percentage
<10 ft	00	00.00
11-20 ft	02(Male)	33.33
20-30 ft	02(Male)	33.33
30-40 ft	02(Male)	33.33
Total	06	100

**Table 8:** Manner of death

Circumstances	No. of Victims		Total	Percent
	Male	Female		
1.Accidental				
a. RTA death	60	06	66	31.73
b. Fall from height death	06	00	06	02.88
c. Machinery accidental death	06	00	06	02.88
Homicidal	30	16	46	22.11
Suicidal	64	20	84	40.38
Total	166	42	208	100

**Table 9:** Cause of death

<b>Total no of asphyxia death (n=112, 53.84%)</b>	<b>Male</b>	<b>%</b>	<b>emale</b>	<b>%</b>
Hanging (n=88, 78.57%)	68	60.71	20	7.85
Ligature strangulation (n=20, 17.85%)	14	12.50	06	5.35
Manual strangulation (n=4, 3.57%)	00	00	04	3.57
<b>Hemorrhagic shock (n=42, 20.19%)</b>	30	71.42	12	8.57
<b>Coma (n=50, 24.03%)</b>	50	100	00	00.00
<b>Decapitation (n=4, 1.92%)</b>	04	100	00	00.00

In the present study, males (n=166, 79.80%) outnumbered females (n=42, 20.19%). The male and female ratio was M:F=3.95:1. Our results were consistent with results of Jayaprakash S et al<sup>3</sup> i.e. male percentage being 70.9%.but was in contrast with the study conducted by Zahid Husain et al,<sup>7</sup> and Patel Ankur P et al<sup>4</sup> the M:F ratio is 5.5:1 and 1.69:1 respectively,. Our results also did not agree with respect to male and female % involved in the study conducted by Dharmaraya Ingale et al<sup>6</sup> i.e. M=58.39% and F=41.60%.

Our results and others study finding suggested males outnumbered females. This was because males are more exposed to hazards of roads, industry, machinery, violence, as they constitute working and earning member in majority of the families while females usually stay at home and look after the children and household works. Other factors might be Unemployment, love disappointment, marital disharmony, financial problems, revenge etc. Moreover, males are more aggressive than females.

For constriction force, ligature material used was saree in 14 cases, nylon rope in 8 cases, dupatta in 10 cases, dhoti in 08cases, telephone cable in 02 case, Lungie in 8 cases, cotton rope in 6 cases, electric wire in 6 cases and rope in 26 cases. For compression force, hands were used in 4cases (manual strangulation) whereas ligature material was used in 20 cases (ligature strangulation).For blunt Force, 60 different vehicular agents were involved whereas in 6 cases of fall from height, hard rough surfaces were involved. For Penetrating Force, 8 sharp weapons were used, 2 cases were of Gun Shot and in 14 cases heavy sharp cutting weapon were used. 2cases of explosion with roof fall were seen. 04cases of machinery agents were encountered.

In the present study, it was found that agents responsible for majority of neck injuries is the constricting force that is Ligature material in 88 out of 208 cases(42.30%). Amongst ligature material, rope was used in most of the cases i.e. 26(29.54%) and saree was used in 14cases (15.90%).

Dharmaraya Ingale et al<sup>6</sup> found in their study that rope was used in 25.40% of neck injury victims followed by Saree, which was 21.84%.This study, is comparable to our study.

BR Sharma et al<sup>8</sup> has documented that chunni was used in 31% of victims of neck injuries followed by nylon rope in 18% victims. Their observations are contrast to our results.

Sadikhusen G. Momin et al<sup>9</sup> states that chunni was also used in 34.44% victims in their study followed by nylon rope which was 31.1%. Their results are in contrast to our finding.

In the present study, we noticed slit in the neck (cutthroat injury) and associated injury was there on the chest. Zahid Husain et al<sup>7</sup> finding are almost similar to our results. However, their study comprised of 452 victims. In the present study, only 2 cases of firearm were seen. Our study differs as regards to site of firearm injury. The most common firearm weapons used in their study were Kalashnikov, rifles, pistols followed by rifled weapons and shotguns. Whereas in our study, country made weapon was used.

In our study, machinery accidents were seen in 4 cases and cylinder explosion and roof fall cases were also two.. In all the 6 cases, victims were Male. It constitutes 2.88% of the total cases.In Machinery accidents, agents were Machine belt and second as harvesting machine.

In the present study it was observed that Cervical vertebrae (Fracture and Dislocation) was the most common organ injured in the majority of the victims i.e., 42cases (20.19%), followed by (Larynx and Trachea plus Mouth, Pharynx, Esophagus) in 38 cases (18.26%) which was followed by larynx and trachea in 28 cases (13.46%). In our study, injury of great neck vessels were seen in 24 cases (11.53%). Strap muscles in 22 cases (10.57%). Mouth, pharynx and esophagus were injured in 18cases (8.65%). Sternocleidomastoid muscles were injured in 18cases (8.65%). Hyoid bone (fracture and cut injury) in 19 cases (7.69%), thyroid and Cricoid cartilage were injured in 14 cases each (6.73%).

A Cervical vertebra (Cv) (fracture and dislocation) was the most common organ injured in our study in majority of the victims. Exact number of victims at various levels were- a) Atlantoccipital joint—16 victims b) 2nd&3<sup>rd</sup> Cv—8 victims c) 3<sup>rd</sup>&4<sup>th</sup>—4 victims d) 4<sup>th</sup>&5<sup>th</sup> Cv-2victims e)5<sup>th</sup>&6<sup>th</sup> Cv--4 victims f) 6<sup>th</sup>&7<sup>th</sup>Cv- 02 g)7<sup>th</sup> CV—2victims h)All over-4victims..Total are 42 victims at various cervical vertebrae level. Our results are in contrast with the study done by Jayaprakash S et al<sup>10</sup> in which he finds only 1.6% of vertebral fracture and dislocation. Rupture of Sternocleidomastoid muscle is found to be 19.6% in his study whereas it is only 8.65% in our study. Sharma BR et al<sup>5</sup> noted in their study that commonest neck injury were injury to the Sternocleidomastoid muscle (54%) followed by hyoid bone fracture (21%) and thyroid cartilage fracture (17%) which is in contrast to our study. Our results involving cervical vertebrae are almost consistent with the reports and studies of Daniel J Sptiz et al,<sup>11</sup> Sanjay Gupta,<sup>12</sup> Bahadur Kumral et al,<sup>13</sup> AH Meshram et al,<sup>14</sup> Eloisa Maselli et al.<sup>15</sup>

Out of 208 cases, autopsied only 6 cases of fall were encountered. Two male victims aged 14 years and 16 years fell from top of the bus with height of approx 14 feet. Two male-aged 42 years and 46 years fell from top of the overloaded lorry with height of approx 20 feet. Two male-aged 24 years and 22 years fell from under construction house with height of 35 feet. In the present study, coma was the cause of death. Victim's age ranges from 14-46 years. All victims were Male. The neck injuries due to fall from height were less than 10 feet is seen in 0 cases followed by fall from height of 11-20 feet in 2cases, 20-30 feet in 02cases and 30-40 feet in 02 cases. Manner of deaths in fall from height was due to accidental fall. It accounted for total 6 cases (2.88%) out of 208 cases of neck injuries. Our finding was almost near to the studies of Ling li et al<sup>16</sup> where they documented more than 50% victims fell accidentally and majority victims were male between 20-40yrs which is consistent with our study. Our results are in accordance with the studies of C.R.Vasudeva Murthy et al<sup>17</sup> where they have mentioned that most cases of fall from height were accidental in nature, younger males were the major victims, and most of the deaths in victims occurred between 0-40 feet height. Turk EE et al<sup>18</sup> noticed in their study that deaths due to fall from height were more common in males and severe head injuries predominantly occurred which were similar to our study but most cases of fall from height were suicidal in nature is in non agreement with our study.

In our study it was found that males accounts for 64, females accounting for 20 and the total being 84 in suicidal circumstances(40.38%). In accidental circumstances, it is noticed that 72 males and 06 females and total being 78 (37.50%) which includes RTA death being 66(31.73%), fall from height death victim were 6(02.88%) and machinery accidents (including explosive) victims being 6(02.88%). In homicidal circumstances, males accounting for 30 and females accounting for 16 and total being 46(22.11%). The manner of death in present study is maximum suicidal in nature followed by accidental and homicidal. In all manner of death, male predominance was noticed. In our study the manner of death is maximum in suicidal circumstances i.e.84(40.38%) followed by accidental circumstances i.e.78(37.5%) and homicidal deaths i.e. 46 (22.11%).Out of 78 cases of accidental fatalities, commonest cause of injury was the road traffic accident. Out of 84(40.38%) suicidal fatalities, commonest cause of injury was asphyxial death.(Hanging)

Our study was in agreement with the studies of Patel Ankur P et al<sup>4</sup> as they mention in their study that suicidal hanging (neck injury) were most common (97.5%) followed by accidental and homicidal. Our study was also consistent with the studies of Ajay Kumar S et al<sup>3</sup>, Shetty BS et al,<sup>19</sup> Aleksandra Apostolov et al,<sup>20</sup> Sikary AK et al,<sup>21</sup> Smith Srisont.<sup>22</sup> Our findings were in contrast with the studies of Zahid Hussein et al<sup>7</sup> as they have noticed homicidal deaths constituted maximum numbers (77.7%) of all autopsies conducted in their study.

In our study, total number of mechanical asphyxia death was 112 out of 208.68 males (60.71%) and 20 females (17.85) died due to hanging followed by 14 males (12.50%) and 6 females (5.35%) due to ligature strangulation followed by only 4females (3.57%) who died due to manual strangulation. In our study, 42 out of 208 victims died due to hemorrhagic shock of which males 30(71.42%) and females 12(28.57%) Coma as cause of death noticed in the present study in 50 male victims (100%) out of 208...Decapitation as a cause of death was noticed in 4 males out of 208 cases. Our results of hanging were consistent with Dharmaraya Ingale et al<sup>6</sup> findings as far as Male victims are concerned i.e.58.39 percentage whereas his findings was in contrast as far as female victims are concerned i.e. 41.60% which was more.

Our results were in agreement with Ajay Kumar S et al<sup>3</sup> where he reported hanging was the most common type of asphyxial death accounting for 80.60%. Our results were not comparable with his study as regards to ligature strangulation (4 cases, 5.5%). Our observations were similar to the observation made by Patel Ankur et al<sup>4</sup>; males were commonly affected in their study. They state hanging (82.48%) was the most common cause of death followed by strangulation (3.09%). Our results of asphyxia deaths were in agreement with study done by Sharma BR et al<sup>5</sup> who found hanging (69%) outnumbered other asphyxial deaths like ligature and Manual strangulation. In our study, hemorrhagic shock was also one of the leading causes of death, which is similar to study of other authors like Zahid Hussain et al,<sup>7</sup> Shetty BS et al,<sup>19</sup> Parthasarathi Pramanik et al<sup>23</sup>, Smith Srisont et al<sup>22</sup>. Aleksandar Apostolov et al<sup>20</sup>. In our study, minimum number of cause of death was due to decapitation i.e. 4 cases (1.92%) out of 208 cases of neck injuries which was almost nearer to the finding of Bahadur Kumral et al<sup>13</sup>.

In our study, we have not encountered suicide by ligature strangulation due to precipitating or predisposing cause for committing suicide whereas in contrast to our study, Serafettin Demirci et al<sup>24</sup> in their study they found 3 cases of suicide by ligature strangulation with preexisting factors like Depression, Bronchial Asthma and Schizophrenia. In the present study, we have not encountered a person committing suicide by stabbing and cutting him where injury was seen in the neck, the precipitating factor was AIDS (acquired immuno deficiency syndrome) in contrast to Smith Srisont et al<sup>22</sup> who states that a male with 27yrs old committed suicide by stabbing and cutting himself with few injuries on the neck. The precipitating cause was AIDS.(acquired immunodeficiency syndrome). In the present study, we encountered tracheotomy as a neck injury in 08 cases. After reviewing available literature, no investigator found or cites in their studies. Our results were in contrast with other studies. We had not encountered seat belt injuries even some people possess.

## Conclusion

Neck injuries constitute a potential factor in increasing the amount of morbidity and mortality; therefore proper attention should be paid towards their accurate diagnosis and satisfactory management. Death in young due to neck injuries causes heavy loss of valuable work force and human resources. In the present study, it was found that suicide was the most common manner of death followed by road traffic accident. To prevent suicidal deaths, help lines taken care of by team of psychologists, social workers, counselors and nurses should assist people in stress and at risk to commit suicides. To combat road traffic accidents, traffic rules should be obeyed and trained emergency team with well equipped advance ambulance should be available on time etc.

**Conflict of Interest:** None.

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