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A STUDY OF THORACO ABDOMINAL INJURIES IN MEDICO LEGAL AUTOPSIES CONDUCTED IN THE DEPARTMENT OF FORENSIC MEDICINE, S.V. MEDICAL COLLEGE, TIRUPATI DURING JANUARY 2014 TO JUNE 2015.

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Abstract: Since prehistoric times, thoraco abdominal cavity has been looked upon as one of the most vulnerable region of the body and injuries involving it have always been considered very serious. Due to its anatomical position and dimension the Thoraco Abdominal region is a major site of impact in any form of blunt trauma. Thoraco abdominal injuries are caused by a wide variety of reasons like road traffic accidents, railway accidents, assaults, blunt and penetrating trauma associated with falls, industrial mishap, and growing menace of terrorism globally. In the present study by analyzing the following objectives one can reduce the calamities caused by unnatural causes. To study types type of agent, severity of Thoraco Abdominal injuries leading to fatality, incidence of age, sex and status of victims and cause of death. To analyze the association of other bodily injuries contributing death, period of survival and relationship of diurnal and seasonal variations. **Methods:** The present study was carried out in S.V. Medical College, Tirupati Out of 1251 autopsied bodies 322 cases were due to Thoraco Abdominal Injuries. All the cases that are autopsied were screened for Thoraco Abdominal injuries resulting from deaths due to Road Traffic Accidents, Railway Accidents, assault, firearm injuries and fall from height, fall due to electric shock. **Results:** The statistical analysis of the data collected was done and presented results in the tabular. The results are analyzed, discussed and concluded. **Conclusions:** Death due to Thoraco Abdominal Injuries constitutes 25.7% of the total autopsied cases. In accidents road traffic accidents is the most common mode of occurrence of chest injuries. Chest injury incidents occurred most commonly between 6pm to 12am least between 12am to 6am. More number of victims died on the spot. In road traffic accidents majority of the victims were pedestrians. Male outnumbered females in the ratio of 5.4:1. Peak incidence of age group affected is between third and fourth decades. In the Thoraco Abdominal injuries, liver was the most common organ involved. In maximum cases two chest organs were involved. Rib fracture is the most common skeletal injury, followed by clavicle fractures in Thoraco Abdominal Injuries. Most common associated injury is head injury. The major cause of death is hemorrhagic shock.

Keywords: Thoraco-Abdominal Injuries, Road Traffic Accidents, Blunt and penetrating Trauma, fall from height, hemorrhagic shock.

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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 thorax and abdominal cavity contains the vital organs like heart, lungs, liver, spleen, kidneys, intestines, great vessels and supporting tissue, trauma to this region challenges the integrity and even the viability of the individual. Because of its size and anatomical position it is a major site of trauma in road accidents, railway accidents, and fall from height and in sports injuries etc. Thoracic trauma constitutes 10 to 15% of mortalities in the world wide population.

Injuries of the Thoraco abdomen are not always isolated but often associated with injuries to the other parts of the body i.e. head, neck, spine, pelvis, extremities etc. In case of thorax and abdomen, blunt trauma can produce a wide spectrum of injuries extending from the fracture of bones like ribs, sternum and vertebrae to injuries of organs like contusions and ruptures which may lead to hemopericardium, haemothorax, pneumothorax and haemoperitonium. The manner of sustaining Thoraco Abdominal injuries may be accidental suicidal or homicidal. Sometimes homicidal Thoraco Abdominal injuries are alleged as accidental and vice versa.

Road traffic accident is the major cause of Thoraco Abdominal injuries in all over the world. It is an unplanned event occurring suddenly, unexpectedly in unforeseen circumstances. Exponentially increasing number of automobile vehicles, poor adherence to traffic rules and regulations, abuse of alcohol and use of cell phones while driving are the cause of accidents. Tragic accidents are not often due to ignorance, but are due to carelessness, thoughtlessness, hurriedness and due to over confidence. Incidence of road traffic accidents has been increasing at the alarming rate throughout the world. Road traffic accidents are the third most preventable causes of death. In India over 1,45000 persons die annually due to traffic accidents, 1.6 millions injured seriously and 4 lakhs disabled permanently. Every day there are 3300 deaths and 6600 serious injuries on the road in the world. Due to narrow roads, excess motor vehicles on roads and violation of traffic rules more number of road traffic accidents occurring leading to Thoraco Abdominal injuries. Thoraco Abdominal injuries are the leading causes of death despite optimal use of available treatment facilities. Homicides are also on rise because of increasing population, unemployment, thirst for comforts, easy availability of the weapons and for easy way of earning money. So the incidence of Thoraco Abdominal injuries increasing significantly due to increase in the road traffic accidents and rising levels of violence in the society in general

MATERIALS AND METHODS

The present study has been carried out in the Dept of Forensic Medicine, S.V.Medical College, Tirupati during the period January 2014 to June 2015 as Cross Sectional Descriptive Study.

All the cases that are autopsied were screened for Thoraco Abdominal injuries resulting from deaths due to Road Traffic Accidents, Railway Accidents, assault, firearm injuries and fall from height, fall due to electric shock

A detailed information and data pertaining to the cases were collected prior to autopsy and studied with respect to age, sex, time, mode, manner, causes of injury sustained, agent causing an injury, frequency of organs injured, period of survival and cause of death. Information pertaining to the time 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 discussion with family relatives, friends and others along with the police. Consent was obtained from the family members /near relatives in case of known dead bodies. All the findings thus obtained were noted down in a separate proforma for each case. The statistical analysis of the data collected was done and presented results in the tabular forms, bar diagrams and pie charts. Photographs taken where ever necessary. The results are analysed, discussed and concluded.

INCLUSION CRITERIA – The dead bodies which sustained Thoraco Abdominal injuries by physical violence and autopsied at S.V.Medical College, Tirupati were included.

EXCLUSION CRITERIA – The dead bodies sustained Thermal injuries over Thoraco Abdominal region and autopsied at S.V.Medical College, Tirupati.

RESULTS

TABLE: 1 MANNER OF SUSTAINING THORACO ABDOMINAL INJURIES

S.No.	CAUSE OF THORACO ABDOMINALINJURIES	TOTAL	PERCENTAGE
01	RTA	204	63.4%
02	RAILWAY INJURIES	58	18%
03	ASSAULT [FIRE ARM INJURIES, STAB INJURY, BLUNT FORCE]	36	11.2%
04	FALL FROM HEIGHT	15	4.6%

05	UNKNOWN	07	2.2%
06	COLLAPSE OF WALL	02	0.6%
	TOTAL	322	

TABLE 2: PERIOD OF SURVIVAL

SNO	PERIOD OF SURVIVAL	NO OF CASES	PERCENTAGE
01	SPOT DEATH	169	52%
02	DURING TRANSPORT	025	08%
03	HOSPITAL DEATH	128	40%
	TOTAL	322	100%

TABLE 3: CAUSE OF DEATH

SNO	CAUSE OF DEATH	NO:OF CASES	PERCENTAGE
01	HEMORRHAGIC SHOCK	166	51.5%
02	TRAUMA TO THE HEAD	87	27%
03	TRAUMA TO THE SPINE	09	2.8%
04	NEUROGENIC SHOCK	07	2.4%
05	SEPTIC SHOCK	04	1.2%
06	SHOCK LUNG	02	0.6%
07	ELECTRIC SHOCK	01	0.3%
08	PERITONITIS	01	0.3%
09	TRAUMATIC ASPHYXIA	01	0.3%
10	MULTIPLE INJURIES	44	13.6%

TABLE 4: DIURNAL VARIATIONS

SNO	DIURNAL VARIATIONS	NO OF CASES	PERCENTAGE
01	12.00 AM TO 06.00AM	56	17%
02	06.00 AM TO 12.00 PM	86	27%
03	12.00 PM TO 06.00PM	82	25%
04	06.00 PM TO 12.00 AM	92	29%
05	NOT KNOWN	06	02%

TABLE 5: SEASONAL VARIATIONS

SNO	SEASON	NO OF CASES	PERCENTAGE
01	SUMMER [FEB-MAY]	137	42.6%
02	RAINY SEASON [JUN-SEP]	78	24.2%
03	WINTER [OCT-JAN]	107	33.2%

DISCUSSION:

MANNER OF SUSTAINING THORACO ABDOMINAL INJURIES

With regard to manner of sustaining Thoraco Abdominal injuries, in the present study the commonest manner of Thoraco Abdominal injuries were due to road traffic accidents 63.4% followed by railway injuries 18%, assault 11.2%, fall from height 4.6% and collapse of the wall 0.6%.^{Table - 1} In the present study majority of the deaths with Thoraco Abdominal injuries were seen in road traffic accidents i.e 63.4%. It is in accordance with the studies of Recep Demirhan et al as they have documented that in 65% of the cases studied by them, blunt injury to Thoraco Abdominal region is mostly related to traffic accidents¹. It is nearer to the studies of Dr.K.K.Aggarwal et al as they have mentioned in their observations that abdominal injuries (19%) and thoracic injuries(7%)². were the dominant causes of death in RTA cases next to head injury(57%).The present study is similar to the studies conducted by Fayna Rodriguez- Gonzalez et al i.e. traffic accidents are the most frequent cause of cardiac contusions resulting from a direct blow to the chest.³ Dean T. Mason et al analysed in their study that 59% of the cases

involved an automobile.⁴ According to Ira A. Ferguson automobile accounts for 63% of blunt chest trauma.⁵ The present study is in agreement with study made by Hanumantha A et al i.e. the common cause of blunt abdominal trauma in India is road traffic accident followed by pedestrian accidents, abdominal blows and fall from heights.⁶ Adrian P Banning et al in their study stated that blunt Thoraco Abdominal trauma occurs most commonly in RTA cases followed by direct blow to the chest, fall from height, sporting and industrial injuries and kicks by animals.⁷ Pathak Manoj Kumar et al states from their study that chest injuries with associated abdominal injury comprised a substantial number of deaths in RTA.⁸ The present study is in agreement with study of Meera Th et al i.e. RTA was the leading cause of blunt Thoraco Abdominal trauma (86.40%), followed by assault by blunt weapon(8%).⁹ The present study is in agreement with studies of Husaini Numan et al as they noticed that accidental Thoraco Abdominal injuries were commonest followed by homicidal and suicidal and among accidental occurrences, RTA was the commonest cause for Thoraco Abdominal injuries (84.9%).

AGENT CAUSING THORACO ABDOMINAL INJURY

With regard to agent causing Thoraco Abdominal injury in the present study, the heavy motor vehicles constituted 29% followed by Train 18%, light motor vehicles 14% and two wheelers 9%, firearm 7%, fall 5%, three wheeler 3%, knife 3%, collapse of wall 0.5% and assault 0.5%. The present study findings may be attributed to the high speed, narrow roads, and hilly terrain of the region. Since Tirupati is between Chennai and Bangalore, many vehicles cross Tirupati as it is a pilgrimage place and flooded with floating population. B. Suresh Kumar Shetty et al¹¹ in his study mentioned that heavy motor vehicles constituted 44.4%, the present study is in agreement with the above study. Mohamed Fouad Ismail et al conducted the study over chest trauma for a period of 10 years, their studies revealed light and heavy motor vehicles constituted 28% and two wheelers constituted 19.9% and fall from height 6.7%, the present study is in agreement with the above study.¹² Dean T. Manson et al, in their study regarding blunt chest trauma revealed that 59% involved an automobile, and in all the steering wheel compressed the anterior chest. The present study is in partial agreement with the above study.⁴ The studies of -Jha N, Srinivasa D.K, Roy G, Jagdish S who conducted epidemiological study of road traffic accident cases in south India revealed heavy motor vehicles are the major cause of road traffic accidents.¹⁴ Kaul A, Sinha US, Pathak YK, Singh A, Kapoor AK, Sharma S, Singh S. in their study regarding fatal road accidents and, study of distribution, nature and type of injury mentioned that heavy motor vehicles are the major cause of Thoraco Abdominal injuries.¹⁴ and Singh H, Dhatarwal SK. Pattern .mentioned that heavy motor vehicles are the major causes for Thoraco Abdominal injuries in their study "Fatality due to chest injury in road traffic accident victims."¹⁵ The reason why heavy motor vehicle is the major agent for Thoraco Abdominal

injury is because of alcoholic drivers, drivers who are substance abused, talking with cell phone during driving and fall asleep during driving because of tiredness.

TYPES OF THORACO ABDOMINAL INJURIES LEADING TO FATALITY

In the present study which was conducted over a period of 1 ½ year 322 cases were examined during autopsy with Thoraco Abdominal Injuries. A total no of 679 different types of injuries affecting Thoracic and Abdominal regions were observed in these cases which are as follows:

Regarding fractures in the Thoracic region, rib fracture is the most common skeletal injury in the chest region constituting 37.2% in the total no of injuries, followed by fracture of the clavicle 5.5%, sternum 5.3% and fracture of Thoracic vertebrae 2.7%. In the abdominal region, fracture of the Lumbar vertebrae observed in 2.7% of the total no of injuries. Amongst the thoracic organs lungs were the most commonly affected amounting 11.5% (laceration 8.9%, contusion 1.6% and stab 1%) of the total no of injuries, followed by heart constituting 3.5% (laceration 2.9%, stab 0.4% and contusion (0.2%) of the total injuries. This may be due to the fact that fracture of the ribs are of frequent occurrence in cases of trauma. Lungs are most commonly affected as they occupy most of the space in the Thoracic-cage making them more vulnerable to injury by trauma as compared to the other organs. The findings of the present study are in similarity with N.Ali and B.M Gali's study of "pattern and management of chest injuries in Maiduguri, Nigeria". According to them ribs are the commonest fractures seen in thoracic region and lungs are the commonest organs involved. Husaini Numan et al in their study of "Pattern of Thoraco Abdominal injuries in rural region" mentioned that the commonest injury in thoracic region was fracture of ribs and is in accordance with the present study¹⁰. The present study is also consistent with K. Moghissi's study of "Laceration of the lung following blunt trauma"¹⁶ where it is mentioned that ribs and lung are the major injuries in chest trauma. Mohamed Fouad Ismail et al in their study over the period of 10 years (1997-2007) examined 472 victims and observed rib fractures in 23.9% of cases, pulmonary contusions in 27.1% and lacerations in 6.9% of cases¹². The present study is in partial agreement with this study. Mehmet Sirmali et al conducted a study on 1417 cases with Thoracic trauma between May 1999 to May 2001 and found that rib fracture secondary to blunt thoracic trauma is an important indicator of severity of trauma. They observed rib fractures in 38.7% of the cases and pulmonary contusion in 17.2%. The present study is in agreement with this study. Dr.T.H.Meera et al in their study on Blunt cardiac trauma in vehicular accidents brought for autopsy noticed 48.57% of the cases associated with ribs and sternal fractures¹⁷. Present study is in agreement with this. B.Suresh Kumar Shetty et al mentioned in their study that lung(61%) is the most common organ involved in the chest trauma¹¹ and present study is consistent with it. The present study is not in agreement with the studies conducted by Mohamed Fouad Ismail et al as they mentioned that pulmonary contusions seen in 27.1% and lacerations in

6.9% of cases¹². The present study results are consistent with the study done by K. Moghissi in which he finds 4.4% of lung lacerations are due to blunt chest trauma¹⁶.

ASSOCIATION OF OTHER BODILY INJURIES CONTRIBUTING TO DEATH

In the present study which was conducted over a period of 1 ½ year 322 cases were examined during autopsy with Thoraco Abdominal Injuries. In these cases other associated bodily injuries contributing to death are head injuries in 45.3%, Limb injuries (fractures) in 23.6%, neck in 10.9% and pelvis in 4.6% of cases. The present study is comparable with the studies of Dr.Sangeet Dhillon, Dr.Piyush Kapila et al studied 50 cases brought to mortuary in Indira Gandhi Institute of medical college Shimla. Out of 50 cases head injuries were seen in 31 cases and fractures in 23 cases. Dr. K. K. Aggarwal et al conducted a study on 100 cases of RTA referred for autopsy to the Gov. Medical College Patiala. According to them the most common site involved was head and face (85%) followed by lower limb (65%) and upper limb (54%)². The present study is in partial agreement with the above study. Mohamed Fouad Ismail et al observed in their study on Thoraco Abdominal injuries that the other associated injuries were head injury (38.9%) and limb fractures(33.5%).¹² The present study is in agreement with this study.

PERIOD OF SURVIVAL

In our present study of 322 cases of autopsy with Thoraco Abdominal injuries, 52% were died on the spot, 40% died while undergoing treatment in the hospital and 8% died during transportation.^{Table-2} Regarding time interval, 184 cases died in between 0 to 6 hours (57.15%), 92 cases died between 6 to 24 hours (28.58%), 35 cases died in between 24to 48 hours (10.87%) and 11 cases died after 48 hours (3.4%). C.R.Vasudeva Murthy et al, in their study on various pattern of injuries due to fall from height observed that in 57.69% cases death occurred on the spot¹⁸. MeeraTh et al in their study of 125 cases of blunt Thoraco Abdominal trauma in medicolegal autopsy cases conducted at the regional institute of medical sciences observed that 59 victims (47.2%) died on the spot⁹. Which is similar to the present study The present study is comparable with the studies of Pathak Manoj Kumar et al, who have noticed during their study that more than two third of the victims (69.91%) died at the place of incidence⁸.

INCIDENCE OF SEX

Out of 322 cases 50 cases were females and 272 cases were males. Male: female ratio is about 5.4:1 Meera Th et al in their studies on pattern of blunt thoraco abdominal trauma in Manipur mentioned that males outnumbered females in the ratio of 3.8:1⁹. The present study is in agreement with it.The present study is in agreement with the studies of Ulku Yazici et al, where ale:female is10:1¹⁹. Hanumantha A et al mentioned in their study that male : female is 4:1,⁶

which is nearer to the present study. B. Suresh Kumar Shetty et al¹¹ and Husaini Numan et al¹⁰ mentioned that male: female ratio is more than 6:1. Mason et al has analyzed their studies in 28 victims. Their observations include 86% males are associated with chest injury⁴. The present study is consistent with the above studies.

INCIDENCE OF AGE

The majority of the victims in the present study of Thoraco Abdominal injury were in the age group of 31 to 40 years (22.4%), followed by the age group 21 to 30 years (21.2%) and 41 to 50 years (20.1%) Early (<10 years) and late ages (>60 years), show minimum cases i.e 1.5% and 12.3% respectively. J. J.Moar during his study on medico legal autopsies in relation to thoracic injuries observed that 46.2% of the victims are in the age group of 21 to 30 years. Our present study is in partial agreement with the present study²⁰. Firas Yazigi et al documented in their study that before the age of 40 years, chest trauma constitutes 20 to 25% of deaths and the present study is in partial agreement with their study²¹. Husaini Numan et al revealed in their study on pattern of Thoraco Abdominal injuries in rural region that 82.6% of the victims are males and mostly in the age group of 21 to 40 years¹⁰. Their results are comparable with our present study. The present study is comparable with the following studies i.e. study of Dean T. Mason et al who analyzed in 28 cases in that 97% were young aged between 5 to 38 years⁴, B.Suresh Kumar Shetty et al observed in their study cases 83% were in between 21to 50 years¹¹ and Pathak Manoj Kumar et al stated in study that young adult age group 16 to 45 year comprised the substantial number of deaths due to RTA.⁸ Meera Th et al in their study of 120 cases of blunt Thoraco Abdominal injuries observed that the commonest age group of the victims was 21 to 30 years i.e. 20.08%⁹, which is nearer to our present study. More than half (63.7%) of victims were in the age group of 21 to 50 years. This may be due to fact that these people lead more active life and more mobile and go out for work and keep themselves out doors most of the time. Besides being young and enthusiastic have a habit of taking risks like boarding in moving vehicle ,travelling on foot board vehicle, risky speed driving and crossing he roads carelessly. The reason for minimum cases seen in children and old age group of people may be due to the care taken by accompanying people and less mobility in this age group.

STATUS OF VICTIMS

In the present study it is observed that the maximum number of victims were pedestrian's i.e., 24.4%, followed by two wheelers i.e., 18%, , auto 5.2% car 4.5%, lorry 1.8%, jeep 1.8%, bus 1.2%, tractor 0.6%, bullock cart 0.3%, pulling cart 0.3%, road roller 0.3%, bicycle 0.3% and others 41.3%. Mohamed Fouad Ismail et al in their study noticed that pedestrian injuries are seen in 38.3% of the victims, motor vehicles in 28.1%, and motor cycle crash in 19.9%¹². These

findings are similar to the present study The present study is in agreement with the studies conducted by Pathak Manoj Kumar et al, in which they observed that maximum number of victims were pedestrians in deaths due to RTA.⁸ The present study is not in agreement with the study done by B.Suresh Kumar Shetty et al, on pattern of Thoraco Abdominal injuries sustained by the victims of fatal road traffic accident in Manipal, south India during 1999 to 2003, in which they observed that majority of the victims in fatal road traffic accident cases were two wheeler occupants(35%) followed by pedestrians (23%)¹¹.

CAUSE OF DEATH

In the present study which was conducted over 322 cases of autopsies with Thoraco Abdominal injuries, it was observed that the main cause of death was hemorrhagic shock in 51.5% of the cases followed by, Trauma to the head 27%, Trauma to the spine 2.8%, Neurogenic shock 2.4%, Septic shock 1.2%, Shock lung 0.6%, Electric shock 0.3%, Peritonitis 0.3%, Traumatic asphyxia 0.3% and Multiple Injuries in 13.6% of cases.^{Table-3} Dr.Sangeet Dhillon et al noticed in their studies that hemorrhagic shock was the cause of death in majority of the victims²². The present study is in agreement with this observation. Meera Th et al Stated in their study that the commonest cause of death was hemorrhagic shock (as a result of intra thoracic and abdominal bleeding) combined with head injury in 48.8% of cases followed by hemorrhagic shock alone in 44% of the cases.⁹ The present study is in agreement with above observations. Mohamed Fouad Ismail et in their study observed that out of 472 victims examined by them 82.3% died due to multiple trauma. In the present study multiple injuries observed as a cause of death in 13.6% of the cases. The present study findings are not in agreement with the above study¹². The high percentage of deaths due to severe hemorrhage are due to rib and sternal fractures with associated rupture of vital organs like heart, lung, liver, spleen, intestines and injury to great vessels.

DIURNAL AND SEASONAL VARIATIONS

From this study it is observed that maximum number of cases were reported between 6pm to 12am (29%) followed by 6 am to 12pm (27%) ,12pm to 6pm (25%) and least is found between 12am to 6am (17%).^{Table 4} Not known in 02% of the cases. In this study maximum number of cases are seen in summer [42.6%] followed by winter [33.2%] and least in rainy season [24.2%].^{Table 5}

CONCLUSION

In the present study which was conducted over 1251 autopsied bodies in the Dept of Forensic Medicine over a period of 1 ½ year, 322 cases were observed with Thoraco Abdominal injuries. In these cases of Thoraco Abdominal injuries, 63.4% were due to RTA followed by

railway accidents 18%, assault 11.2% and by fall 4.6%. Most common skeletal injury in Thoraco Abdominal region is Rib bone fracture (37.3%), followed by the clavicle (5.5%). Most common organ injured in the Thoraco Abdominal region is liver 15.5% followed by lung 11.5%. Associated Head injuries seen in 45.3% of the cases followed by limb fractures 23.6% and neck 10.9%. Most of the injured persons died on the spot (52%). Males outnumbered females in the ratio of 5.4:1. Adults of 21 to 40 years of age (43.6%) are more vulnerable to the fatal Thoraco - abdominal injuries. Maximum number of injured persons were pedestrians 24.4%, followed by motor cyclists 18%. The main cause of death was Hemorrhagic shock in 51.5% of the cases, followed by trauma to the head 27%. Most of the incidents of Thoraco Abdominal injuries occurred between 6pm to 12am and least between 12am to 6am. Majority of the cases of occurred during summer season.

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