

Original Research Paper

Victim Profile and Pattern of Thoraco-Abdominal Injuries Sustained in Fatal Road Traffic Accidents

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Abstract

The present research aims to highlight the pattern of thoraco-abdominal injuries sustained by the victims of fatal road traffic accidents (RTA) in Manipal, South India. The study is an autopsy based observation of thoraco-abdominal injuries in victims of fatal road traffic accidents during 1999 – 2003. Road traffic accidents accounted for most of the injury related deaths (77%) during the study period. A male preponderance (86%) was observed with a male-female ratio of 6:1. Individuals in the age group of 21 to 50 years formed the most vulnerable (83%) group. External thoracic injuries were more common than internal thoracic injuries in the thoracic region. In the abdominal region, internal injuries were more common than external injuries. Lungs (61%) and kidneys (23%) were the most commonly involved organs in the thoracic and abdominal regions respectively. Majority of the victims were two wheeler occupants (35%) followed by pedestrians (23%). The study indicates the pattern of thoraco-abdominal injuries sustained along with the trend of road traffic accidents in the region.

Key Words: Thoraco-Abdominal Injuries; Road Traffic Accidents; Blunt Force Trauma

Introduction:

Accidents are a counter product of modernization and hasty life and are considered as a modern day epidemic. Analysis of the trend of RTA and associated risk factors influence the planning of preventive and remedial measures pertaining to the human habitations, roadways and in the setup of health care institutions for any eventualities. A number of studies on various aspects of non-natural deaths reported road traffic accidents to be the major cause of mortality arising from non-natural causes in different regions of India. [1, 2] Accidents rank fourth among the leading causes of death. Among all accidental deaths, road traffic injuries claim 1.2 million lives every year and form the main bulk of deaths from non-natural causes. More than 25% of the global accidental deaths occur in South East Asia region. [3]

It is estimated that by the year 2020, 8.4 million people will die every year of injuries. Injuries from road traffic accidents is estimated to be the third most common cause of disability worldwide and the second most common cause of disability in the developing world. [4]

There are differences in the road use and pattern of road traffic injury across different countries. Regional differences exist in the pattern of injury sustained by different types of road user that can have significant implications in the development of prevention policies. The present research is aimed at understanding the pattern of thoraco-abdominal injuries caused in road traffic crashes in and around Manipal, South India.

Material and Methods:

The present study was carried out in the Department of Forensic Medicine, Kasturba Medical College (KMC), Manipal. KMC is situated in Udupi district of coastal Karnataka, in South India. The present research is a retrospective analysis of the autopsies conducted during January 2000 and December 2003 at the aforementioned center. All the deaths from RTA were included in the study. The autopsy case files and information furnished by the police in inquest documents were studied in detail. A detailed Victimologic profile was made. The data were compiled with a focus on the analysis of injuries in the thoraco-abdominal region with special reference to the nature of the

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wound, and organs most commonly affected in road traffic accidents.

Results:

A total of 633 autopsies were conducted during the study period (2000 – 2003), of which 222 were injury related deaths. Age distribution of the victims is shown in Figure 1. RTA alone accounted for the majority (77%, n=171) of injury related deaths. Detailed distribution of injury related deaths during the study period is shown in Figure 2. With regards to the victim profile in fatal road traffic accidents, males were more commonly involved (86%, n=147), male-female ratio being 6:1. The most vulnerable age group to sustain injuries was 21-50 years (83%, n=142). Two wheeler occupants were the most common victims of road traffic accidents (n=59, 34.5%) followed by pedestrians (n=43, 23%). The exact status of 19 victims of RTA in the study remained unclear at the time of autopsy. The most common offending agents in were heavy motor vehicles (n=76, 44%). In 43 cases (25%), the offending vehicles could not be identified and remained unknown indicating the incidence of 'hit and run' cases. Details of the victims and offending vehicles in RTA are shown in Table 1. Injuries to the thoraco-abdominal region were observed in 155 cases (91%). Distribution of thoraco-abdominal injuries is shown in Figure 3. External thoracic injuries were observed in 136 cases. Contusions were the most common external thoracic injury (n=72) followed by abrasions (n=56), lacerations (n=7) and incised wounds (n=1). Fractures of ribs were observed in 95 cases, sternum in 17, and clavicle in 15 and vertebrae in 9 cases of fatal road traffic accidents. Internal thoracic injuries were observed in 80 cases. Among internal thoracic injuries, lungs were the most commonly involved organ (n=49, 61.3%) followed by the heart (n=9, 11.3%). (Figure 4)

External abdominal injuries were involved in 74 cases. Contusions were the commonest (n=38) followed by abrasion (n=29), laceration (n=5) and incised wounds (n=2). Internal abdominal injuries were observed in 153 cases. Kidney was the most commonly involved abdominal organ (n=33) in road traffic accidents followed by the liver (n=29). (Figure 5) Among the abdominal injuries sustained in road traffic accidents, the kidneys sustained more contusions than lacerations whereas in the liver lacerations were more common than contusions.

External injuries to the thorax were more frequent than internal injuries while in the abdomen, internal injuries were more frequently observed than external injuries.

Discussion:

RTA cause mechanical trauma, resulting in morbidity, disability and even mortality. The fatality rate in road traffic accident in India is one of the highest in the world and reported to be 20 times more than that reported in developed countries. [3] In our study, fatal road traffic accidents accounted for most of the injury related deaths. Our findings are comparable to that reported in the earlier studies from different regions in India. [1, 5] The incidence, however, is much higher to that reported by Wong et al. in a study conducted in Singapore. [6] The lesser number of cases in their study may be attributed to very good and spacious roads, and excellent awareness and abidance of traffic rules by the people in Singapore. The patterns of injuries in RTA are quite different in developed countries as compared to developing countries like India and also in different cities within India. Road use pattern in the Indian cities is very different from those in developed countries. Two wheelers, motorized as well as non-motorized vehicles form the main components of Indian traffic.

Research has shown that the two wheeler occupants are among the majority to be affected in RTA. [7] In our study most of the victims who sustained thoraco-abdominal injuries in the road traffic crashes were two wheeler occupants followed by pedestrians and pedal cyclists. The more number of two wheelers and its utility in this region possibly can be directly related to these injuries. Our findings are in agreement with the study by Jha et al [8] other studies, however, report an increased incidence of injuries in the pedestrian group. [9, 10] Two wheeler occupants are reported to be the commoner victims of RTA in the neighbouring city of Mangalore. [11]

With regard to offending vehicles in fatal RTA in our study, the heavy motor vehicles constituted 44.4% followed by two wheelers (14.0%). Our findings may be attributed to the high speed, narrow roads, and hilly terrain of the region. Similar observations are made in the earlier studies. [8-10] The study observed that the age group of 21-50 years was most susceptible to mechanical injuries with a very evident male predominance of the victims. In our study, the male to female ratio was reported as 6: 1. Our findings are in accordance with the studies done by Husaini et al [5] and Wong et al. [6] Jha et al [8] and Kaul et al [9] have reported a lower male-female ratio of 3: 1 while a higher male-female ratio of 9: 1 was reported by Singh and Dhatarwal. [10] Highest incidence of road traffic fatalities in the age group of 21-50 years in

our study is in general agreement with the studies done by other researchers. [5, 6, 8, 9] Males are usually the earning members of the family in this region and are increasingly exposed to traffic making them more vulnerable to the RTA. Kanchan et al. have reported the age and gender variations in the trend of road traffic fatalities [12] and various earlier studies have discussed the probable causes for the vulnerability of younger males to accidents. [2, 13, 14] The increase in population and vehicles in general leading to increased congestion on the Indian roads can be directly related to the number of RTA. Road traffic fatalities are reported to be the common cause of unintentional injuries among children in the region. [15]

Thoraco-abdominal involvement in the RTA can be related to the anatomical location of this region that makes it easily susceptible to impact in any form of blunt force trauma. In our study significant number of victims had combined thoraco-abdominal injuries followed by thoracic injuries and abdominal injuries alone. In modern day civilian trauma centres, thoracic injury directly accounts for 20-25% of deaths due to trauma; and thoracic injury or its complications are a contributing factor in a further 25% of trauma deaths. [16]

Most of the victims in our study were two wheeler riders and pedestrians and the common region of injury was the chest. This semi-yielding nature makes the area more vulnerable to injuries commonly seen as contusions and abrasions. Our findings in this regard correlate well with the earlier studies. Thoracic injuries were more often seen in RTA similar to other study groups. [5, 17]

Blunt force trauma to the chest can damage the organ without damaging the thoracic wall. Sub grouping thoracic injuries to external and internal thoracic injuries revealed that external thoracic injuries are more common than the internal, which correlates with the observations made by the previous researchers. [18] Among the internal thoracic injuries, lungs were the most common organ involved followed by the heart. Injury to the lungs and heart may be due to impact of these organs to the solid rib cage and the shearing forces to the hilum of the lungs and the heart by the impact of a moving vehicle without any rib fractures or due to a direct impact of the fractured ribs to the heart and lungs. The lungs occupy most of the rib cage, and thus are probably more vulnerable to injury when compared to the heart. Our findings are in agreement with the earlier studies by other researchers. [5, 19] In the present study,

kidneys were the more commonly involved solid organ than the liver in the abdomen region. These findings are in contrast to studies by Husaini et al [5] and Kaul et al [9] where the liver was the most commonly affected organ followed by the spleen. Liver being the largest internal organ and owing to its anterior location is more often the target of blunt force trauma as reported in the earlier studies. Chandulal reported involvement of the abdominal organs like the liver, spleen, bladder, and kidneys in a descending order of frequency in road traffic crashes. [20] The analysis of risk stratification in road traffic accidents reveals that two wheeler riders were more commonly injured than the pedestrians. These findings can be correlated to the involvement of younger age group who use two wheelers as a more common mode of transport. The heavy vehicles were the offending vehicles in maximum number of cases suggestive of the fact that the accidents with the heavy vehicle usually have a fatal outcome owing to a greater impact. The involvement of the heavy vehicles may be due to rash driving and lack of discipline among the drivers. Unknown vehicles were involved in a number of cases in our study which are reported as 'hit and run' cases. Unknown vehicles have been reported to be the major offending agents in motor vehicle accidents. [18-20]

The thoraco-abdominal injuries require multidisciplinary approach of management. This post-mortem study of pattern of thoraco-abdominal injuries, its type-pattern and nature of external and internal injuries involved is an attempt to highlight the trends in the region. The risk stratification in the susceptible population and the study of nature of offending agent in RTA can help the authorities in propagating safety measures and better availability of health care on roads.

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Fig 1: Age (years) Distribution of the Victims

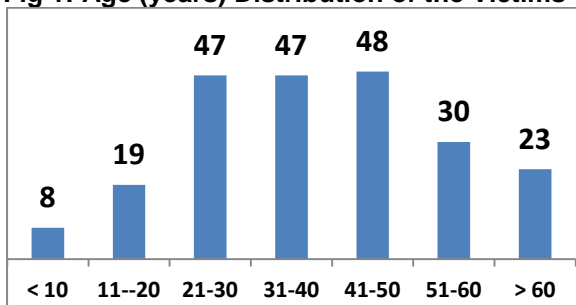


Fig. 2: Circumstances of the Deaths

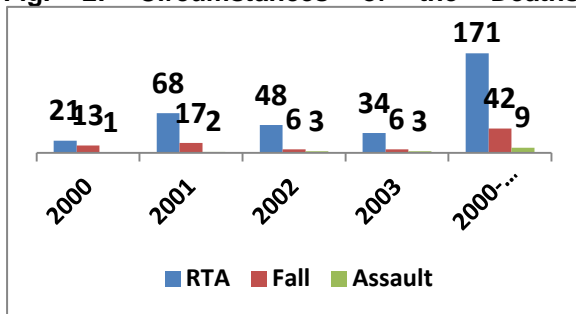


Fig. 3: Thoraco-Abdominal Injuries Sustained in Road Traffic Crashes

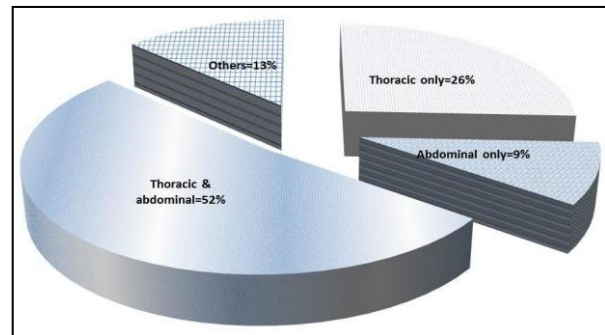


Fig. 4: Distribution of Thoracic Injuries

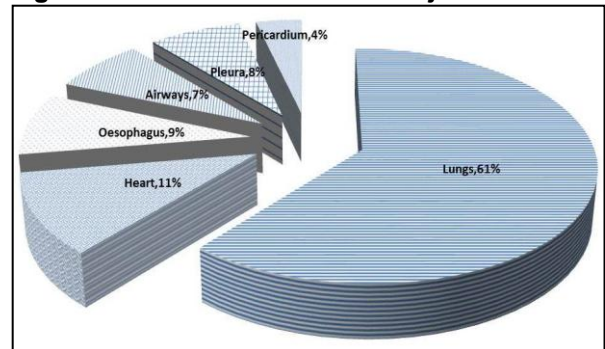


Fig. 5: Distribution of Abdominal Injuries

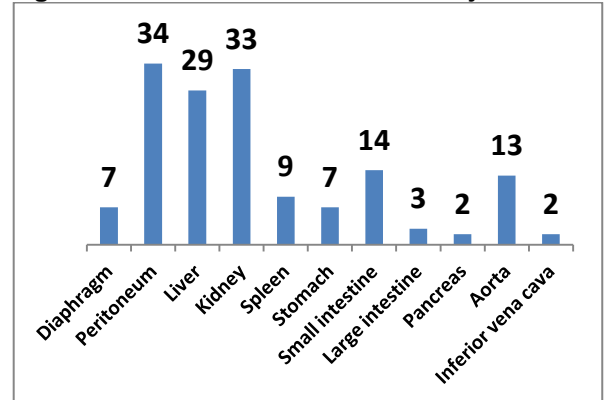


Table 1: Victims and Offending Vehicles in Road Traffic Accidents*

Victim	Offending vehicle
Pedestrian (n=40, 23.4%)	Two wheeler (n=24, 14.03%)
Pedal-cyclist(n=18,10.5)	Auto-rickshaw (n=04, 2.3%)
Vehicular passengers:	Light motor vehicle (n=21, 12.3%)
Two wheeler (n=59, 34.5%)	Heavy motor vehicle (n=76, 44.4%)
Auto-rickshaw (n=2, 1.2%)	Unknown (n=43, 25.1%)
Light motor vehicle (n=21, 12.3%)	Others (n=03, 1.8%)
Heavy motor vehicle (n=12, 7.0%)	
Unknown (n=19, 11.1%)	

* This being a retrospective study, exact cause and responsibility of road traffic incident was not established at the time of autopsy. The information is based on history and initial police investigations