

## The Pattern of Chest Injuries Following RTA

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### Abstract

**Background:** Vehicle collisions are a primary source of mortality on the planet. Due to the location of essential organs inside the chest cavity, severe chest injuries sustained in such events are often deadly. The purpose of this research is to assess the significance of these injuries on motorist safety.

**Study Design:** Descriptive retrospective study.

**Methods:** The purpose of this study was to provide a descriptive retrospective analysis of postmortem autopsy results from instances of road traffic accidents with chest injuries treated over a period of 10 years. The statistical analysis was done in IBM SPSS 15.0 (P 0.05).

**Results:** There were 70 total cases examined. The age range was from 6 decades to 80 decades, and the ratio of males to females was 5.5 to 1. Rib fractures were the most prevalent chest injury, accounting for 94.1% of all cases, followed by haemothorax (58.5%), laceration of the lungs (21.0%). One incidence (1.1% of total) involved the diaphragm, making it the chest structure least often afflicted. Multi-system injuries accounted for the majority of fatalities (80.2%).

**Conclusion:** More men and younger, more active adults die from chest injuries sustained in car accidents. When it comes to chest injuries, the ribs take the cake. Seldom do people sustain damage to their thoracic spine or other internal organs. Numerous injuries account for the vast majority of fatalities.

**Keywords:** Accident, Chest, Injuries, Postmortem.

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### Introduction

Road traffic accidents (RTAs) were listed by the World Health Organization (WHO) as the ninth biggest cause of mortality worldwide in 2004 [1]. According to the report, if the present rate of increase in this disease continues, it would overtake AIDS as the fifth biggest cause of death globally by the

year 2030 [1]. Several studies have indicated that victims of RTA are at risk for sustaining chest injuries of varying severity; due to the location of essential organs including the heart, major arteries, and lungs inside the chest, these injuries may have a devastating impact on the victim's life very quickly.

According to a study conducted by Hossack [2], the most common cause of death for pedestrians involved in RTA in Australia was trauma to the head and chest. Moreover, he found that pedestrians were more likely to have injuries to the back and legs than those riding in saloon cars [2]. Curiously, some injuries sustained by RTA victims have been attributed to cardiopulmonary resuscitation originally aimed at saving their lives. Such injuries are, however, unlikely to be the major causes of death in RTA cases. These injuries, which include rib and sternal fractures as well as haemothorax, are sometimes difficult to differentiate from those actually caused by the RTA itself. Nevertheless, many authors have shown fractures of the ribs to be the most common form of chest injury following RTA [3-5].

While there is a significant rate of road traffic deaths [6-11], very little research has been published on the topic of road traffic accidents in developing nations like Nigeria. Deaths caused by RTAs are among the highest in Nigeria [12-14]. In order to objectively assess RTA's effect on the socioeconomic lives of the population, additional study on RTA is needed. Therefore, the purpose of this research is to analyze data from the Obafemi Awolowo University Teaching Hospitals Complex in Ile-Ife, Nigeria over a 10-year period to identify trends in chest injuries, types of victims who sustain them, and the extent to which these injuries contribute to the mortality of those who have been involved in road traffic accidents.

### Materials and Methods

This was a retrospective, descriptive study of autopsy results from cases of road traffic accidents (RTA). Injuries to the thoracic wall and/or the organs contained inside the thorax were criteria for inclusion in the research. The study's data came from autopsy records and a registry kept by the relevant

department, as well as the medical files of patients who died while hospitalized. Information such as the victim's age, sex, sitting position in the vehicle, type of vehicle, type of chest injury, and final anatomic cause of death, among others, was extracted. The timing of the accidents, alcoholic history, and personal disease history of the victims was not considered because these were not routinely recorded as part of the forensic investigations of such cases during the period covered by the study.

All cases with incomplete bio-data and/or documentation of the various injuries sustained were excluded from the study.

Using chi-square, the Statistical Package for the Social Sciences (SPSS) version 15.0 examined the collected data for statistically significant percentage differences.

### Results

Overall, there were 600 cases of RTA-related deaths for which postmortems were performed during the study period. As a result of missing information, 55 instances had to be removed from the analysis. Twelve percent of victims had some kind of chest injury, with 70 instances showing such injuries. The male-to-female ratio was 5.5:1, with 60 men (85.1% of the total) and 10 females (24.9% of the total). The ages of the victims varied from 6 decades to 80 decades, with a mean age of 40.1 years (15.5 years SD). The fourth decade of life was the most common age range, accounting for 25 instances (30.0%). This was followed by the 20 to 30-year age group with 18 cases (24.3%). Victims younger than 10 years old were the least involved with only 2 cases (2.5%).

About 41 victims (50.7%) were passengers, while 24 (32.0%) were the drivers of the vehicles and 10 (13.3%) were pedestrians. There was no adequate information on the exact sitting position of the passengers within

the vehicles. In all the pedestrian cases, the victims were knocked down by fast-moving vehicles. The majority (68.0%) of the accidents occurred within inter-city routes compared to intra-city routes which accounted for only 16 cases (21.3%). In about 57.3% of cases, multiple vehicles were involved in the accidents with lone accidents accounting for 27.0% of cases.

As a rule, the rib cage in the chest was the target. Ninety-four percent of the rib fractures were confirmed to be broken. Unfortunately, radiographic examinations are not regularly conducted as part of the post-mortem investigation in instances of RTA at the OAUTHC, hence the nature of the rib fractures was not properly documented. The second most common chest pathology was hemothorax, which was present in 46 of the patients (58.5%). Among the 70 patients who had rib fractures, 58.5% had hemothorax. A total of 55 individuals (80.2%) with rib fractures additionally had serious multiple injuries elsewhere. Twenty-five percent, or 19 instances, had rib fractures in addition to lung lacerations. Just five patients (5.1%), suffering from varied degrees of cardiac

damage, required hospitalization. They were all linked to a laceration of the myocardium and, in variable degrees, hemopericardium and/or hemothorax. Two of these four incidents were related with sternum and rib fractures, whereas the other two were just connected with rib fractures. In addition, the combined impact of many injuries in different places of the body led to the deaths of two of the victims, while chest injuries led to the deaths of the other two. Pneumothorax did not occur in any of the patients. Table 1 lists other forms of chest injuries seen during autopsies.

According to Table 1, the majority of the deaths associated with chest injuries (80.2%) were ultimately due to the combined effects of all the multiple injuries sustained while chest injuries were solely responsible for only 5 deaths (5.1%).

According to Table 1, 40 victims (53.4%) died at the scene of the accident while 25 (30.1%) died while on admission to the hospital (all within 3 days of admission). Interestingly, there were no deaths after 3 days of admission to the hospital.

**Table 1**

Parameter	Distribution	Frequency(%)
Type of injury	Ribfracture	75(94.1)
	Haemothorax	46(58.5)
	Laceration of the Lung	20(21.0)
	Laceration to the Heart	4(4.0)
	Sternal Fracture	4(4.0)
Final anatomic cause of death	Rupture of the Diaphragm	2(1.1)
	Severe Multiple Injuries	55(80.2)
	Chest Injury with respiratory failure	5(5.1)
	Hypovolaemia	5(5.1)
Place of death	Cervical spine fracture with respiratory arrest	1(1.0)
	Accident Scene	40(53.4)
	Inpatient	25(30.1)
	Enroute	5(5.1)

## Discussion

The high male to female ratio of chest injuries in fatal RTA is similar to what has been reported by various authors including the WHO [1,6-8]. While this seems to suggest that women may be more careful drivers and road users than men and thus less likely to be involved in RTA, it may actually be due to the fact that there are more male drivers and road users on our roads. Nevertheless, it is important that efforts are made by the road safety authorities to improve the driving habits of all those concerned.

Most people killed in car accidents are in their thirties and forties [3,6,10,13], despite this being the most productive age group in terms of economic and social progress. Similar results have been reported by other writers [7,15-17]. More than half of fatal RTAs in the Transkei area of South Africa occur among victims between the ages of 21 and 40, according to research conducted by Meel [18]. Among all age groups, those between 21 and 40 are the most active and, hence, the most at risk [19,20]. It is well known that developing nations can not achieve sustainable economic development until they reduce the number of fatalities in this age range due to road traffic accidents, AIDS, and other forms of violence. [18].

It was also shown in this research that fatal incidents involving passengers occurred more often on intercity routes than on intracity roads, perhaps because of the greater propensity of drivers on intercity highways to exceed the posted speed limit. This probably explains the wide disparity between intercity vehicular fatalities compared to those that occurred along intra-city routes. The majority of the deaths on these inter-city routes may not be unconnected with the high numbers of commercial, passenger mini vans which ply these routes the operators and passengers that use these vans do not comply with the minimum safety requirements. It, therefore, becomes imperative that adequate measures be

put in place by the appropriate regulatory bodies to improve safety along the inter-city highways while ensuring that drivers obey recommended speed limits and all passengers use their seat belts.

Rib fractures were the most prevalent kind of chest injury, occurring in almost 94.1% of patients. Consistent with comparable findings [3-5]. Rib fractures were shown to be linked to a helmet in over half of cases, and to multiple injuries in over eighty percent of cases. Unfortunately, most of these people did not survive until medical help arrived [21]. Hence, it is crucial for first responders treating patients with rib fractures to be aware of the high likelihood of the existence of haemothorax and other injuries, so that timely, suitable measures may be implemented to increase the odds of survival. Very few investigations have shown that RTA results in sternum fracture, heart injury, esophageal injury, or aortic rupture [22].

Just three occurrences of sternal fracture were reported in this investigation, and all of them were connected to other types of injuries. Just four occurrences of hemopericardium and/or haemothorax were reported, and all four were accompanied by heart damage. When we looked for esophagus injuries and aortic ruptures, we found none. Ribs, sternum, and vertebrae provide adequate protection for vital organs including the heart, oesophagus, and aorta, which may explain why direct impact injuries to these structures are so uncommon [3]. As a result, significant damage to these intra-thoracic organs would need an extremely high magnitude of blunt force trauma [3]. Instead, the lungs are more susceptible to harm in RTA's associated injury [21,22] because to their size and closeness to the rib cage. While evaluating individuals who have suffered a fracture of the rib cage, sternum, or thoracic vertebrae, it is particularly vital to keep in mind the possibility of intra-thoracic organ injury [21,22].

Although such injuries are uncommon, they do occur. A further reduction in RTA-related fatalities may be possible if chest injuries are treated properly, especially at the site of the accident. This research found that the cumulative impact of several injuries to diverse regions of the body accounted for the majority of fatalities (80.2%). In order to properly determine the degree of the victim's injuries, it is crucial to undertake a whole-body assessment, rather than only focusing on the visible chest injuries [23], particularly in cases when the victim has suffered a chest injury as the result of a road traffic accident. Not included in this analysis were deaths caused by secondary conditions, such as sepsis, pneumonia, or pulmonary thromboembolism, which may be less common causes of mortality in RTA [24].

Nevertheless, in the United States, researchers Mackenzie *et al* found that sepsis and renal failure were major causes of mortality for RTA patients who had to remain in the hospital for an extended period of time [25]. Most of the patients in our research passed away at the site of the accident, and the others passed away within three days of hospital admission, well before complications such as wound infections and thromboembolism could set in.

No patients were reported dead after three days in the hospital, which is a sobering fact. As a result, it is crucial to have prompt and effective medical care provided both at the site of the accident (where it is often subpar and chaotic) and at the hospital. [21,22]

### Conclusion

It is important that appropriate efforts are made by the road safety authorities to improve the driving habits of all those concerned and especially commercial minivan drivers in order to reduce the impact of their poor driving habits. It is also imperative that victims of RTA should be properly examined by care givers for

other injuries, the combined effects of which more readily kill them.

Finally, an appropriate, well organized emergency care system needs to be instituted urgently to prevent these avoidable deaths.

### References

1. Global status report on road safety: time for action. Geneva, World Health Organization; 2009. Available: [www.who.int/violence\\_injury\\_prevention/road\\_safety\\_status/2009](http://www.who.int/violence_injury_prevention/road_safety_status/2009)
2. Hossack DW. The pattern of injuries in 470 pedestrians killed in road accidents. *Med J Aust.* 1975;1(22):678-679.
3. Zargar M, Khaji A, Karbakhsh DM. Thoracic injury: A review of 276 cases. *Chin J Traumatol.* 2007;10(5):259-262.
4. Athanassiadi K, Gerazounis M, Moustardas M, Metaxas E. Sternal fractures: retrospective analysis of 100 cases. *World J Surg.* 2005;29(6):744-749.
5. Smyth BT. Chest trauma in children. *J Pediatr Surg.* 1979;14(1):41-47.
6. Dgedge M, Novoa A, Macassa G, Sacarlal J, Black J, Michaud C, Cliff J. The burden of disease in Maputo City, Mozambique: registered and autopsied deaths in 1994. *Bull World Health Organ.* 2001;79(6):546-552.
7. Odero W. Road traffic injuries: Little discussed killer in Sub-Saharan Africa. At Harvard centre for population and development studies. 2004:1-2. Available: [www.unisa.ac.za/contents/facultis/humanities/shs/docs/safety2005vol11.pdf](http://www.unisa.ac.za/contents/facultis/humanities/shs/docs/safety2005vol11.pdf) Accessed 12 August 2009
8. Adamek J, Hladik J, Stefan J, Vyhnanek F. Epidemiologic study of fatal injuries autopsied at the institute of Forensic medicine of the 3rd Medical School of Charles University Hospital in Vinohrady, Prague, from 1996 to 1999. *Soud Lek.* 2001;46(2):21-23.
9. Salgado MS, Colombage SM. Analysis of fatalities in road accidents. *Forensic Sci Int.* 1988;36(1-2):91-96.

10. Marsh DR, Kadir MM, Husein K, Luby SP, Siddiqui R, Khalid SB. Adult Mortality in slums of Karachi, Pakistan. *J Pak Med Assoc.* 2000;50(9):300-306.
11. Singh D, Dewan I, Pandey AN, Tyagi S. Spectrum of unnatural fatalities in the Chandigarh zone of North-West India – A 25-year autopsy study from a tertiary hospital. *J Clin Forensic Med.* 2003; 10(3):145-152.
12. Seleye-Fubara D, Ekere AU. Pedestrian deaths resulting from road traffic accidents seen at the University of Port Harcourt Teaching hospital – Six-year review. *Niger J Med.* 2003;12(2):103-105.
13. Mandong BM, Manasseh AN, Ugwu BT. Medicolegal Autopsies in NorthCentral Nigeria. *East Afr Med J.* 2006;83(11):626-630.
14. Nzegwu MA, Banjo AAF, Akhiwu W, Aligbe JU, Nzegwu CO. Morbidity and Mortality among road users in Benin-City, Nigeria. *Annals of African Medicine.* 2008; 7(3):102-106.
15. Kumar TS, Kanchan T, Yoganarasimha K, Kumar GP. Profile of unnatural deaths in Manipal, Southern India 1994-2004. *J Clin Forensic Med.* 2006;13(3):117-120.
16. Prasad BK, Prasad C. Road traffic accident (RTA) as major killer: a report on medico-legal autopsies in BharatpurOlaofe *et al.*; *BJMMR*, 17(5): 1-7, 2016; Article no. *BJMMR*. 28177 7 hospital. *Kathmandu Univ Med J.* 2003; 1(1); 34-35.
17. Knobel GJ, De villers JC, Parry CD, Botha JL. The causes of non-natural deaths in children over a 15-year period in greater Cape Town. *S Afr Med J.* 1984; 66(21): 795- 801.
18. Meel BL. Trends in Fatal Motor Vehicle accidents in Transkei region of South Africa. *Med Sci Law.* 2007;47(1):64-68.
19. Akang EE, Akinremi T, Oje EM, Oluwasola AO, Ipadeola TO. Pattern of coroners' autopsies at Ring Road State Hospital, Ibadan, Nigeria: A retrospective study (1994-2000). *Med Sci Law.* 2009; 49(2): 117-122.
20. Odesanmi WO. Forensic Pathology in Nigeria: The Ife Experience. *Med Sci Law.* 1982;22(4):269-274.
21. Kumar VAG, Honnungar RS, KumarTS, Hallikeri V. Pattern of chest injuries in road traffic incident victims: A six-year retrospective study. *Med Sci Law.* 2011; 51:93-96.
22. Kumar A, Singh M, Verma AK, Rastogi AK. Blunt injuries of chest: a medico-legal analysis. *J Indian Acad Forensic Med.* 2012;34(2):108-110.
23. Anupam C, Krishna PK, Sreeramulu PN. A clinico-epidemiological study of traumatic chest injuries in a rural tertiary care centre in India: Our experience. *Int j Biomed Adv Res.* 2015;6(2):110-114.
24. El-Menyar A, Abdelrahman H, Al-Hassani A, Eliabib M, Zarour A, Al-Thani H. Clinical presentation and time-based mortality in patients with chest injuries associated with road traffic accidents. *Arch Trauma Res.* 2016;5(1):e31888.
25. Mackenzie CF, Shin B, Fisher R, Cowley RA. Two-year mortality in 760 patients transported by helicopter direct from road accident scene. *Am J Surg.* 1979;45(2): 101-108.