

A Descriptive Study on Autopsy Finding in Two Wheeler Road Traffic Accidents

G. Amritha Sulthana

Senior Assistant Professor, Department of Forensic Medicine, Government Medical College, Krishnagiri

Received: 18-11-2023 / Revised: 21-12-2023 / Accepted: 26-01-2024

Corresponding author: Dr. G. Amritha Sulthana

Conflict of interest: Nil

Abstract:

Introduction: India has one of the highest road accident rates in the world. There has been a steady rise in the casualties in road accidents in the country and their proportions in total deaths. Many works of literature were available about the pattern of injury in road traffic accidents. Some reported that the motorized two-wheeler victims are the commonest in RTA. Therefore, this study aimed to assess the factors and patterns of injuries related to RTAs due to two wheelers.

Materials and Methods: It is a retrospective study involving 200 two wheeler road traffic accidents victims brought to the mortuary for post-mortem examination. Preliminary data's collected from the investigating Officer and the injuries measured during autopsy and analysed. Statistical Analysis did using IBM SSPS Version 24.

Results: Majority of the Victims were males belonging to the age group of 20- 40 years. Riders were most commonly involved than Pillion riders. Significant proportion of the riders was males. Abrasions were higher in frequency among the external injuries, seen more in the extremities. Among the head injuries contusions are commonly seen followed by fractures. Most commonly involved skull bone is temporal bone, linear fissure fracture type more in frequency than comminuted fracture. Subdural haemorrhage seen in higher frequency. In riders, Fracture of Forearm bones, Femur commonly involved. Head injury is commonest cause of death.

Conclusion: The Present study shows that the mostly commonly involved victims are males, in young age less than 40 years. Cranio Cerebral injuries are the commonest cause of death. Death was more among riders not using helmet. Helmet wearing plays one of the most important factors preventing the fatality.

Keywords: Injury pattern; Road Traffic Accidents; Two Wheelers.

This is an Open Access article that uses a funding model which does not charge readers or their institutions for access and distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>) and the Budapest Open Access Initiative (<http://www.budapestopenaccessinitiative.org/read>), which permit unrestricted use, distribution, and reproduction in any medium, provided original work is properly credited.

Introduction

Injuries are increasingly recognized as a global public health epidemic. Around the world, almost 16,000 people die every day from all types of injuries. Injuries represent 12% of the global burden of disease, the third most important cause of overall mortality and the main cause of death among 1-40 year age groups. [1] The category of injuries worldwide is dominated by those incurred in road crashes. According to WHO data, deaths from road traffic injuries account for around 25% of all deaths from injury. [1]

India has one of the highest road accident rates in the world. There has been a steady rise in the casualties in road accidents in the country and their proportions in total deaths due to all accident have also increased considerably in the past.

In India, nearly 80,000 get killed and 340,000 are injured every year in about 300,000 accidents on road network of just 22,00,000 km². There is an accident every minute and death every 8 min.

significant variations also arise between different states of India [2]. India has the highest incidence of death due to road traffic accidents in Uttar Pradesh (11.4%) followed by Tamil Nadu (11.3%), Andhra Pradesh (10.7%), and Maharashtra (9.6%) [3]

Many works of literature were available about the pattern of injury in road traffic accidents. Some reported that the motorized two-wheeler victims are the commonest in RTA [4-6]. Currently two wheelers are major component of road traffic, preferred family vehicle and they have taken mega share of road accidents.

Motorcycle users, pedestrians and pedal cyclists are vulnerable road users who are directly exposed to impacting vehicle or hard objects during collision and likely to get injured severely. Others reported pedestrians as the commonest victims of RTA [7-9] Thus, different regions have different types of victims of RTA depending on the types of vehicle

used, traffic safety rules and congestion, public awareness, and road condition.

Due to enormous increase in two wheeler collisions, the frequency of doing autopsy on road traffic accident cases by forensic pathologist increases many fold. Autopsy on victims of motor vehicle accidents helps to determine the time of accident, period of survival, manner of accident, rider or passenger, consistency of injury patterns with road traffic accident history, collection of trace evidence to identify the site of accident etc. [10]

Factors predisposing Road Traffic Injuries are classified into Agent, Human and Environmental. Analysis of this Epidemiological Triad is crucial to develop and implement mechanisms for control and prevention of fatal injuries.

Deaths and injuries due to RTA are preventable. A wide range of effective road safety interventions exist and a scientific, systematic approach to road safety is essential to tackle the problem. In spite of WHO warning, regarding the RTA fatality by the year 2020, there is limited information on the injury patterns, distribution, and outcomes of the RTA victims of motor cycles in this region. Lack of systematic data generation mechanisms both at the national and state level leads to limitation in designing appropriate intervention strategies to deal with the problem in the country. Therefore, this study aimed to assess the factors and patterns of injuries related to RTAs due to two wheelers.

Material and Methodology

This retrospective study was conducted in 200 two wheeler accident victims were randomly selected from road traffic accident cases brought to the Government Medical College, Krishnagiri for routine medico legal post-mortem examination for a period of one year. Victims of Two Wheeler Motor vehicle accidents hit by any type of vehicle or self-fall brought dead directly to the casualty or died in the hospital in spite of treatment were

included in the study. Death due to other causes, decomposed, severely mutilated bodies and unknown bodies were excluded

Preliminary data were collected from the medico legal documents such as history of the case, Inquest form, First Information Report, Accident Register, Death Report, Clinical data submitted by the investigating officer at the time of medico legal examination.

During autopsy, on external examination, nature of injury, site, size, number were noted. Internal organ injuries details were recorded. Cause of death was arrived at based on the findings made out during autopsy. Statistical analysis was done using SPSS software version 24.

Results

In our study totally 200 two wheeler motorcyclist victims were included in this study. Total number of helmet users and non-helmet users and pattern of injuries were analyzed.

In our study of 200 victim's age less than 20 years were found to be 10 (5%), 20-30 years were 84(42%), 30-40 years were 66 (33%) and above 40 years were 40 (20%). Out of 200 victims males comprised 168 (84%) and female comprised 32 (16%). Significant no of victims of road traffic accidents were males. P value <0.001. Among victims total number of riders were 156 (78%) and pillion riders were 44 (22%). Significant proportion among the riders was males. Among the total incident 26 occurred between 3 and 6 AM, 54 between 6 and 11 AM, 48 between 11 AM and 3 PM, 25 occurred between 3 PM and 6 PM, 37 from 6 PM to 10 PM and 10 occurred between 10 PM and 3 AM. Regarding the survival period of the victims, 15 (7.5%) were spot dead and 10 (5%) was brought dead. Those who survived less than 12 hours were 52 (26%), 12-24 hours was 46 (23%) and rest 77 (38.5%) survived for 1-14 days. More fatalities within short period of interval occurred in less than 12 hours viz., 77 (38.5%).

Table 1: Regional distribution of injuries:

Regions	Abrasions	Contusions	Lacerations	Fractures
Head & Neck	102	86	80	142
Thoraco- Abdomen	56	15	16	25
Upper Limbs	154	35	12	30
Lower Limbs	112	41	35	52

Among the external injuries, abrasions were seen 102 cases over Head and neck, 154 cases over Upper limb, 112 cases over Lower limb and in only 56 cases over Thoraco- abdominal region.

Contusions were seen 86 cases over Head and neck, 35 cases over Upper limb, 15 cases over Thoraco- abdominal region and in 41 cases over Lower limb. Similarly lacerations were seen 80

cases over Head and neck, 12 cases over Lower limb, 16 cases over Thoraco- abdominal region and in only 12 cases over Upper limb.

Fractures were seen 142 cases over Head and neck, 52 cases over Lowerlimb, 25 cases over Thoraco- abdominal region and 130 cases over Upper limb. Among head and neck injuries meningeal hemorrhages was present in 120 cases, cerebral

injuries in 36 cases and surgical intervention were done in 36 cases.

Among the fractures of the skull, temporal bone was involved in 82 victims followed by frontal bone in 30 victims; Occipital bone is the least affected. Mostly the skull fractures were fissured. Among the meningeal injuries sub-dural hemorrhages were most common followed by sub-arachnoid hemorrhages in and extra-dural hemorrhages. Next we analyzed the thoraco-abdominal injuries of which rib fractures constitute the most among fractures. Abrasions were commonly seen. Visceral damage was present in 20 cases in our study. Coming to upper limb abrasions are the most common injuries and the fractures are

the most severe form of injuries. Shoulder and elbow were the most commonly involved regions. Next common region was forearm. Fractures involving radius and ulna were seen in 18 victims, humerus fracture in 10 and clavicle fracture in 6 victims.

Similarly in lower limb knee is the most commonly injured part followed by leg and foot, ankle was involved in few cases. Among fractures, femur was most commonly involved followed by leg both bone fracture. Foot fractures the least common. Among the total fatalities 65 % suffer meningeal hemorrhages, 15% had cerebral injuries, 56% had skull fractures, and 15% had Spinal injuries, 26 % Lower limb fractures.

Table 2: Distribution of fatal injuries

Distribution of Fatal Injuries	Total
Meningeal Hemorrhages	130
Cerebral Injuries	30
Skull Fractures	112
Spine Injuries	30
Lower limb fractures	52

In our study out of 200 cases, 156 (78%) travelled without helmet and rest 44 (22%) with helmet. Coming to cause of death, head injury accounts for 71% of fatalities followed by multiple injuries, whereas blunt injury abdomen and pelvic injury were the least. Among the death toll of head injuries hardly 25% of victims used helmets. Helmet usage is significantly less in fatalities.

Table 3: Cause of death

Cause of death	No. of fatalities
Head injury	142
Multiple injuries	38
Lower limb injuries	10
Blunt injury abdomen	7
Pelvic injury	3

Discussion

Two-wheelers are the most commonly involved road users who contribute to major burden of road traffic accidents in developing countries, owing to their least stability, higher speed and thrill seeking behaviour of the riders "restless driving". [11,12]

Working and economically productive age group 20 to 40 69%. In all age groups, 80 to 90% were males as they are the breadwinners of the family. They constitute the largest fraction of those who use the motorized vehicles. This is supported well by many other studies. [13] Older drivers tend to drive less and cautiously. But due to defective vision, neurological deterioration and other co-morbid conditions they have slower reactions which might be expected to be involved in more accidents.

In our study, 94% were males which is well supported by other studies [14,15]. Since males are the breadwinners of the family they have to look after the family. Factors for the increased risk of male drivers to be the victims include: hormonal

influence leading to thrill-seeking, over-confidence, excess speed, late-night driving. Vehicle characteristics such as old, ill-maintained or borrowed vehicle also contribute. 78% of all fatalities occur during first three years of driving. Due to inexperience [16].

In the present study, the peak occurrence of the accidents is around [6- 11] AM which was supported by many other studies. [13] Sleeplessness, fatigue and stress contribute more to RTAs. It is estimated that among road fatalities nearly 50-60 % occurs at the site of crash or while transfer to the hospital, 20-30% during hospital stay, 5-10% after discharge from the hospital. Neurological injury, hemorrhage and shock are the major cause of death. This was similar to findings of our study. Majority of fatal two wheeler accident victims have received multiple external injuries. Multiple body parts were involved in each case. Abrasion, contusions, lacerations and fractures were seen over head and neck, thoraco- abdominal and extremities [11]. Multiple Injuries were more commonly observed in fatal two wheeler accidents.

More frequency of secondary injuries seen in the motor-cyclists may be attributed to a greater distance of fall in them. Even a single crash may lead to multiple primary impacts in a victim. Head and extremities were the most common areas to suffer superficial injuries. Crush injuries predominantly seen in lower limbs.

In our study abrasions are the most common type of injury in road traffic accidents even in all fatal cases which is also supported by many other studies [17]. It is found that abrasion injuries were more common on the extremities. In the present study, abrasions are seen more in the extremities i.e., over the upper limbs and the lower limbs, followed by the head and neck region and thoraco-abdominal regions. This correlates with the parachute reflex i.e., when a conscious individual falls there will be reflex extension of all the four limbs to protect the head and torso which contains the vital organs.

Secondary injuries are more common in motorcyclists. More frequency of secondary injuries seen in the motor-cyclists may be attributed to a greater distance of fall in them. Even a single crash may lead to multiple primary impacts in a victim. Primary impact injuries are most commonly seen in the lower extremities and pelvis, followed by upper extremities and shoulder, whereas abdomen, head and neck are less commonly involved regions. Secondary impact injuries are mostly seen in the head and neck and are followed by upper and lower extremities.

Maximum injuries are recorded in lower extremities, followed by head and neck and upper extremities. It is observed that number of secondary injuries is fairly high in fatal road traffic accidents. Crushing injuries are responsible for more incidences of secondary injuries. Contusion injuries were more common on the scalp tissue. In the present study, among the meningeal injuries subdural hemorrhages were most common followed by sub-arachnoid hemorrhages in and extra-dural hemorrhages. This is supported by other studies [13].

In general thorax and abdomen are safe. They are well protected by the extremities, which block any kind of harm to the trunk, if expected. Even trivial form of injury like abrasion is rare because of clothing's worn by the victim. But contusions and fractures were considerable among which rib fractures and chest wall bruising were frequent. It is because the clothing can prevent trauma due to tangential forces, but not those due to perpendicular ones. The damage to the visceral organs are the most fatal.

The abrasions seen over the body surface are often caused due to friction over the road surface on falling over the ground. Graze abrasions occur

when the victim's body is dragged against any rough surface like roads, wall etc. or due to the fall of the motor cycle over them.

Elbow and forearm are often injured in motor cycle accidents. In the present study, the abrasions in this region might have been caused by either by handle bar or fall on the ground. Legs are often injured in motor cycle accidents when the motorcycle dash with other vehicle or any fixed structures or the legs may be trapped in the motor cycle frame. In the present study, fractures were seen commonly in femur. But according to most other studies, commonest fracture in lower limb occurs in tibia. [15]

In the present study, Cranio-cerebral injuries, the commonest cause of death which is similar to other studies. [17] It's also noted that no significant difference in pattern of fatal head injuries among riders and pillion riders. That too meningeal hemorrhages and cranial fractures are the most frequent fatal injuries than actual injury to the underlying brain substance. On comparing the pattern of fatal injuries among riders and pillion riders the thoraco-abdominal injuries like visceral damage and pelvic fractures were frequent. The second common cause of death was due to multiple injuries. Lower limb injuries and abdominal visceral injuries were the lowest fatal injuries among our sample. Whereas lower limb injuries are common in riders than in pillions viz., well supported by most of the studies. [18]

In our study, most of the victims are non-helmet users (78.9%). When compared to them, those who had worn helmet are protected from head injuries similar when compared to non-helmet users who were about 80% as in many other studies [13].

Conclusion

The Present study shows that the mostly commonly involved victims are males, in young age less than 40 years. Cranio Cerebral injuries are the commonest cause of death. Death was more among riders not using helmet. Helmet wearing plays one of the most important factors preventing the fatality. Vast majority of the road users were not wearing helmets and so the major cause of death in case of their fatalities are "Head Injuries".

References

1. Two-wheelers on Indian roads: how safe are they?– August 25, 2011Posted in: Articles, Automotive & Trucks, Roads & Highways
2. "All the info you need on lane sharing (lane splitting)". www.WhyBike.com. [http:// www.whybike.com/motorcycle274.htm](http://www.whybike.com/motorcycle274.htm). Retrieved 28 June 2007. 20 Anna Maria Kalli, Elias Aissar Sallum, Cristiane de Alencar Domingue

3. Douglas Bowley, Kenneth Boffard Pattern of injury in motor vehicle accidents Pattern of injury in motor vehicle accidents.
4. Singh D, Dewan I, Sharma AK. A retrospective study of death due to head injury in Chandigarh. *J Indian Acad Forensic Med.* 1998; 18: 1-4.
5. Dandona R, Mishra A. Deaths due to road traffic crashes in Hyderabad city in India: Need for strengthening surveillance. *Nat Med J India.* 2004; 17: 74-79.
6. Akhilesh P, Desania NL, Verma R. Profile of road traffic accident and head Injury in Jaipur (Rajasthan). *J Indian Acad Forensic Med.* 2008; 30: 6-10.
7. Sharma BR, Sharma AK, Sharma Singh H. Fatal road traffic injuries in Northern India: Can they be prevented? *Trends Med Res.* 2007; 2: 142-148.
8. Gupta S, Roychowdhury UB, Deb PK, Moitra R, Chhetri D. Demographic Study of Fatal Cranio-Cerebral Road Traffic Injuries in North Bengal Region. *Medico-Legal Update.* 2007; 7: 1-3.
9. Singh YN, Kaustav B, Kanak D. An epidemiological study of road traffic accident victims in medico-legal autopsies. *J Indian Acad Forensic Med.* 2005; 27: 166-169.
10. Jain A, Menezes RG, Kanchan T, Gagan S, Jain R. Two wheeler accidents on Indian roads--a study from Mangalore, India. *J Forensic Leg Med.* 2009 Apr; 16(3):130-3. Epub 2008 Oct 22.
11. Susan Wells et al. (April 10, 2004). "Motorcycle rider conspicuity and crash related injury: case-control study". *BMJ.* <http://www.bmj.com/cgi/content/full/328/7444/857>. Retrieved 2007- 06-26.
12. E. Th. Petridou, E. Germeni, A. Ntinapogias, The European Code Against Injuries (ECAI), *Archives of Hellenic Medicine*, vol 25, supplement 1, 2008.
13. Michael Fitzharris, Rakhi Dandona, G.Anil Kumar^{4,5} and Lalit Dandona¹, Crash characteristics and patters of injury among hospitalized motorized two-wheeled vehicle users in urban India. *BMC Public Health* 2009; 9:11.
14. Valent F, Di Bartolomeo S, Marchetti R, Sbrojavacca R, Barbone F. A case-crossover study of sleep and work hours and the risk of road traffic accidents. *Sleep.* 2010 Mar; 33(3):349-54
15. Cherpitel CJ. Alcohol and injuries: a review of international Emergency room studies. *Addiction* 1993; 88: 923-37.
16. Kortor JN, Yinusa W, Ugbeye ME. Lower limb injuries arising from motorcycle crashes. *Niger J Med.* 2010 Oct-Dec; 19(4):475-8. rt Safety Bureau (ATS)
17. Nilambar Jha, DK Srinivasa, Gautam Roy, S Jagdish Year: 2003 Volume: 28 Issue: 2 Page: 85 Injury Pattern among Road Traffic Accident Cases
18. Dr. S.S. Oberoi, Dr. K.K. Aggarwal, Dr. D.S. Bhullar, Dr. R. Kumar, pattern and distribution of injuries in fatal two wheeler accidental cases. *Journal of Punjab Academy of Forensic Medicine & Toxicology* 10: 2010.