

## A Cross Sectional Study of Pattern of Mechanical Trauma Cases at Tertiary Care Institute of Central Gujarat

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### Abstract

**Introduction:** As per current changing trends in India, non communicable diseases and traumatic injuries cases are uprising in compare to infectious diseases. Mechanical trauma cases are increasing worldwide. Among trauma cases, road traffic accident injuries are one of major causes to produce disability & mortality in younger population  
**Objectives:** This study was conducted with aim to study the pattern of mechanical trauma cases at tertiary care institute of central Gujarat, India and to identify the factors related to the trauma.

**Materials and Methods:** A cross sectional study conducted among mechanical trauma patients visiting at Dhiraj Hospital, SBKSMIRC, SVDU, Vadodara between September to December 2021. Total 50 patients were studied as per inclusion and exclusion criteria. The data was collected in pre-tested semi-structured proforma which included pattern of mechanical trauma cases and the factors related with. The data was compiled and statistically analyzed.

**Observations and Results:** Out of total 1084 indoor patients at Dhiraj Hospital during the study period, 50 cases were of having various mechanical trauma. Among them, 34 cases were of Road Traffic Accident injuries, 9 cases were of fall from height, 4 cases were of Thermal injuries, 3 cases were of other mechanical trauma. Lower limbs were most commonly involved(42%) body part followed by upper limb (32%). Most common factor for causing the road accident (38%) was wrong side driving or overspeeding. Maximum accident cases were noted in evening times(between 4pm to 8pm). 54% cases had minor injuries while 32 cases had major bodily injuries.

**Conclusion:** Burden of mechanical trauma cases was 5% of all indoor cases of Surgery and allied departments. Maximum cases (88%) were of hard and blunt type of mechanical injuries and we have not noted any chemical and radiation injuries. In maximum cases, the mode of injury was RTA. Main factor causing road traffic accident was over speeding and wrong side driving. Most of the causative factors for the incident are rectifiable by use of vehicle safety measures and awareness of road traffic regulations among community.

**Key words:** Mechanical trauma, Injury, Road traffic accident.

### Introduction

India is passing through a major socio-

demographic, epidemiological, technological and media transition. The political, economic and

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social changes have altered the health scenario. In a developing country like India, infectious diseases were the leading cause of mortality in the past decades, but at present, non communicable diseases and traumatic injuries are on the rise. Globally about 5.8 million people die each year as a result of traumatic injuries<sup>1</sup>. Mechanical injuries are injuries produced by mechanical force-blunt, sharp or firearms. The severity and extent of mechanical injuries depend on the amount of force delivered to the body- if the weapon deforms or breaks on impact; some energy is spent in deforming or breaking. Lesser energy is thus delivered to the body, and injury is less severe. Legal definition of injury-Any harm, whatever illegally, caused to any person in body, mind, reputation or property<sup>2</sup>. A road traffic accident (RTA) can be defined as "an event that occurs on a way or street open to public traffic; resulting in one or more persons being injured or killed where at least one moving vehicle is involved"<sup>3</sup>. Worldwide, everyday about 3400 people die due to road traffic accidents (RTA) and predicted to result in death of around 1.9 Million people annually by 2020<sup>4</sup>. Among trauma road Traffic accidents are one of the major causes of disability and mortality in the younger population and are projected to be the Fifth leading contribution to global burden<sup>5</sup>.

### Aims and Objectives

1. To study the pattern of mechanical trauma cases at tertiary care institute of central Gujarat,India.
2. To identify the factors related to various types of trauma and its causes.

### Materials and Methods:

Across sectional study was conducted at SBKSMI&RC and Dhiraj hospital, Waghodia, Sumandeep Vidyapeeth,Gujarat in September to December 2021. **Sample size:** The patients visiting Dhiraj Hospital during September to December 2021 were included fulfilling inclusion criteria. Dhiraj Hospital is affiliated to SBKSMI&RC which is a tertiary level medical facility in central Gujarat and receives patient from Vadodara and surrounding districts of central Gujarat as well as adjacent region

of Madhya Pradesh.

**Inclusion criteria:** All type of mechanical trauma patients visiting Dhiraj hospital for medical treatment and willing to give consent were included in the study.

**Exclusion criteria:** Patients not giving consent for this study were excluded.

**Study method:** The study subjects enrolled according to the inclusion and exclusion criteria. All participants were provided with a participant information sheet which includes study title, purpose and confidentiality of study, nature of study and Protection for patient and security etc. Written informed consent for the case study were obtained. Data collected as per pre-tested, semi-structured proforma. It includes profile pattern of mechanical trauma and factors affecting it for example type of trauma, manner of injury, part of body involved in injury, If RTA then factors responsible for RTA, most common occupant vehicle, use of safety measure, time of trauma etc. All data were collected and statistically analyzed in MS Office 365.

### Observation and Results

During the study duration of four months, total 1084 patients were admitted as indoor cases in orthopedic, general surgery, plastic surgery, neuro surgery, pediatrics departments i.e surgery and allied departments. Among them, 50 cases (approx.5%) were of various mechanical trauma.

All the cases we observed were of accidental in manner. No cases of suicidal, homicidal or undetermined manner were observed. Out of all 50 cases, RTA cases were 34, fall from height cases were 9 thermal injury cases were 4 and other type trauma cases were 3.

Road traffic accident (RTA) is found to be the major cause of Trauma followed by Fall from height and thermal injuries etc.

Out of total accidental cases studied, 80% were males and 20% were females. Most common affected age group was 41-50 years (30%) followed by 21-30 years (22%), 31-40 years (20%), 51-60 years (16%), and equally affected in <20 years and >61 years i.e.6%

(Table 1) The occupation status of study participants i.e. 60% participants had salaried job/daily wage workers followed by 14 % unemployed/home maker, 12 % were professional/private business, 8 % were commercial vehicle driver and 6 % were students.

Maximum cases (88%) were of hard and blunt type of mechanical injuries. (Figure 1) Lower limb were most commonly affected body part in 42% cases followed by 32 % upper limb , 30 % head, 6 % back, 6% neck and 2 % chest. Head is one of the vital body part, so if protected by safety measures like helmet, the injuries could be non-fatal. (Figure 2)

Out of RTA cases, most common responsible factor for causing accident, as per patient's views, was over speeding wrong side driving in 38% cases followed by 16% cases were due to drug abuse/ alcohol intake, 13% were due to stray animal while bad condition vehicle, poor quality road and bad weather accounts for 10 % cases and 3% were due to use of mobile phone during driving. (Figure 3)

Out of RTA cases reported, 77.8 % cases involved two wheeler driver followed by 18.5% were two wheeler passenger and 3.7% were four wheeler passenger. (Figure 4) Most of cases were using two wheeler followed by pedestrians, bicycle and heavy vehicle; while most common vehicle of opposite party was heavy vehicle followed by four wheeler and two-threw wheeler. Only 2.2% road traffic accident patient observed practiced safety measures, while incidence, like helmet and seat belt which shows lack of use of safety measures while vehicle driving.

Out of thermal injury cases, 50% cases were due to flame burns and 25 % were due to moist heat burns and 25 % were due to electric shock injuries.

Maximum accidents i.e. 42% were noted at evening time (4-8pm) followed by 28 % were early morning (6 am-12pm), 16% were at night (8pm -6am) and 14 % were at afternoon (12-4 pm).

Out of all accidental cases, 54 % had minor injuries at the time of admission and they were stable followed by 32% had major bodily injuries and 14 % were thermodynamically critical on admission. Out of all accidental cases reported to the hospital, 74% patients were received primary treatment from either primary healthcentre, private clinic, home remedies

or any other hospital before admissions to the hospital while 26% patients were directly admitted to the hospital without receiving any primary treatment else.

## Discussion

Road traffic accident (RTA) is found to be the major cause of Trauma followed by Falls from height and buns etc which is in agreement with Rajni S et. al<sup>6</sup>. In present study 80% were males and 20% were females affected while most commonly affected age group was 41-50years (30%) followed by 21-30 years (22%). Sharma et. al<sup>7</sup>. studied total 306 patients of mechanical injury cases reported to the department of emergency. In which approx. 75% cases were male and 25% cases were female. Most of the study participants i.e. 30% belong to the age group of 21-30 years. which is consistent with Kharat R et. al<sup>8</sup>. where males were predominantly affected and maximum number of cases were reported in the age group of 21-30 years while most common affected age group in present study was 41-60 years. Malik Y et. al<sup>9</sup>, Kishore SK et al<sup>10</sup> and Singh T K et, al<sup>11</sup> reported the maximum number of cases in the age group of 20-40 years.

The leading cause of death was Road Traffic Accidents (83%) and Blunt mixed injury was the most common type of injury noted in Sharma et al<sup>7</sup> study which is consistent with our findings where most common type of injury was due to hard blunt injury. Jagtap et al<sup>12</sup> did retrospective study and studied the total 2450 registered "medico-legal" cases in casualty of which approx. 80 % cases were males and 20% were females. Most common affected age group was 21-30 years and around 47 % cases registered were due to road traffic accidents which are in agreement with present study except age group.

In present study 60% participants had salaried job/ daily wage work, 6% were students and 14 % unemployed/home maker which is nearly consistent with Jha N et al<sup>13</sup> who had studied the RTA cases had approx. 52 % participants were laborer/employed in service and 13.6% were housewife /unemployed while approx. 16 % were students.

In present study, most common part of body involved in injury was lower limb (42%) followed

by upper limb (32%) and head (30%) which is in agreement with Shamim M et al<sup>14</sup> where also lower limb (44.7%) were the commonest body part involved in road traffic accidental injuries. Similarly in Kishore SK et al<sup>10</sup> where in 52.8% cases lower limb affected. In around 74 % patients' primary treatment was given before admission to the hospital in our study while Rajni S et.al<sup>6</sup> reported that pre hospital care received In around 62%.

In present study 38.7% RTA cases were due to over speeding, 16.1% were due to drug intake/ alcohol intake and 9.7% were due to poor quality of roads while in Kumar S et al<sup>15</sup> approx..64 % cases were due to alcohol intake which was quite high as compared to present study and 40 % were due to over speeding which is nearly consistent with our study findings. Agnihotri A et al<sup>16</sup> also reported that most common cause to be speeding (36.17 %), followed by negligence of traffic rules (32.44 %) and bad road condition (8.5 %). Singh SK et al<sup>17</sup> reported that Drivers' fault accounted for 78% of total accidents, 76.5% of total injuries and 73.7% of total fatalities in 2013 in India where Within the category of drivers' fault, accidents caused due to over speeding accounted for a highest share of 55.6%. intake of alcohol and drugs accounted for 5.3% and 6.4%, respectively. As a share of total road accidents and deaths, overloading / overcrowding of vehicles accounted for 19.6% and 22.8%, respectively.

In present study out of RTA cases, 77.8 % affected patients were driver (two wheeler) and 22.2% were passenger of either two or four wheeler while Farooqui JM et al<sup>18</sup> also reported that two wheeler users and pedestrians were most commonly affected during RTA. Shamim M et al<sup>14</sup> reported 53.5% were drivers and 36.9 were passengers, Menon A et al<sup>19</sup> also reported the Two wheeler occupants were most commonly involved which is also consistent with Agnihotri A et al<sup>16</sup> and Kishore SK et al<sup>10</sup>. Most of

cases were using two wheeler while most common vehicle of opposite party was heavy vehicle followed by four wheeler and two-threw wheeler which is in agreement with Sharma D et al<sup>20</sup> where most of the injured were using two wheeler and counterpart of its were having four wheeler followed by two wheeler. In present study, only 2.2% patients of RTA had practiced the safety measures like helmet and seat belt while driving which is less than that reported in Shamim M et al<sup>14</sup> (27.5%)

Present study reported that maximum accidents occurred at the time of evening 42% followed by morning (28%) which is consistent with Kishore SK et al<sup>10</sup> reported that most common time of trauma was evening i.e. 4 to 8 pm followed by mid noon and morning. Opposite results were reported by Singh YN et al<sup>21</sup> where most common time of trauma was in morning (33%) followed by Evening (29%).

**Table 1: Distribution of study participants according to age and sex**

Sex	Female f (%)	Male f (%)	Total f (%)
<b>Age group (In years)</b>			
< 20	2 (20.0)	1 (2.5)	3 (6.0)
21-30	1 (10.0)	10 (25.0)	11 (22.0)
31-40	0 (0.0)	10(25.0)	10 (20.0)
41-50	4 (40.0)	11 (27.5)	15 (30.0)
51-60	3(30.0)	5 (12.5)	8 (16.0)
>61	0 (0.0)	3 (7.5)	3 (6.0)
Total	10 (20.0)	40 (80.0)	50 (100.0)

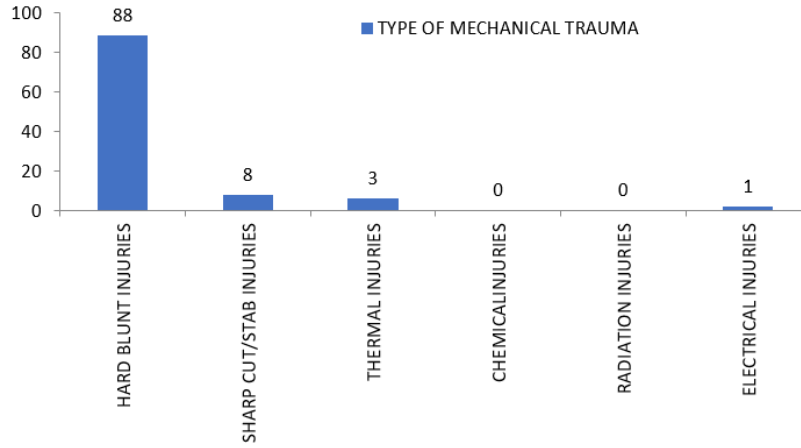


Figure 1: Distribution of study participants according to type of mechanical trauma

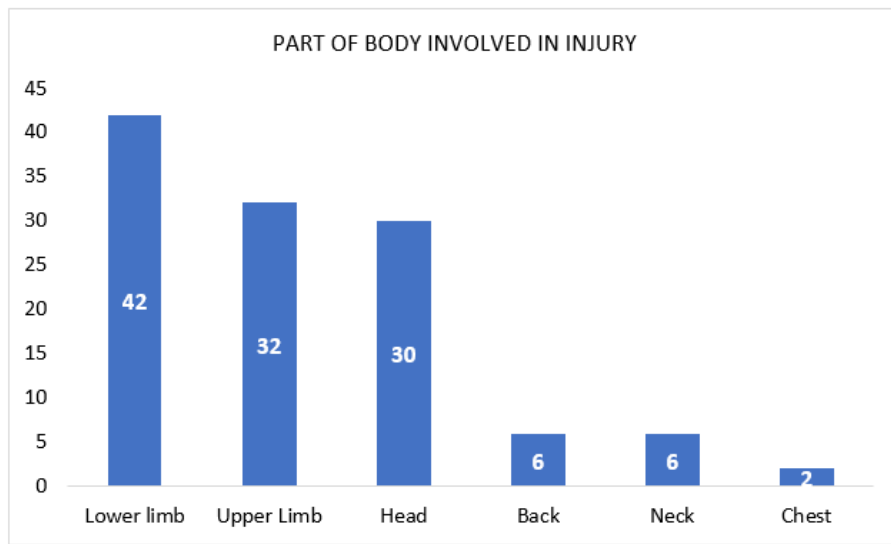


Figure 2: Distribution of cases according to their body part involved in injuries

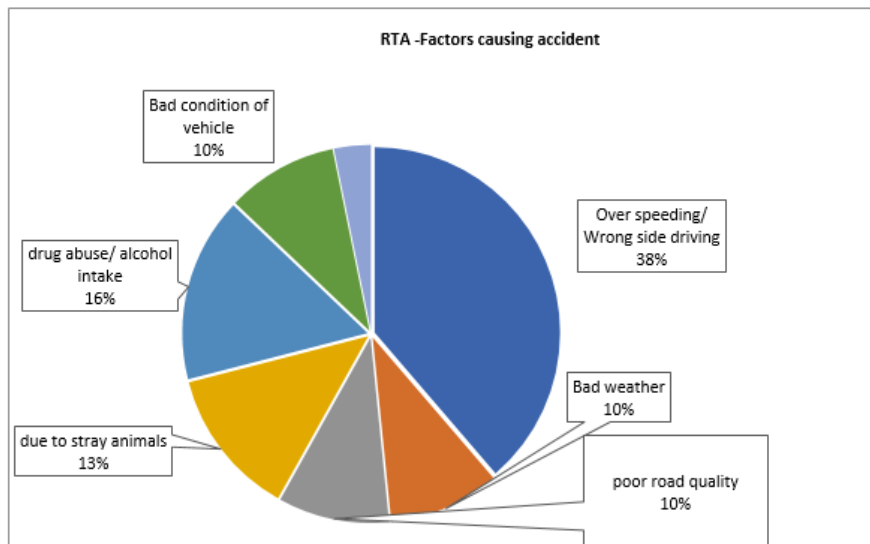
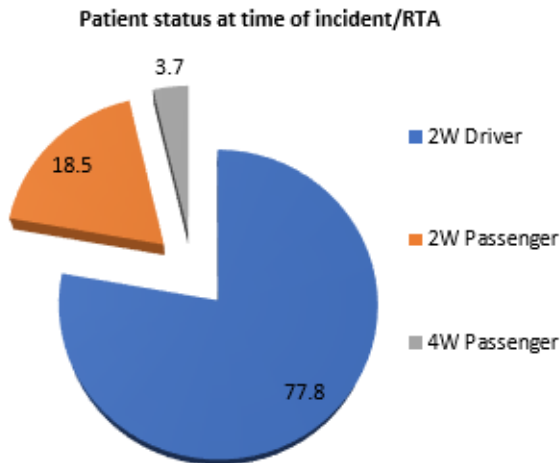


Figure 3: Distribution of cases according to the factors responsible for RTAs



**Figure 4: Distribution of case according to status of patient at time of RTA**

#### Study Limitations & Recommendations:

This study has been conducted as a short term project and data collected in cross sectional manner in limited duration of 4 months. For better accurate results and analysis longer duration of study may be done spanning all seasons in a year or more.

Few chemical trauma cases may be admitted under medicine and allied departments are lacking here. This also may be included to get the wholesome picture.

This study is just an observational type analysis. Further more research may be carried out in-depth like impact of use of safety measures in vehicles in RTA cases, impact of early hospitalized treatment in outcome of serious cases of RTA etc.

There are no homicide or suicide cases noted in this study. Which does not mean that no such cases occurs with mechanical trauma.

#### Conclusion

Total burden of mechanical trauma cases is 5% of all indoor cases of Surgery and allied departments.

Among total 50 cases of mechanical trauma that we studied in our research, maximum cases 88% were of hard and blunt type of mechanical injuries and we have not noted any chemical and radiation injuries.

In maximum cases mode of injury was RTA and that's why manner of injury was accidental.

Main factor causing road traffic accident was over speeding and wrong side driving.

The factors causing the trauma cases are categorized. Most of the causative factors are rectifiable by use of vehicle safety measures and awareness of road traffic regulations among community.

**Ethical Clearance:** This study was non-interventional observational study conducted after getting approval from SVIEC (Sumandeep Vidyapeeth Institutional Ethics Committee).

**Source of Funding:** All cost for this study borne by the investigators.

**Conflict of Interest:** Nil.

#### References

1. World Health Organization: Violence and Injuries: the Facts. 2014. [http://apps.who.int/iris/Bitstream/10665/44288/1/9789241599375\\_eng.pdf](http://apps.who.int/iris/Bitstream/10665/44288/1/9789241599375_eng.pdf)
2. Biswas G. Review of Forensic Medicine and Toxicology. 3<sup>rd</sup> Ed 2015.
3. Thube HR, Chikhalkar BG, Nanandkar SD. A Prospective study of injury pattern in victim of assault attended in south mumbai Government Hospital. Journal of Indian Academy of Forensic Medicine. 2015;37(1):37-40.
4. Shruthi P, Venkatesh VT, Viswakanth B, Ramesh C, Sujatha PL, Dominic IR. Analysis of fatal road traffic accidents in a metropolitan city of South India. Journal of Indian Academy of Forensic Medicine. 2013;35(4):317-20.
5. Kishore K, Gupta B, Bansal P, Singh R, Rastogi P. Profile of Medico-legal Cases in a Tertiary Care Centre at Greater Noida. IJFMT. 2017 Jan;11(1):167.
6. Rajni S, Bhartiya SK, trauma patients in north India: a descriptive study 2018; 5(11):1901-95.
7. Sharma A, Tellewar S, Gupta B, Singh V, Gurdeep Singh. A One Year Epidemiological Study of Mechanical Injury Cases brought to SIMS Hospital, Western Uttar Pradesh. Indian Journal of Forensic Medicine & Toxicology [Internet]. 2020 Jan. 16 [cited 2022 Feb. 2];14(1):1-4.
8. Kharat RD, Kedare RV. Profile of Medico-Legal Cases in Casualty Department of Rural Medical College, Maharashtra: Retrospective Study of One Year. Indian J Forensic Med Pathol. 2019;12(2):152-55.

9. Malik Y, Chawla R, Sharma G, Malik P, Singh R, Tripathi A. Profile of medico-legal cases in casualty of a rural medical college of Haryana. *Journal of Indian Academy of Forensic Medicine*. 2013;35(4):367-8.
10. Kishore SK, Shetty SS, Bhat VJ. Injury Pattern In 100 Non-Fatal Road Traffic Accident Cases in A Tertiary Care Hospital In Mangalore. *JSIMLA*. Mar 2021; Vol 13(1): 25-28.
11. Singh TK, Kowsil L, Surendar J. A study of pattern of injuries in vehicular accidents. *IJFMT*. 2017 Jan;11(1):235.
12. Jagtap N, Patekar MB. Study on pattern of medicolegal cases in casualty of government medical college Kolhapur Maharashtra. *IP Int J Forensic Med Toxicol Sci* 2021;6(3):75-77.
13. Jha N, Srinivasa DK, Roy G, Jagdish S, Minocha RK. Epidemiological study of road traffic accident cases: A study from South India. *Indian J Community Med*. 2004 Jan 1;29(1):20-4.
14. Shamim M. Pattern of Injuries from Road Traffic Accidents Presented at a Rural Teaching Institution of Karachi. *Indian J Surg*. 2017 Aug;79(4):332-337.
15. Kumar S, Isakkirajan P. Epidemiological study of road traffic accidents and role of alcohol in road traffic accidents. *Indian journal of forensic medicine and toxicology*. 2017 Jan;11(1):77-80.
16. Agnihotri A, Galfat D, Agnihotri D. Incidence and pattern of maxillofacial trauma due to road traffic accidents: a prospective study. *J Maxillofac Oral Surg*. 2014 Jun;13(2):184-8.
17. Singh SK. Road traffic accidents in India: issues and challenges. *Transportation research procedia*. 2017 Jan 1;25:4708-19.
18. Farooqui JM, Chavan KD, Bangal RS, et. al. Pattern of injury in fatal road traffic accidents in a rural area of western Maharashtra, India. *Australas Med J*. 2013;6(9):476-482.
19. Menon A, Pai VK, Rajeev A. Pattern of fatal head injuries due to vehicular accidents in Mangalore. *J Forensic Leg Med*. 2008 Feb;15(2):75-7.
20. Sharma D, Singh US, Mukherjee S. A study on road traffic accidents in Anand-Gujarat. *Health line*. 2011 Jul;2(2):12-5.
21. Singh YN, Das KC. An epidemiological study of road traffic accident victims in medicolegal autopsies. *Journal of Indian Academy of Forensic Medicine*. 2005;27(3):166-9.