STUDY OF ROAD TRAFFIC ACCIDENT CASES REPORTED IN A TERTIARY CARE HOSPITAL IN VINDHYA REGION OF M.P. WITH THE USE OF WHO/CDC INJURY SURVEILLANCE SYSTEM

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ABSTRACT

INTRODUCTION

Accidental trauma in general and road traffic accidents in particular can be rightly termed as "invited disease of modern society". Road traffic accidents are both predictable and preventable. Our aim for this study is to find out various factors leading to road traffic accidents in our area and to find preventive measures for lowering the grave effects of these accidents.

METHODOLOGY

Data had been collected from all patients attending trauma center of our hospital who were injured due to road traffic accident. In accordance with the guidelines of the WHO/CDC Injury Surveillance System, the collected data was divided into two categories "Core data" and "Supplementary data" and analysis of data had been done.

RESULTS

Out of total 2931 patients, total numbers of male patients were 2016(68.8%) and total numbers of female patients were 915(31.2%). The age group of 25-44 years was most affected (44.66%). Nature of injury was fracture of bones in 52.40% of cases and about 16.68% of cases had organ system injury requiring intensive management. More than 50% of the Causalities occurred between 4 P.M. and 11:59 P.M. 59.67% of the road traffic accidents have taken place in rural area. Two Wheelers were the commonest mode of Transport (42%) involved in RTAs. Passengers were the commonest victims (39%) followed by Drivers/Operators of the Vehicle. Other motorized vehicle was the commonest counterpart in 42% of cases. Side on collision was the commonest RTA type.

CONCLUSION

To be effective, policies on injury prevention and safety must be designed to suit the social, political, and economic circumstances found in developing countries. Road safety is best achieved when all the key groups share a culture of road safety. Road traffic injuries require to be intervened immediately and stern steps, which can sustain longer, is the need of time to drastically cut shorts the trauma rate and related disabilities for the betterment of our society.

KEYWORDS

Road Traffic accidents, Road Traffic injury, Road Safety.

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INTRODUCTION: Road Traffic Injuries are the only public health problem where society and decision makers still accept death and disability on a large scale among young people. Road traffic accidents are defined as a collision involving at least one vehicle in motion on a public or private road that results in at least one person being injured or killed.[1] Road traffic fatality is defined as 'any person killed immediately or dying within 30 days as a result of an injury or accident'.[2]

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During 2008, Road Traffic Injuries (RTI) ranked fourth among the leading causes of death in the world.[3] Nearly 1.3 million people die annually and 20 to 50 million people suffer non-fatal injuries.[4] Road traffic injuries are the leading cause of death among young people aged 15-29 years and cost countries 1-3% of the gross domestic product (GDP).[4,5] The United Nations has declared 2011-20 as the decade of action on road safety so that the present rising trend of road accidents stabilizes and is reversed by the year 2020.[6] Hence the goal of the United Nations' Decade of Action for Road Safety 2011-2020 is to save five million lives.

The situation is particularly acute in India with population of more than 1 billion people. India is one of the fastest growing economic powers in the world. This economic growth leads to rapidly increasing number of vehicles sold every year (around 6 million) and one of the highest reported mortality rates from road traffic accidents in the

world.[7] According to the World Health Organization (WHO), road traffic injuries are the sixth leading cause of death in India. According to government report, the total number of road accidents increased marginally from 4,86,476 in 2013 to 4,89,400 in 2014. The total number of persons killed also increased by about 1.5 per cent from 1,37,572 in 2013 to 1,39,671 in 2014. However, road accident injuries have marginally reduced from 4,94,893 in 2013 to 4,93,474 in 2014. An analysis of road accident data of 2014 revealed that on an average about 56 accidents take place and 16 lives are lost every hour in India.[8] It has a greater share of hospitalization, deaths, disabilities and socio-economic losses in the young and middle-aged population.[9] Road traffic injuries also place a huge burden on the health sector in terms of pre-hospital and acute care and rehabilitation.[10] Detailed interpretation is necessary as many studies have found traffic crashes to be under-reported in India by 5% for deaths and more than 50% for serious injuries.[11]

The reduction in the mortality in the developed world has been attributed to various factors like improved road conditions, excellent trauma care facilities, general improvement in the awareness of the people, better and safer vehicles and a strict implementation of the traffic laws and statutory measures.

Department of Orthopaedics and Trauma Centres in Medical Colleges of developing countries like India are overburdened heavily in management of trauma arising due to Road Traffic Accidents. This study aims to establish the value of a trauma Registry where trauma rates can be monitored and concrete data is provided in its time, place and person distribution.

WHO has supported efforts to establish international standard for classifying and coding data on injuries reference of which can be found in:

1. International Statistical Classification of Diseases and Related Health Problems, Tenth revision (ICD-I 0).
2. International Classification of the External Causes of Injury (ICECI).

This is adequate for the purposes of relatively simple and straightforward surveillance systems in developing countries and small communities. We have used this classification system and nomenclature for our study.

Rewa is a growing city of Vindhya region and is crossed by the National Highway No. 7 and National Highway No. 26. It caters to a population of about 16 lakhs. S.S. Medical College and Associated G.M. and S.G.M. Hospitals, Rewa (M.P.) is the highest referral center of the region.

This study is an attempt to relate the causality attributes with the resulting injury pattern of unnatural disease. Inferences drawn from this study may form the basis of recommendations to administrators, legislators, road and traffic planners and health strategists to chalk out preventive protocols for control and reduction of such unnatural illnesses.

MATERIAL AND METHODS:

Study design - Observational study.

Study duration - One and half year.

Data had been collected from all patients attending casualty and trauma center of our hospital who were injured due to road traffic accident. They were interviewed to obtain the information about the circumstances leading to road traffic accident. A pre-tested questionnaire was used for interviewing the patients, either in the casualty or in the wards of our Hospital. Where the condition of the patients did not warrant the interview, the relatives or attendants were interviewed. The medico-legal records and case sheets were referred for collecting additional information and where necessary for cross-checking. Prior to study, Ethical committee approval was taken and confidentiality is maintained in obtaining information related to accident events.

In accordance with the guidelines of the WHO/CDC Injury Surveillance System, the collected data was divided into two categories "Core data" and "Supplementary data". Each of these main categories was further subdivided into "minimum" and "Optional" data. This gives four distinct groups of data or data sets as described below.

1. Core Data:

1a. Core minimum data set (core MDS):

It includes:

1. Something to identify the person injured (probably not their name but a unique number);
2. Age of the injured person;
3. Sex of the injured person;
4. Nature of the injury.

1b. Core optional data set (core ODS):

Optional data includes:

1. Date of injury;
2. Time of injury;
3. Residence of injured person;
4. Severity of injury and
5. Disposition of injured person (e.g. was the injured person treated in hospital and then discharged or admitted to hospital);

2. Supplementary data for traffic injuries:

2a. Supplementary minimum data set (supplementary MDS):

1. Mode of Transport.
2. Road user.

2b. Supplementary optional data set (supplementary ODS):

1. Counterpart.

OBSERVATION: Total number of patients who presented to our trauma center during the study period of one year was 2931.

CORE DATA: Core Minimum Data Set:

Age Group (in years)	Total no. of patients	Percentage (%)	Male	Percentage (%)	Female	Percentage (%)
Less than 5	172	5.86	102	5	70	7.6
5-14	184	6.27	124	6.2	60	6.6
15-19	241	8.22	195	9.7	46	5
20-24	429	14.63	329	16.3	100	11
25-44	1309	44.66	929	46	380	41.5
45-64	495	16.88	280	14	215	23.5
> 64	101	3.44	57	2.8	44	4.8
Total	**2931**	**100**	**2016**	**100**	**915**	**100**

Table 1: Age and sex wise distribution of patients

Out of total 2931 patients, total numbers of male patients were 2016(68.8%) and total numbers of female patients were 915(31.2%). Out of the 2931 cases, 1309[44.66%] belonged to the age group of 25-44 years of which 929 were males.

Nature of injury	No. of Patients	Percentage (%)
Fracture	1536	52.40
Sprain	94	3.20
Open Wound	266	9.07
Bruise/Superficial Injury	182	6.20
Dislocation	206	7.02
Concussion/Organ System Injury	489	16.68
Others	158	5.39
Total	**2931**	**100**

Table 2: Nature of injury

Nature of injury was fracture of bones in 52.40% of cases and about 16.68% of cases had organ system injury requiring intensive management.

Core Optional Data Set:

Time of injury	No. of Patients	Percentage (%)
00:00–03:59am	161	5.49
04:00–07:59am	185	6.31
08:00–11:59am	572	19.51
12:00–03:59pm	478	16.30
04:00–07:59pm	787	26.85
08:00–11:59pm	733	25
Unknown	15	0.51
Total	**2931**	**100**

Table 3: Time of injury

RESIDENCE: Out of the total 2931 road traffic accidents, 59.67% of the road traffic accidents have taken place in rural area.

	No. of Patients	Percentage (%)
No Apparent Injury	79	2.69
Minor (Bruise, Cuts)	228	7.77
Moderate (Fractures, Sutures)	1735	59.2
Severe (Requiring Intensive Management)	889	30.33
Total	**2931**	**100**

Table 4: Severity

	No. of Patients	Percentage (%)
Treated & Discharged	319	10.88
Admitted/RHC	2200	75.05
Died	322	10.98
Others	90	3.07
Total	**2931**	**100**

Table 5: Disposition

Most of the patient required Hospitalization [75.05%]

Supplementary Minimum Data Set:

	No. of Patients	Percentage (%)
Pedestrian	845	28.8
Non-Motorised Vehicle	150	5.11
Motorcycle	1231	42
Car	480	16.4
Pickup van, Jeep Minibus	26	1
Truck	76	2.6
Bus	107	3.7
Train	16	0.5
Total	**2931**	**100**

Table 6: Mode of Transport

Two Wheelers were the commonest mode of Transport [42%] involved in RTAs while pedestrian also formed a significant bulk of patients.

	No. of Patients	Percentage (%)
Pedestrian	845	28.8
Driver/Operator	915	31.2
Passenger	1138	39
Unknown	33	1
Total	**2931**	**100**

Table 7: Road Users

Supplementary Optional Data Set:

Counterpart	No. of Patients	Percentage (%)
Pedestrian	819	28
Non-Motorised Vehicle	161	5.49
Motorized Vehicle	1231	42
Fixed object	116	3.80
Non-Collison	586	19.95
Unknown	18	0.63
Total	**2931**	**100**

Table 8: Counterpart

Additional Data:

Sl. No.	RTA type	Number	Percentage	Frequency of Head Injury		Most Common Bone Involved
				Number	Percentage	
1	Head on	1021	34.84	409	40	Tibia Fibula (TF)
2	Side on	1182	40.33	545	53.33	BBFA, Femur, TF
3	Back on	239	8.13	37	3.63	Tibia Fibula
4	Others	489	16.68	30	3.03	Tibia Fibula
Total		**2931**	**100**	**1022**	**100**	

Table 9: RTA type in Relation to Head Injury and Bone Trauma

Head on and Side on collisions contributed to 75% of the total RTAs and 95% of all head injuries and most of the lower limb injuries. Side on collision was the commonest and was found mostly associated with fracture of lower limb in associated with forearm fracture.

Age Group (in years)	Total no of fractures	Tibia & fibula	Femur	Radius & Ulna	Humerus	Pelvis	Others
Less than 5	36	11	12	5	4	0	4
5-14	73	28	21	10	7	0	7
15-19	90	36	26	13	9	2	4
20-24	166	69	49	19	15	1	13
25-44	870	260	210	180	90	10	120
45-64	206	53	49	30	26	3	45
> 64	95	24	33	12	12	2	12
Total	**1536**	**481**	**400**	**269**	**163**	**18**	**205**

Table 10: Division of Patients with respect to bones commonly involved

DISCUSSION: CORE MINIMUM DATA: Age and Sex: Our observation on age and sex distribution clearly reflects the dominance of males over females in general (68.8% male and 31.2% female) and victims of age group of 25-44 years (44.66%) were maximally affected. Out of total 2016 male patients, maximum number of patients (929) belongs to 25-44 yrs age group. Similarly in total 915 female patients, maximum number belongs to same age category. This is in concordance with other studies.[12-15] Some other studies have found more than 60% incidence in age group 25-44 years.[16-18]

According to Pathak et al,[19] The most common age group involved was between 20–30 years followed by 30-40 years. Similar results were found in studies conducted in Delhi by Mehta and in Nepal by Jha.[20-21]

According to Pathak et al[19] the males affected were 5.7 times than that of the number of females. This can be attributed to the fact that in the settings of our country, it is the male that is more involved in outdoor activities. According to a study by Sathiyasekaran BWC, 80% of patients involved in road traffic accidents were males.[22]

Deepak et al[23] also found that out of total 423 RTA cases, 77.3% of the victims were males and the rest 22.7% were females. The highest number of victims 28.8% were from 21-30 years of age group followed by 20.6% in the age group 31-40 years. Same high incidence in males is also reported by other studies.[24-27]

According to latest government report, a very high percentage of road accident victims are in the age group of 15 to 35 years. This group of people account for 53.8 per cent of all persons killed in road accidents during 2014.[8]

Highest incidence in young age group may be attributed to to the fact that this is the age group which ventures out most due to studies or employment. They are more exposed

to socio-economic and cultural stresses. Tendency of over speeding and violation of traffic rules is also more prevalent in this age group. Thus, accidents impacted the most productive age group with devastating consequences for the family and serious economic loss to the community.

Nature of Injury: 52.40% of the patients were having fractures of the bones and about 16.68% of the victims were having organ system injury. 7% of the patients presented with dislocations.

CORE OPTIONAL DATA: Time of Injury: In our present series we found that most of the accidents (>50% of the causalities) occurred between 4PM to 11.59 PM which was probably due to bad light condition, fast and reckless driving, increased traffic load and frustration of tired drivers. Second peak occurred between 8am to 12 noon. It was attributed to the travelling frequency and vehicle use in this region, which is maximum during this time. These hours are the busiest as commuters go to and return from the schools, offices, factories and business place.

Pathak et al[19] found that 43.7% of total cases occurred between 6pm to 10pm, mostly during the earlier half i.e. 6pm-8pm (22.7% of the cases). This can be attributed to relatively lower visibility during this period as well as increase in traffic. Similar findings is also present in other studies.[12,18,20,28-31]

According to government report, During 2014, the time-slot with high rate of road accidents was 15:00 to 18:00 hours and 18:00 to 21:00 hours, accounting for a share of 17.3 per cent (84,436) and 17.0 per cent (83,254) respectively in the total road accidents during 2014.[8]

Residence: 59.67% of the road traffic accidents have taken place in rural area. According to government report, rural areas are more prone to road accidents, accounting for 53.7 per cent of total road accidents during 2014.[8]

Severity: About 59.2% of the patients were having moderate severity, whereas those having organ injury (about 30.33%) required intensive management. More number of moderate and severe injury patients may be because of two reasons– (1) severity of road accident injuries is increasing because of use of more powerful vehicles (2) our hospital is largest referral center in the region so from periphery only severe injuries are referred and minor injuries has been tackled by the local hospital leading to less reported minor injuries in our study.

Sharad et al[12] found that superfi cial injuries like contusion and abrasion occurred in 75% and lacerations occurred in 57.5% of victims. Similar results were seen in a study carried out in Ghaziabad.[32] This is due to the obvious effect of blunt trauma and fall on the roads with a rough surface. Fracture/ dislocation occurred in 40% of victims. Fractures were the most common injuries in studies carried out elsewhere.[15,25] There is general lack of awareness among people regarding first aid treatment. This leads to increased manipulation of the injured limb worsening the nature of fracture.

Disposition: About 75% of the patients required hospitalization. There was a mortality rate of about 11%. This is due to more moderate and severe injuries reported to our hospital.

Odero et al[33] in a global review of RTIs observed that 30%–80% of hospital admissions are due to RTIs. Limited studies in India reveal that 20%–50% of emergency room registrations and 10%–30% of admissions are due to RTIs.[18,22,34-40]

SUPPLEMENTARY MINIMUM DATA: Mode of transport: In the present study, motorized two-wheelers were the most common vehicle (42%). Pedestrians included the next commonest category (28.8%). Motorized two-wheelers clearly outnumbered all modes of travel in this study. Similar findings were revealed in other studies. Pathak et al[19] in their study found that Motorised two-wheeler was the commonest vehicle involved (71.9%) in the accident. Pedestrians included the next commonest category (14.8%). Similar findings were revealed in other studies.[12,14,18,23,41,42]

According to government report, two modes of road transport which accounted for the higher shares in total road accidents were Two Wheelers (27.3 per cent) and Cars, Jeeps &Taxis (22.7 per cent) as reported by the States/UTs during 2014.[8]

The growth of the motor vehicle industry, catchy promotion, increasing purchasing power of people, easy availability of loans and poor public transport systems have possibly contributed to increasing motorization and a changing transportation scenario in India. We tried to peep into the reason as to why these two wheelers were involved in RTAs to such a large extent. We inferred that apart from bad roads on which they are driving, they are also driven recklessly keeping at stake all the rules and regulations of traffic. We are also in opinion that the use of two wheelers has been increased in recent past. Improved technology and reduced cost of two wheelers especially bikes is responsible for increased numbers of bikes in villages. Also as compared to four wheelers these two wheelers are easily accessible to young generation in house and they drive it at a very high speed and risky manners which lead to more accidents.

Road User: Passengers were the commonest victims (39%). Drivers were involved in significant number of cases (31.2%), which could be attributed to dominance of two-wheelers involved in the occurrence of the accident. Amongst the road users in our study pedestrians were found to be affected in 28.8% of cases. Pathak et al[19] and Sharma et al[23] have found more involvement of drivers in their study. Same finding is also present in other studies.[12,15] But it is in contrast to a study carried out in Tanzania by Chalya et al[14] where pedestrians constituted the majority of victims. In a study by Jha et al[18] in Puducherry occupants of vehicles were mainly involved.

There is no footpath at most of the roads in our region so pedestrians are forced to walk on roads. Few zebra crossings are available at some roads. Also peoples are not aware of rules of zebra crossing. Mobile use during walking and crossing the roads is also responsible for increased number of pedestrian injuries.

SUPPLEMENTARY OPTIONAL DATA: Counterpart: Counterpart in about 42% of the cases was another motorized vehicle. About 20% of the cases were as result of non-collision. Pathak et al[19] had found that in 42.3% cases, there was no second vehicle involved i.e. the accident happened due to the skidding of the patient's vehicle, losing of its balance, crashing with a divider/tree, etc.

Additional data: In our study we have found that side on impact is present in 40% of cases and head on collision present in 34% of cases. In the present study majority of the sideways collision was due to blind turnings. It was found that at most turnings the warning sign boards were missing. In all types of injury most common bone is involved is tibia and fibula. Head injury incidence is also more in side on injuries. Forearm fractures are most common in side on injuries. Second common fracture is femur fractures in our study.

In the study conducted by Pathak et al[19] sideways collision was the commonest type (64.76% of collisions). This is similar to the findings of a study carried out by Gunjan et al.[43]

In a study by Pathak et al,[19] among the serious injuries, lower limb fractures were the commonest followed by head injuries which is in concordance with a study carried out in western Maharashtra.[44] Similar findings were revealed in a study carried out by Gichuhi[45] in Nairobi and Gunjan et al[43] in central India. The most severe injuries suffering category was that of "occupants of motorised two-wheelers".

One reason that we could conclude for various types of RTAs was defective road laying and population establishment of our country. It means that our national highways pass through many villages and townships and roads become narrow at these places in addition to increased traffic especially pedestrians. Traffic moving at a high speed on highways suddenly lands up moving through the villages/townships, where schools, bazaars etc. are at full swing especially in the evening hours, giving a fertile land for the human attributes to RTAs to grow and flourish still further.

CONCLUSION: It can be concluded by this study that road traffic accidents has a multifactorial aetiology. There is a need of more research studies on the subject and peoples need to be educated on factors involved in the road accidents. A bibliometric analysis was done to document road traffic injury literature published in low-and middle-income countries, and also to quantify literature on road traffic injuries by countries before and after the World Health Day on Road Safety celebrated in April 2004. India, the second-most populous country in the world, contributed only 0.7% articles on road traffic injuries and had less than one article on road traffic injuries per 1,000 road traffic-related deaths.[46] Only a good collaboration between a efficient pre-hospital system and a trauma care center can provide best care and the best possible outcomes in cases of trauma.[47]

The major human factors that contribute to the potency of road accident causation include drinking, indecisiveness, distraction, fatigue, and confusion. In addition, in most of the cases the drivers are found to be inexperienced, risk takers, impulsive, aggressive, casual and unaware of the road signals. As reported by States/UTs, during 2014, Drivers' fault (78.8 per cent) has been found as the single most important factor responsible for road accidents as against 78.0 per cent during 2013.[8] When factors like poor visibility due to bad light and fog, rains, bad road conditions, absent sign boards, peak hours play a part, drivers need to be extra careful and they should be educated for traffic rules. Strict law for issuing of driving license after proper test should be implemented.

Scientific evidence from high income countries exists for the effectiveness of interventions such as helmet use, avoidance of alcohol drinking,[48] speed control,[49] use of safety belts,[50] proper trauma care, use of sign boards and child safety seats.[51] These measures should be implemented strictly in our country.

The providers and enforcers of road traffic system (vehicle manufacturers, road traffic planners, road safety engineers, police, educators, health professionals and insurers) take responsibility for ensuring that their products and services meet the highest possible standards for road safety. Road users take responsibility by complying with laws, informing themselves, engaging in safe road behaviour and engaging in discussion and debate about road safety issues, whether individually or through NGOs. Responsibility requires accountability and this necessitates ways of measuring performance objectively. A multi-disciplinary approach consisting of education, an efficient pre-hospital trauma care system and definitive trauma care facilities with rehabilitation is required to be put in place if we have to control this ever growing epidemic on the roads.

BIBLIOGRAPHY:

1. WHO. World report on road traffic injury prevention: Summary. Geneva: World Health Organisation. 2004:1e52.
2. Mohan D, Tiwari G, Khayesi M, et al. Road traffic injury prevention: Training manual. Geneva, Delhi: World Health Organization. Indian Institute of Technology; 2006.
3. World Health Organization. Estimates of mortality by causes for WHO member states for the year 2008 summary tables. Geneva: WHO. 2011.
4. United Nations Decade of action for road safety 2011-2020. Available from: http:// www.decadeofaction.org [Last accessed on 2015 Oct 15].
5. World Health Organisation. Road Traffic Injuries Fact Sheet N0 358, March 2013. Available from: http://www.who.int/mediacentre/factsheets/fs358/en/ [Last accessed on 2015 Oct 15].

6. United Nations Decade of action for road safety 2011-2020. Available from: http://www.decadeofaction.org. [Last accessed on 2015 Mar 15].
7. Garg N, Hyder AA. Exploring the relationship between development and road traffic injuries: a case study from India. Eur J Pub Health 2006;16(5):487–91.
8. Transport Research Wing, Ministry of Road Transport and Highways. Road Accidents in India 2014. New Delhi: Ministry of Road Transport and Highways, Government of India; 2015.
9. Ministry of Health and Family Welfare. Integrated Disease Surveillance Project- Project Implementation Plan 2004-2009. New Delhi: Government of India. 2004:1-18.
10. Gururaj G. Road traffic injury prevention in India. Bangalore: National institute of mental health and neuro sciences, 2006;Publication No 56.
11. Gururaj G. Road traffic deaths, injuries and disabilities in India: current scenario. Natl Med J India 2008;21:14–20.
12. Sharad S, Keshav A, Parnnika A. A retrospective study of road traffi c accidents-injury characteristics, management and outcome at Rohilkhand Medical College & Hospital, Bareilly. Inter J Medical Sci Res Prac 2015;2(2):73-76.
13. Ganveer GB, Tiwari RR. Injury pattern among non-fatal road traffi c accident cases: A cross-sectional study in Central India. Indian J Med Sci 2005;59:9-12.
14. Chalya PL, Mabula JB, Dass RM, et al. Injury characteristics and outcome of road traffi c crash victims at Bugando Medical Centre in Northwestern Tanzania. J Trauma Manag Outcomes 2012;6:1.
15. Chauhan A, Ahmed N, Singh JV, et al. Epidemiology of road traffi c injuries in a tertiary care Centre of Lucknow. Indian J Community Health 2014;26:181-6.
16. Chunli C, Huichun W, Xiaohong S. The investigation and analysis of 1000 cases of traffic injury emergency treatment in five cities in China 1991. Proceedings of international conference of traffic safety; New Delhi, India January 1991;27-30.
17. Balogun JA, Abreoje OK. Pattern of road traffic accident cases in a Nigerian University Teaching Hospital between 1987 and 1990. Trop Med Hyg 1992;95(1):23-9.
18. Jha N, Srinivasa DK, Roy G, et al. Epidemiological study of road traffic accident cases: a study from South India. Indian Journal of Community Medicine 2004;29(1):20-24.
19. Pathak SM, Jindal AK, Verma AK, et al. An epidemiological study of road traffic accident cases admitted in a tertiary care hospital. Med J Armed Forces India Jan 2014;70(1):32-5.
20. Mehta SP. An epidemiological study of road traffic accident cases admitted in Safdarjang hospital, New Delhi. Indian J Med Res. 1968;56(4):456-466.
21. Jha N. Road traffic accident cases at BPKIHS, Dharan, Nepal: one year in retrospect. J Nepal Med Assoc. 1997;35:241-244.
22. Sathiyasekaran BWC. Study of the injured and the injury pattern in road traffic accident. Indian J Forensic Sci. 1991;5:63-68.
23. Sharma D, Singh U, Mukherjee S. A study on road traffic accidents in Anand-Gujarat. Journal of indian association of preventive and social medicine 2011; 2(2):12-15.
24. Moshiro C, Heuch I, Astrom AN, et al. Injury morbidity in an urban and rural area in Tanzania: an epidemiological survey. BMC public health 2005;5:11.
25. Ganveer GB, Tiwari RR. Injury pattern among non-fatal road traffic accident cases: a cross-sectional study in central India. Indian J Med Sci. 2005;59(1):9-12.
26. Ghosh PK. Epidemiological study of the victims of vehicular accidents in Delhi. Journal of Indian Medical Association 1992;90(12):309-12.
27. Verghese, Mohan D. Transportation injuries in rural Haryana, North India Proceedings of International Conference on Traffic Safety New Delhi India January 1991;27-30.
28. Kiran ER, Saralaya KM, Vijaya K. A prospective study on road traffic accidents. J Punjab Acad Forensic Med Toxicol. 2004;4:12-16.
29. Pawan BC, Meghna N, Rodrigues D, et al. Understanding some factors associated with road traffic accidents: analysis of data for the year 2003 available from major hospitals in Mangalore. Indian J Prev Soc Med. 2005;36(3):87-93.
30. Ranganthan N, Gupta S, Raju MP. Spatial and temporal characteristics of accidents in a Metropolitan city 1991. Proceedings of International Conference on Traffic Safety New Delhi, India January 1991;27-30.
31. Dsouza C, Rao VV, Kumar A, et al. Epidemiological trends of trauma in tertiary care Centre in Dakshina Kannada district of Karnataka, India. J Clin Diagn Res 2014;8:66-8.
32. Singh R, Bhatnager M, Singh HK, et al. An epidemiological study of victims of road traffi c accidents cases: A study from national capital region (Ghaziabad), India. Indian J Prev Soc Med 2011;42(1):30-4.
33. Odero W, Garner P, Zwi A. Road traffic injuries in developing countries: A comprehensive review of epidemiological studies. Trop Med Int Health 1997;2(5)**:**445–60.
34. Gururaj G, Channabasavanna SM, Das BS, et al. Epidemiology of head injuries—Project report. Bangalore: NIMHANS, KSCST; 1993. Publication no. PR/3/93.
35. Gururaj G, Reddi MN, Aeron Thomas A. Epidemiology of road traffic injuries in Bangalore. In: Proceedings of the 5th world conference on injury prevention and control. New Delhi: Macmillan; 2000.
36. Gururaj G, Shastry KVR, Chandramouli AB, et al. Traumatic brain injury. Bangalore: National Institute of Mental Health and Neuro Sciences; 2005 Publication no. 61.

37. Colohan AR, Alves WM, Gross CR, et al. Head injury mortality in two centers with different emergency medical services and intensive care. J Neurosurg 1989;71(2):202–7.
38. Maheshwari J, Mohan D. Road traffic injuries in Delhi: A hospital based study. J Traffic Med 1989;17(3-4):23–7.
39. Mishra BK, Banerjee AK, Mohan D. Two-wheeler injuries in Delhi, India: A study of crash victims hospitalized in a neuro-surgery ward. Accid Anal Prev 1984;16:407–16.
40. Sidhu DS, Sodi S, Banerjee AK. Mortality profile in trauma victims. J Indian Med Assoc 1993;91(1):16-18.
41. Singh A, Goel A, Shekhar. Epidemiological study of non fatal road traffic accidents in Rohilkhand region. Medico-Legal Update 2011;11(1):4.
42. Chandra Shekar BR, Reddy C. A five-year retrospective statistical analysis of maxillofacial injuries in patients admitted and treated at two hospitals of Mysore city. Indian J Dent Res 2008;19(4):304-8.
43. Gunjan B, Ganveer, Tiwari RR. Injury pattern among non-fatal road traffic accident cases: a cross-sectional study in central India. Ind J Med Sci. 2005;59(1):9-12.
44. Patil SS, Kakade RV, Durgawale PM, et al. Pattern of road traffic injuries: A study from western Maharashtra. Indian J Community Med. 2008;33:56-57.
45. Gihuchi K. Injury pattern among non-fatal road traffic crash victims. East African Orthopaedic J. 2007;1:23-25.
46. Borse NN, Hyder AA. Call for more research on injury from the developing world: Results of a bibliometric analysis. Indian J Med Res 2009;129:321-6.
47. Beuran M, Paun S, Gaspar B, et al. Prehospital trauma care: A clinical review. Chirurgia (Bucur) 2012;107:564-70.
48. Krug E, Silcock D, Ward D, et al. Helmets: A Road Safety Manual for Decision Makers and Practitioners. Geneva: World Health Organisation; 2006.
49. Peden M, Scurfield R, Sleet D, et al. World Report on Road Traffic Injury Prevention. Geneva: World Health Organisation; 2004.
50. Dinh-Zarr TB, Sleet DA, Shults RA, et al. Reviews of evidence regarding interventions to increase the use of safety belts. Am J Prev Med. 2001;21(4):48-65.
51. Zaza S, Sleet DA, Thompson RS, et al. Reviews of evidence regarding interventions to increase use of child safety seats. Am J Prev Med. 2001;21(4):31-47.