



A STUDY TO ASSESS THE FACTORS ASSOCIATED WITH SEVERITY OF ROAD TRAFFIC INJURIES IN THE EMERGENCY MEDICINE DEPARTMENT OF PESIMSR, KUPPAM

JEEDHU RADHAKRISHNAN¹, NARAYAN RAO² & FREEDA DSOZA³

¹Assistant Professor, Department of Emergency Medicine, PESIMR, Kuppam, Andra Pradesh, India

²Professor and HOD, Department of Emergency Medicine, PESIMR, Kuppam, Andra Pradesh, India

³Quality Educator, Department of Quality Management Services, PESIMR, Kuppam, Andra Pradesh, India

ABSTRACT

Objective: To assess the factors associated with severity of road traffic injuries and to compare between the factors and the severity of road traffic injuries.

Method: A prospective study was conducted at PESMIR during the period of 2012-2014. A total 750 confirmed accident cases were considered for the study. The secondary data was collected as per the date and time of accident, age, gender, education, place of accident, type of vehicle involved, victim involved, usage of seat belts or helmets, type of road, animal barricade, driving licence, alcohol influence and Injury Severity Score.

Results: The results showed that male patients contributed to 83.0% of the accident while females were 17% with the mean age between 36 to 38 years respectively. Majority of the patients were below primary school (59.7%). Between the times of accident to the time of arrival to the hospital the mean was 15.52 minutes. With regard to the place of accident, rural area contributed to 85.00%. The 2-wheeler contributed to 42.00% among the type of vehicles with rider contributing to 39.00% under the victim category. Usage of seat belts or helmets was almost nil contributing to 99.60%. Most of the roads were single roads (94.4%). The usage of driving license contributed to only 45.00%. Alcohol consumption in road traffic accidents contributed to 48%. Injury Severity Score showed that 43.00% of the population in the study was critically ill. All the contributed factors were statistically significant ($p < 0.01$) with type of road, area of accident, alcohol influence, age, rider and usage of seatbelts/helmets respectively.

Conclusion: Road traffic injury has emerged as a major public health problem, which can be definitely prevented and controlled by the light of sensitization programme. Efforts need to be made in all areas concerned with road safety, enforcement, education and emerging care, after all road safety is no accident occurs on the epitome

KEYWORDS: Road Traffic Accidents, Injury Severity Score

INTRODUCTION

The Road traffic accidents are a human tragedy. They involve high human suffering and socioeconomic costs in terms of premature deaths, injuries, loss of productivity, and so on.¹ During 2008, Road Traffic Injuries (RTI) ranked fourth among the leading causes of death in the world.² Road traffic injuries are an important cause of morbidity and mortality worldwide, especially in low and middle-income countries and are currently ranked 9th globally among the leading causes of disease burden, in terms of disability adjusted life years (DALYs) lost. The total annual costs of road

crashes to low-income and middle-income countries are estimated to be about US \$ 65 billion, which is more than the total annual amount received in development assistance¹. Nearly 1.3 million people die every year on the world's roads and 20 to 50 million people suffer non-fatal injuries, with many sustaining a disability as a result of their injury.³ 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 In India, the motor vehicle population is growing at a faster rate than the economic and population growth. The surge in motorization coupled with expansion of the road network has brought with it the challenge of addressing adverse factors such as the increase in road accidents.¹ According to the World Health Organization (WHO), road traffic injuries are the sixth leading cause of death in India with a greater share of hospitalization, deaths, disabilities and socio-economic losses in the young and middle-aged population. Road traffic injuries also place a huge burden on the health sector in terms of pre-hospital and acute care and rehabilitation.⁶ During the calendar year 2012, Tamil Nadu has reported the maximum number of road accidents (67,757) accounting for 15.4% of such accidents in the country. Although Maharashtra had the highest number of registered vehicles in the country, the highest number of deaths due to road accidents during the years were reported in Tamil Nadu (11.6%) followed by Uttar Pradesh (10.9%), Andhra Pradesh (10.8%) and Maharashtra (10.0%). The rate of accidental deaths per thousand vehicles was highest in Bihar and West Bengal at 1.9 each followed by Himachal Pradesh (1.8), Andhra Pradesh (1.5) and Jammu and Kashmir (1.5) as compared to 1.0 at the national level. The rate of deaths per 100 cases of road accidents was the highest in Nagaland (133.3), followed by Punjab (75.8) and Mizoram (70.0) as compared to 31.6 at the national level. The deaths in Jammu and Kashmir, Nagaland, Uttar Pradesh and Andhra Pradesh, due to road accidents were reported to be 69.6, 67.5, 53.5 and 51.9% respectively.⁷ World Health Organization (WHO) strategy of 2001 reports that currently road traffic injuries are the leading cause of deaths and injuries, the 10th leading cause of all deaths and 9th leading contributor to the burden of disease worldwide based on disability adjusted life years. The numbers of deaths resulting from road traffic crashes have been projected to reach 8.4 million in the year 2020.⁷ In India, road traffic injuries lead to major cause of mortality and morbidity. As the major chunks of patients are due to road traffic injuries. It was felt as a necessary attempt to know the factors responsible for road traffic injuries. Therefore this study is undertaken to know the factors associated with severity of road traffic injuries. Since ours is the only tertiary level hospital with full fledged department of emergency in the area and catering for all types of emergencies including trauma. A total sample of 750 patients was selected for the study from October 2012 to April 2014 after obtaining an informed consent. The proposed outcome of the study was to know the factors contributing to road traffic accidents and to assess their severity based on Injury Severity Score(ISS).The present study aims to assess the factors associated with severity of road traffic injuries and to compare between the factors and the severity of road traffic injuries.

MATERIALS AND METHODS

A prospective study was conducted at PESMIR during the period of 2012-2014. A total 750 confirmed accident cases were considered for the study. The secondary data was collected as per the Performa-date and time of accident, date and time of arrival to emergency department, age, sex, education, place of accident, type of vehicle involved, victim involved, usage of seat belts or helmets, type of road, animal barricade, driving licence, alcohol influence and Injury Severity Score.

Inclusion Criteria

All the victims of road traffic crash who come/brought to the hospital within 24 hrs of the crash.

Exclusion Criteria

Brought dead patients, who deny consent for the study, refused treatment, injuries caused by other than road traffic injuries and Cases in which reliable history is unavailable.

Ethical approval was obtained from the Ethical committee of hospital. The consent has obtained from the patients/relatives for the study. Detailed history was collected based on the performa. Alcohol use will be assessed based on self report and breath odour, as assessed by the interviewer. Clinical information on injury type and severity was recorded from the medical charts. Additional details were obtained from police and the medical staff when available; injury severity was assessed using the Injury Severity Score (ISS). Each injury sustained was assigned an Abbreviated Injury Score (AIS) and allocated to one of six body regions (head, face, chest, abdomen, extremities and external). Highest AIS from the three more severely injured body regions was squared and summed to produce the ISS. Univariate analysis was employed to test the hypothesis

RESULTS

Table 1: Mean Age Distribution of the Patients Studied

Gender	Mean age ±SD	CI-95%	P-Value
Female	37.99±5.31	30.25-45.58	0.00**
Male	36.16±3.42	28.56-42.13	0.00**

** , Significant at 1% level (p<0.001), ns-non significant

Total 750 confirmed accident cases were included for the study, the mean age of the female patients was 38 and male patients were 36. The male patients comprised 83.1% and female patients were 16.9% respectively. Majority of the patients reached hospital between 15.52 minutes from the place of accident. Age and irrespective of gender were found to be statistically significant (p<0.001).As per the findings rural population is vulnerable and highly probe and met with accident due to alcohol consumption, drug abuse, negligence of driving , rash driving and overrule of legal suits of traffic and it was comprised 85.2% where as urban area accounted 14.80% respectively.

Table 2: Distribution of Patient Accidents Based on Type of Vehicle

Type of Vehicle	Frequency	P-Value
2 + 4 wheeler	48(60.4%)	0.00**
3+4 wheeler	30(4.0%)	0.00**
4+4 wheeler	32(4.30%)	0.00**
2+3 wheeler	34(4.50%)	0.00**
2+2 wheeler	43(5.70%)	0.00**
4 wheeler	145(19.30%)	0.00**
3 wheeler	102(13.60%)	0.00**
9 wheeler	3(4.0%)	0.86 ^{ns}
Total	750(100.0%)	

** , Significant at 1% level (p<0.001), ns-non significant

The results explores that type of vehicles met with accident during the accrual period , as per the study it was constituted two - wheeler 41.70%, four wheeler was 19.3%; three wheeler was 13.60%, 2+4 wheelers was 6.4%; 2+2 wheeler was 5.70%, 2+3 wheelers was 4.50%, 4+4 wheelers was 4.30%,3+4 wheeler was 4.0 % of the accidents occurs

on the road ways .The accident were plausibly changes by the road condition, time and climatic condition. Except nine wheeler vehicle, all the above said vehicle Table 2 were found to be statistically significant with irrespective of age group (p<0.00).

Table 3: Distribution of Victim

Victim	Frequency	P-Value
Driver	94(12.50%)	0.00**
Pillion	79(10.50%)	0.00**
Passenger	188(25.10%)	0.00**
Pedestrian	97(12.90%)	0.00**
Total	750(100.0%)	

**, Significant at 1% level (p<0.001), ns-non significant

From the Table 3 reveals that, the various victims status met by the accidents, total 38.9% were being rider category, 25.1% was passenger group, 12.9% pedestrian group; 12.5% are driver group and 10.5% are pillion group respectively. Among the population 99.6% of the victims were not being used the seat belt/helmet, and only 0.4% were used the seat belt/helmet. Results show that, the majority of the roads are single (94.4%), while on 2.70% constituted to tarry roads 2.90% is with humps. 54.30% had no driving licence. Only 45.7% used the licence. 48% consumed alcohol while driving compared to 52% non alcoholic patients and found to be statistically significant (p<0.01). based on the injury the study comprises 43.1% patients with critical injury score, 40.3% had acquainted minor injury score, moderate constituted nearly about 9.2% and severe constituted was 7.50% respectively presented in Figure (1).

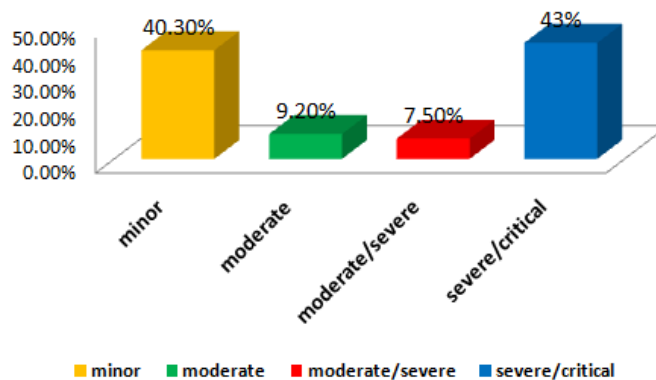


Figure 1: Injury Severity Score (ISS)

Table 4: Comparison of Age versus Injury Severity Score

Age (Years)	Severity				Total
	Minor	Moderate	Mod/Severe	Severe/Critical	
< 18	38	9	6	15	68
19 -30	103	19	19	124	265
31 - 60	126	36	27	165	354
> 60	35	5	4	19	63

Chi-square=24.29, d.f=15, p-value=0.039

Table 5: Comparison between the Type of Vehicle and Injury Severity Score

Type of Vehicle	Severity				Total
	Minor	Moderate	Moderate/ Severe	Severe/ Critical	
2 wheeler	108 (p=0.00)	26(p=0.00)	28(p=0.00)	151(p=0.00)	313(p=0.00**)
2 + 4 wheeler	14(p=0.00)	1(p=0.91)	3(p=0.56)	30(p=0.00)	48(p=0.00**)
3+4 wheeler	17(p=0.00)	5(p=0.66)	1(p=0.98)	7(p=0.52)	30(p=0.00**)
4+4 wheeler	14(p=0.00)	4(p=0.76)	1(p=0.95)	13(p=0.23)	32(p=0.00**)
2+3 wheeler	10(p=0.00)	3(p=0.42)	1(p=0.96)	20(p=0.00)	34(p=0.00**)
2+2 wheeler	21(p=0.00)	1(p=0.93)	3(p=0.68)	18(p=0.00)	43(p=0.00**)
4 wheeler	75(p=0.00)	15(p=0.00)	10(p=0.00)	45(p=0.00)	145(p=0.00**)
3 wheeler	41(p=0.00)	14(p=0.00)	9(p=0.00)	38(p=0.00)	102(p=0.00**)
9 wheeler	2(p=0.86)	0(-)	0	1(-)	3

P value= .000, chi square= 43.87, df =24

Table 6: Comparison between Driving License and Injury Severity Score

Driving License		Severity				Total
		Minor	Moderate	Moderate/ Severe	Severe/Critical	
01	No	161	40	33	173	407
02.	Yes	141	29	23	150	343

P Value= .790, chi square= 1.04, df= 3

DISCUSSIONS

This study was undertaken to identify the various risk factors associated with road traffic accidents and also to check the Injury Severity Score for each patients coming to emergency medicine department with the complaints of road traffic accidents. The age group of the patients in the present study was distributed from 1 year to 80 years. In female patients, the mean age constituted to 37.99 and in male patients it was 36.16. According to the study done by Nilamber J et al in JIPMER²⁷ maximum injuries were in the age group of 20-29 years (31.3%) and 71% of the victims were under 40 years of age. In another hospital based study by Ganveer GB²⁸ majority of the victims were in the age group 18-37 years. One more study reported in NIMHANS by Gururaj G *et al* ¹⁹ highest number of Traumatic Brain Injuries with Road Traffic Injury was in the age group of 21-35 years (43%) with a male to female ratio of 4:1. This finding is in agreement with various studies which have been found that , the most of the victims being the productive age-groups.

One more similar study conducted at Municipal Corporation of Delhi total **25** of the total injuries 69% occurred in the age group of 15 to 35 years and males were four times more affected than females. The study conducted at Government Medical College and Hospital, Chandigarh.270 (33.96%) cases were major victims of age group 21-30 years followed, by age group 31-40 years were 163 (20.50%). Majority of victims involved were males 643 (80.88%) as compared to females 152(19.12%).it is clear from above study that males in the group 20-39 years are more vulnerable for accidents as they are most active group.28.In Karnataka the study was conducted in Bijapur 2007, showed that the maximum no. of victims 30.9% were of age group 20-29 years, both males and females. Age group 20-39 years accounted for 50% of cases, while age group 20-49 years accounted for 2/3rd of the cases. The lowest no. of victims were seen in age group more than 60 years and less than 10 years accounting for 6.34% and 4.16% respectively. Asper the present study findings ,the agreement was made with the above studies. It is evident that the victims are predominantly

from a productive age group with the Road Traffic Injury resulting in a compromise in their quality of life. However, the present study female percentage constituted to 16.9% compared to male patients 83.1%. Lower literacy, lack of awareness, elevated socio demographic index were oftently increased the incidence of accidents on road ways .predominately the present study explored that road condition, alcohol consumption during night time were reported as predictors of the study hypothesis and found to be statistically significant ($p < 0.00$).

CONCLUSIONS

Road traffic accidents are on the rise, globally. The main cause of injuries can be attributed to the man's ever increasing desire to move faster than his two legs can carry him. This attitude reflects his mind and quest for inventing faster and stronger machines as means of communication and transportation. Such machines have brought along with them an increase in the number of road traffic accidents, both in air and on the road. The sensitization programme for rural population could be declined the incidence of road accidents. The government is strictly addressing these issues and reduces the obstacles on undulating roads.

ACKNOWLEDGEMENTS

The author acknowledge the Principal, Medical superintendent of the PESIMR, Kuppam for the constant supports for conducting this research work.

REFERENCES

1. Eric MO ettal, Factors associated with severity of road traffic injuries. The pan African Medical Journal. 2011,p:8-20
2. Mao Y ettal. Factors affecting the severity of motor vehicles traffic crashes. Inj Prev, Sep3 (3):1997. p:183-89
3. Albalate D, Fernandez V. Factors affecting the severity of motor cycle injury. Traffic Inj Prev. Dec11 (6):2010. p:623-31
4. Erica r Casey ettal. Analysis of traumatic injuries presenting to a referral hospital emergency department. International Journal of Emergency Medicine.2012.
5. Alyson Hazen, BS and John E. Ehiri. Road Traffic Injuries: Hidden Epidemic in Less Developed Countries. Journal of the National Medical Association. January 2006. P:73-82
6. Ronan A. Lyons ettal, using multiple datasets to understand trends in serious road traffic casualties. Accident Analysis and Prevention 40(2008)1406-1410
7. Dash DK. India leads world in road deaths: WHO- times of India. Aug 17, 2009.
8. Nantulya VM, Reich MR. The neglected epidemic: road traffic injuries in developing countries. BMJ. May11:2002. p:1139-1141
9. Odero W. Alcohol related road traffic injuries in Kenya. East African Medical Journal. Dec 75(12):1998.p: 708-11
10. Khayesi M, Odero W, Heda PM. Road traffic injuries in Kenya: magnitude, cause and state of prevention. Inj control Safe promotion. Mar-Jun: 10(1-2):2003. P: 53-61.

11. Oginni FO, Ugboke VI, Adewole RA. Knowledge, attitude and practice of Nigerian commercial motorcyclists in the use of crash helmet and other safety measures. *Jun (6): 2009. P:119-127*
12. Mishra R, Sinha ND, Sukhla SK, Sinha AK. Epidemiological study of road traffic accident cases from Western Nepal. *Indian journal of Community Medicine. Jan 35(1):2010.p:115-121*
13. Mogaka EO et al. Factors associated with severity of road traffic injuries. *Pan Afr. Med Journal. Mar(10):2011.p: 8-20*
14. Singh YN, Bairagi K, Das KC. An epidemiological study of road traffic accident victims in medicolegal autopsies. *JIAFM. Mar 27(3):2005. P:971-73*
15. Yau KK. Risk factors affecting the severity of single vehicle traffic accidents in HongKong. *Accid Anal Prev. May36(3):2004.p:333-40*
16. Andrews CN, Lett R. Road traffic accident injuries in Kampala. *East Afr MED Journal. Apr 75(4):1999. P: 189-94*
17. Jess FK, Corinne PA, Dushyanthi V. *Injury control: The Public Health Approach.*
18. Robert BW, Bradley ND, John ML, editors. *Maxcy-Rosenau-Last: Public Health and Preventive Medicine. 14th ed, Stamford (CN): Appleton and Lange; 1998: 1209-1222.*
19. *Road Traffic Accidents in Developing Countries. Report of a WHO meeting. Geneva, Switzerland; 1984. (World Health Organization, TRS 703).*
20. Gururaj G, Kolluri SVR, Chandramouli BA, Subbakrishna DK, Kraus JF. *Traumatic Brain Injury. Publication No. 61. Bangalore 560029, India: National Institute of Mental Health and Neurosciences; 2005: 17-23.*
21. Mohan D. Road safety in less-motorized environment: future concerns. *International J Epidemiol 2002; 31: 527-532.*
22. Whitlock G, Norton R, Clark T, Pledger M, Jackson R, MacMahon S. Motor vehicle driver injury and socioeconomic status: a cohort study and retrospective driver injuries. *J Epidemiol Community Health 2003; 57: 512-516*
23. Ahmed Bayoumi, *The Epidemiology of fatal motor vehicle accidents in Kuwait. Accident Analysis and Prevention Volume 13, (4) 1981 Dec, 339-348. Available online 17 July 2002 available from:*
<http://www.sciencedirect.com/science/journal/00014575>
24. Nilambar Jha, Chandra Shekhar Agrawal. *Epidemiological Study of Road Traffic Accident Cases: A Study from Eastern Nepal. Regional Health Forum, WHO South-East Asia Region 2004; 8 (1): 15-28.*
25. Rastogi R. *A study of accidents in and around Kota city. Indian highways 2006 Apr; 34 (4): 5-16.*
26. Pramod KV, Tewari KN. *Epidemiology of Road Traffic injuries in Delhi: Result of a survey. Regional Health Forum. Delhi. WHO- SEAR 2004; 8 (1): 4-14.*
27. Shrivastava KP, Sinha MK, Lala SK. *Fatal accidents: An analysis of one hundred cases. Journal of Indian*

- Academy of Forensic Sciences, 1978; 17(1): 51-56.
28. Nilamber J, Goutam R, Jagadish S. Epidemiological study of road traffic cases:
 29. A study from south India. *Indian Journal of Community Medicine* 2004 Jan-Mar; XXIX(1): 20-24
 30. Ganveer GB, Tiwari RR. Injury Pattern among non-fatal Road Traffic Accident cases: a cross sectional study in central India. *Indian J Med Sci [serial online]* 2005, [cited 2007 July 27]; 59(1), 9-12. Available from:
<http://www.indianjmed.org/text.asp?2005/59/1/9/13812>
 31. Nayak P, Udit BD, Kumar N. An Autopsy study of thoraco-abdominal trauma in road traffic accident cases. *Journal of Karnataka Association of Medico legal sciences*, 2001; 10.(1): 18-22.
 32. Gururaj G. The effect of alcohol in incidence, pattern, severity and outcome from traumatic brain injury. *J Indian Med Assoc*, 2004 Mar; 102.(3): 157-160.
 33. *International Statistical Classification of Diseases and Related Health Problems 10th revision. 2nd ed.* Geneva, Switzerland. World Health Organization; 2004.
 34. Kallina, Ingo (head of design and safety at Mercedes Benz), Testimony at NTSB Air Bag Public Forum, March 1997.
 35. National Highway Traffic Safety Administration. Special Crash Investigation Report (November 2000)
 36. Abu-Isa, IA, Fleck LL and Jacques CHM, Research Report PO -363, AN 67: Vehicle combustion experiments I. Electrical ignition of interior with windows closed. GMC Research Labs. October 1977.
 37. National Highway Traffic Safety Administration. Fourth report to Congress: Effectiveness of occupant protection systems and their use. May 1999; Washington, D.C.
 38. Chandler CF, Lane JS, and Waxman KS, Seatbelt sign following blunt trauma is associated with increased incidence of abdominal injury. *Am Surgeon*. 1997; 63:885-888.
 39. Williams N and Ratliff, Gastrointestinal disruption and vertebral fracture associated with the use of seat belts. *Ann Royal Coll Surgeons* 1993; 75:129.132.
 40. Hendey GW and Votey SR Injuries in restrained motor vehicle accident victims. *Ann Emerg Med* 1994; 24:77-84.
 41. Sims JK, et al., Automobile accident occupant injuries. *JACEP* 1976; 5:796-808
 42. Peden M, Scurfield R, Sleet D, Mohan D, Hyder AA, Jarawan E, et al. World report on road traffic injury prevention. World Health Organization, Geneva, 2004.
 43. Vehicle Statistics [online] 2008 [accessed on 11th Nov 2008] Available from URL:
<http://www.rto.kar.nic.in/bng-veh-stat.htm>
 44. Traffic Injury Surveillance Programme: A feasibility study. National Institute of Mental Health and Neuro Sciences, Bangalore. Publication No.68, 2008.
 45. G. Gururaj, Head injuries & Helmets: Helmet Legislation and Enforcement in Karnataka and India, National

- Institute of Mental Health & Neuro Sciences, Bangalore 2005.
46. Helmets: a road safety manual for decision-makers and practitioners. Geneva, World Health Organization, 2006
 47. Ulmer RG, Preusser DE. Evaluation of the repeal of motorcycle helmet laws in Kentucky and Louisiana. Washington D.C., National Highway Traffic Safety Administration, 2003 [online] 2003 [accessed on July 3rd 2013] Available from
URL:<http://www.nhtsa.dot.gov/people/injury/pedbimot/motorcycle/kentucky->
 48. Gururaj G. Road traffic Injury Prevention in Bangalore, India. National Institute of Mental Health and Neuro Sciences, Bangalore. Publication No. 56, 2006.
 49. Mohan D. The road ahead: Traffic injuries and fatalities in India. Transportation Research and Injury Prevention Programme. Indian Institute of Technology, Delhi, 2004.
 50. Jason PJ, Roger WB, Tracy SC, Carol H: Encyclopedia of Forensic and legal medicine: Vol 4: p 1-12.
 51. Lau IV, Horsch JD, Viano DC, Andrzejak DV (1993) Mechanism of injury from air bag deployment load. Accident Analysis and Prevention 25: 29-45.
 52. Dussault C eds. Proceedings of the 16th International Conference on Alcohol, Drugs and Traffic Safety, Montreal, 4-9 August 2002. Montreal, Societe de l'assurance automobile du Quebec, 2002: 39-44.
 53. Gururaj G, Benegal V. Final report of the project: Drinking and driving under the Influence of Alcohol, (unpublished report). National Institute of Mental Health and Neuro Sciences, Bangalore, 2003.
 54. Drinking and Driving: A road safety manual for decision makers and practitioners, Geneva, Global Road Safety Partnership, 2007.
 55. Enforcement automation [online] 2012 [accessed on September 10th 2013] Available from URL:
<http://www.bangaloretrafficpolice.gov.in/>
 56. Otto S: Autopsy Diagnosis and Technique: 4th edition: Hoeber-Harper books: 1961.
 57. Mohammad HK, Babar M, Mohammad WK, Ayesha M: frequency of helmet use among motorcycle riders in Rawalpindi: Professional Med J Dec 2007; 14(4): p 663-68.
 58. Aravind K, Sanjeev L, Deepak AM, Rajiv R, Dogra TD: Fatal road traffic accidents and their relationship with head injuries: An epidemiological survey of five years. Ind JNT: 2008, Vol 5: p63-7.
 59. Singh B, Palimar V, Arun M, and Mohanthy MK: profile of trauma related mortality at manipal: Katmandu university medical journal: 2008, vol6, no 3: p393-98.
 60. Timothy MP, Marc S: An analysis of motorcycle helmet use in fatal crashes: NHTSA technical report: 2008: p 1-39.

