



▼ REVIEW ARTICLE

ROAD TRAFFIC ACCIDENTS: A NARRATIVE REVIEW

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ABSTRACT ►

Introduction: Road Traffic Accidents (RTA) are the only public health problem for which society and decision makers still accept death and disability among young people on a large scale. The demographic, epidemiological and economic transition in India has changed the health scenario in a significant way during the last two decades.

Methods: An extensive search of all materials related to the topic was carried out in PubMed, Medline, World Health Organization website and Google Scholar search engines. Relevant documents, reports, research articles focusing on the distribution and determinants of Road Traffic accidents (RTA) published in the period 1994-2014 were included in the review. A total of 87 articles on Road traffic accidents were included in this study.

Results: The distribution and multiple determinants of RTA were identified, of which non usage of safety measures like helmets and seatbelts and influence of alcohol plays a vital role.

Conclusion: Based on this study it is evident that prevention and control of most of the modifiable factors can bring about a change in the statistics that would ensure our future to be safer.

Key Words: Road Traffic Accidents, Helmet, Seat belts.

INTRODUCTION

Road traffic accidents are the only public health problem for which society and decision makers still accept death and disability among young people on a large scale.¹ The demographic, epidemiological and economic transition in India has changed the health scenario in a significant way during the last two decades. This shift in health problems and priorities has brought the entire spectrum of non-communicable diseases to the forefront of health care delivery system. A steep increase in vehicle and human population traversing the adverse road situations has made road traffic injuries a serious condition. The phenomenal increase in morbidity, mortality, disability and socio-economic impact from injuries in particular, during the past decade has been a matter of increasing concern among professionals and policy makers.² The global burden of disease due to RTI is expected to move from ninth position to third position by 2020. The economic cost of road crashes and injuries is estimated to be 1% of Gross National Product (GNP) in low-income countries, 1.5% in middle income countries and 2% in high-income countries. The global cost is estimated to be US\$ 518 billion per year. Low-income and middle-income countries account for US\$ 65 billion, more than they receive in development assistance.³ The major causes for RTAs in India are, rapid increase in personalized modes of transport, a mixture of slow and fast moving vehicles, lack of road discipline, drunken driving and use of mobile phones while driving.⁴

METHODS

An extensive search of all materials related to the topic was carried out in PubMed, Medline, WHO website and Google Scholar search engines. Relevant documents, reports, research articles focusing on the distribution and determinants of Road Traffic accidents (RTA) published in the period 1994-2014 were included in the review. A total of 87 articles on Road traffic accidents were included in this study.

RESULTS

Global Scenario of Road Traffic Accidents

Odelowo EO et al (1994)⁵ A two-year prospective study on injuries sustained from motor-cycle accidents, (MCA) was conducted by Department of Surgery at the University of Ilorin Teaching Hospital, Ilorin, Nigeria, in 1983 and 1984. It was found that Motor cycle accident patients constituted 10.3% of total 715

road traffic accident patients and also presented 5.7:1 male preponderance. Peak age was 18 to 30 years. Nearly 75% sustained lower extremity, chest and cranio cephalic injuries (6.8%), whereas (5%) died because of motor cycle accidents.

Beyazatas FY et al (1998)⁶ A retrospective study was conducted at the emergency department of the hospital in the Cumhuriyet University, Sivas, to analyze traffic accident cases. The hospital files of cases from the Emergency Department of the Hospital between 01 Jan and 31st Dec 1998, were investigated retrospectively. Of the total cases, most (44.52%) were in the 1-25 years age group, 41% were pedestrians in the accidents, 81.29% of accidents happened within the city. 44.03% occurred in the summer and 39.83% occurred at 12 noon to 6p.m. 44.5% victims reached to the hospital in the first hour. The vehicle type in 60.80% of the cases was automobile, whereas 14.28% of the cases had consumed alcohol. The blunt injuries in head, neck region accounted for 47.50% of which was present in head-neck region. 257 cases (41.45%) were hospitalized. 23 cases (3.71%) died because of road traffic accident.

Last JM et al (1998)⁷ One of the first epidemiological studies to document the effectiveness of an injury prevention strategy demonstrated that helmets decreased head injuries among motorcycle drivers in the military (Cairns 1941: Cairns and Hal Bourne 1943). Cairns and his associates compared head injury incidence between helmeted and unhelmeted riders and were among the first to recognize the importance of studying defined populations using appropriate control groups.

Andrade SM et al (2001)⁸ A study conducted in municipality of Londrina, a medium – sized city of southern Brazil in 1996 to know the characteristics of road traffic accidents that occurred during the first semester on 1996. 3643 were victims of RTAs during the year 1996. Car or small truck collisions were the most common type of accident. The rate of motor cycle related injuries (per 1,000 registered vehicles) was seven times higher than that resulting from cars or small trucks. Fatality rates were higher for motor cyclists who collided with stationery objects (29.4%) and pedestrians who were injured by Lorries and buses (22.2%), in comparison with a mean fatality rate of 1.8%.

Kahoro Pet al (2001)⁹ In a study done on road traffic accident victims at the Nairobi hospital, Nairobi,

by the Department of Human Anatomy, College of Health Sciences, Nairobi. Medical records of randomly selected road trauma patients who presented at the Accident Centre between 1st July 1997 and 31st August 1998 were analyzed. It was found that mean age was 32 years with a peak incidence in 21-30 year age group, where as Males comprised 63.1% of the injured. The predominant category of the road user injured was vehicle occupant (70%), where as pedestrians only constituted 21.3%. Major city road or highways were the commonest scenes of injury (38.3%). Most of the responsible vehicles were small personal cars (5.8%), where as minibuses caused 20% of the injuries

Jirojwong S et al (2002)¹⁰ In a study conducted in provincial hospitals in Chon Buri, Thailand in 1999, information was reviewed from eight non referral and one referral hospital. The majority of the patients of non referral hospitals were males (71.1%), motor cyclists (84.2%), and received ambulatory care (83.9%) young patients had a higher risk of being admitted to the hospital.

Wong E et al (2002)¹¹ Study was conducted by Department of Emergency Medicine, Singapore General Hospital, Singapore, to identify the factors that are contributing for road traffic accident mortality and pattern of injuries over a period of 1 year in 2001. A total of 226 deaths occurred, of which 82.3% victims were males. The median age was 31 years. Blood alcohol was detected in 42 (18.7%) victims. In general head injury was the most common among road traffic victims accounting for (86.7%), followed by thoracic (67.7%) and abdominal (31.4%) injuries. Severe lower extremity trauma was most common among pedestrians and pedal cyclists (20.6% and 11.0%) respectively.

Larson EM et al (2002)¹² A population study conducted by Department of Health and Society, Division of Social Medicine and Public Health Science, Faculty of Health Sciences, Linkoping, Sweden in 2001 to acquire knowledge about prevalence of first aid training and incidence of being a bystander and of the first aid provided at traffic crashes and impact of first aid training on the risks people take in road traffic. A questionnaire was administered to 2800 randomly selected persons aged 18-74 years. The response rate was 67.55. During the previous five years, 39% of the population had received first aid training with higher rate among younger individuals and those with higher education. After training, 30% of the respondents had used their skills and 41% took fewer risk in traffic

, particularly those who were older or had a lower level education. 14% of those with training had been bystanders at a traffic crash and at 20% of the crashes, a bystander had administered first aid, and one third of those who provided such assistance had use of their training.

WHO (2002)¹³ Population based epidemiological surveys are virtually nonexistent due to resource constrains as well as problems of definitions, methodological limitations, period of measurement and interpretation etc. With a 16-18% increase in motorization per annum in many countries of the region, the vehicle fleet will double in five years and triple in eight years. The rate of road traffic injuries in South East Asia is higher than in other parts of the world. Persons injured in road accidents occupied nearly 10-30% of beds in the hospitals.

Whitlock G et al (2003)¹⁴ In a community based cohort study with prospective and retrospective outcomes done in New Zealand, 10,525 adults were studied. Samples were drawn from a multidisciplinary work force and a random sample of urban electoral rolls. Outcome measures were motor vehicle driver injury resulting in admission of the driver to hospital or the driver's death or both, during the period 1988-98; hospitalization and mortality data were obtained by record linkage to national health databases. After adjustment for age and sex, driver injury risk was inversely associated with both occupational status (p for linear trend, 0.001).

Koushki PA et al (2003)¹⁵ In a study conducted by Department of civil Engineering, Kuwait University, Safat, Kuwait, Gulf in Jan 1994, to know the impact of seat belt use on road accident injury and injury type among road accident. It was found that seat belt use had an positive effect in reducing both road traffic fatalities and multiple injuries. The use of seat belts has also affected the nature of the injuries resulting from road traffic accidents. Non-use of belts experienced higher frequencies of head, face abdominal, and limb injuries. User of belts, suffered higher frequencies of neck and chin injuries.

Zhou JH et al (2003)¹⁶ A study was conducted by the Traffic Medicine research Institute of Surgery, Third Military Medical University, Chongqing, China, during the year 1997 and 1998 to know the epidemiological characteristics and preventive methods of road traffic accident. A total of 13121

road traffic crashes with 6201 crashes with casualties were analyzed. The incidence of crashes was higher in May, June and July and on Friday, and Wednesday at 8.00 a.m. – 12.00 noon and 2.00 p.m. – 6.00 p.m. within a day. Casualties were 44.0% in pedestrians and 42.% in passengers of the total casualties. Pedestrians accounted for 59.1% of total deaths and 56.4% of the total severe injuries. People over 60 years old accounted for 24.1% of the total pedestrian casualty. The age of drivers and passengers were mainly between 18-30 years, followed by 31-40 years. The main reasons for these crashes were improper driving 26.1%, inadequate following distance 11.6%, violating driving norms 9.1%, carelessness 6.1%. Head injury was the most common reason for deaths among the road traffic crashes followed by chest and back injury. Violating traffic laws by pedestrian was one of the main reasons for pedestrian casualty.

Saidi HS et al (2003)¹⁷ In a study conducted by the Department of Human Anatomy and Surgery, College of Health sciences, University of Nairobi, Kenyatta National Hospital (KNH) in Nairobi, Kenya from 1st February 1999 to 30th April 1999 revealed that Road injury admissions formed 31% of all injury admissions. The mean age was 30 years, whereas males comprised 86.4% of all patients. The proportion of patients under 20 years of age was 20% with a peak age of 20-29 years. The mean pre hospital time was 2.56 hours and the emergency department disposition time was 3.36 hours, only 17.5% reached their areas of definitive care within 60 minutes.

Olukoga IA et al (2003)¹⁸ A study on the pedestrian casualties and fatalities in road traffic crashes was conducted by Division of Economics, University of Natal, Durban, south Africa in 1999, a South African Municipality, was undertaken using official road traffic accident data. The pedestrians were in the age group of 25 to 44 years and accounted for 39.3% of the casualties and 48.2% of the fatalities. The most vulnerable pedestrians were those between 30 to 34 years old and they accounted for 11.7% of the casualties and 14.6% of the fatalities and those between age group 40 to 44 years accounted for 7.5% of casualties and 10.2% of the fatalities. Out of these cars were involved in 52% of the vehicle pedestrian crashes whereas mini buses and buses which were involved in 3% of vehicle pedestrian crashes and motor cycles were involved in 1% of the vehicle pedestrian crashes. There was no statistically significant difference in the monthly distribution of road traffic crashes.

Kuezhthaler I et al (2003)¹⁹ Study was conducted in Innsbruck University Clinics by the Department of Biological Psychiatry to know alcohol/benzodiazepine use in injured road users, admitted to the Emergency Room of the University Hospital of Trauma surgery in Innsbruck, Austria in 2001. The large majority of patients were drivers (55%), followed by passengers (19.7%), cyclists (12.6%), followed by pedestrians (12.3%) respectively. Blood samples of 269 patients involved in road traffic accidents were analyzed. Alcohol was most commonly found drug in all groups constituting drivers (36.9%), passengers (15.1%), cyclists (29.4%), followed by pedestrians (18.2%). The commonly detected Benzodiazepine was diazepam, benzodiazepine consumption was seen in drivers (8.1%), passengers (5.7%), cyclists (8.8%), followed by pedestrians (3%). As compared to males, females showed lower frequencies of using both alcohol and benzodiazepine. Frequency of alcohol was higher in patients less than 60 years of age.

Seleye FD et al (2003)²⁰ A six year retrospective review of medico legal autopsies at the University of Port Harcourt Teaching Hospital, Port Harcourt, Nigeria in 2001 to highlight pedestrian deaths resulting from RTAs. It was found that cars constituted the commonest cause of pedestrian deaths (51.2%), which was followed by motorcycles (39.5%) and with heavy vehicular deaths contributing to 9.3%. The male to female ratio was 1.5:1. The under 20 years age constituted 32.6%, while the under 30 years constituted 53.5%, involved in accidents. Multiple injuries contributed to 48.8%, followed by head and neck injuries (34.9%).

Montazeri A et al (2004)²¹ Another study conducted to describe road traffic related mortality data in Iran between 1999 and 2000 in Iranian Institute of Health Sciences Research, Tehran, Iran, revealed the following data, a total of 15,482 individuals died from road traffic accidents, most of them were male (79%), mostly aged 40 years or less (65%) and most of them were pedestrians or car occupants (62%). Head injury was most common cause of road traffic related mortality (66%) in males and female of all ages. 57% of deaths occurred before admitting in the hospital. Of the total injuries, head injury was the most common cause of mortality and most of the deaths occurred before admitting to the hospital.

Martin JL et al (2004)²² A study conducted by analysis from both National and police data (2001) and data from the Rhone Medical Road Accident Trauma

Register (1996-2001) to know differences between males and females in traffic accident risk in France in 2001. In France 7,720 people were killed in RTAs in 2001, 75% of which were men, whereas the number of injured people were 153,945 of which 65% were men. Male and female incidence rate was 3.1 for mortality and 1.7 for morbidity. Two wheel motorized vehicle accidents are very specific to males. The fatality rate and severe injuries rate among survivors are higher, Males are more severely injured for all body regions and have more often severe after effects.

Jha N et al (2004)²³ An epidemiological study on road traffic accident cases, conducted by department of Community Medicine and Department of surgery at the SUNSARI District Hospital (SDH), Ineruwa and the B.P. Koirala Institute of Health Sciences (BPKIHS) hospital, Dharan, Eastern Nepal for a period of one year from May 1997 to April 1998. A total of 870 road traffic accident victims were reported during the period. Males are commonly affected accounting for 76.1% than females 23.9%. The highest number of victims were in the age group of 20-29 years accounting for 28.6% followed by (18.9%) in 30-39 years age group. Laborers, constituted the largest group (27.6%), followed by students (24.2%). Almost an equal percentage (23%) of victims were either illiterate or had only primary level of education, whereas victims with higher education were fewer in proportion. A greater number 126 (14.5%) of accident cases were reported in the month of July followed by January. The highest number of accidents occurred on Sundays (30.5%), followed by Fridays (20.0%) respectively. Out of 212 drivers 16.9% drivers were found to have consumed alcohol 2-3 hours prior to accident. Buses (31.4%), trucks (12.3%) and bicycles (11.3%) were the commonest vehicles involved in the RTAs. The common mode of sustaining accidents was by falling down from a moving vehicle.

Komba Deus Damian et al (2006)²⁴ 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.

Indian scenario of Road traffic accidents

Shrivastava KP et al (1978)²⁵ In a study done in Darbhanga Medical college from January 1973 to June

1976, in Darbhanga, it was observed that motor truck was responsible for the maximum number of accidents followed by other vehicles such as buses, cars etc. The male to female ratio was 3:1. The maximum fatalities (28%) were in the age group of 21-30 years and next followed by the age group 1-10 years (23%). The peak period of incidence (25%) was found to be between 8 am to 10 am followed by 6pm to 8pm (15%). The pedestrians (75%) outnumbered the others. Of the 100 cases studies, 50% died of run over and 42% were knocked down by various vehicles and remaining 8% died due to primary impact injuries sustained. Head injury alone was the cause of death in 28% of cases, head injury along with abdominal injury in 18% of cases, thoraco abdominal injuries in 14% and head injury along with thoracic injury in 13% of cases. In 40% of cases the death was instantaneous.

Chirstoper JL et al (1990)²⁶ Deaths due to Road Traffic Injury (RTI) are the commonest cause among all injury deaths, killing 1.4 million people worldwide.⁴⁵ Also 20-50 million persons are left seriously injured due to RTIs annually. In the developing countries 85% of the total global mortality and 90% of the Disability Adjusted Life Years lost are due to RTIs. RTI accounts for 30 to 86% of the trauma admissions to hospitals in low income and middle income countries.⁴³ In addition, traffic injuries in these countries incur an annual loss of \$65 billion to \$100 billion annually. These costs include both loss of income and the burden placed on families to care for their injured relatives. If the current trend continues, RTIs will be the third leading contributor to the global burden of disease by the year 2020.

Nayak P et al (2001)²⁷ In a study done on 331 victims of road traffic accident at KMC Manipal Karnataka in 2001, revealed that the maximum number of victims 23 (26%) were in the age group of 21-30 years, followed by 17 (20%) in 41-50 years age group. Male to Female ratio was 7:1. among the 87 victims, 26 (29.9%) were pedestrians and 61% were occupants in various types of vehicles, of which 33 (37.93%) were two wheelers, 10 (11.4%) were three wheeler occupants, 18 (20.68%) were four wheelers occupants. Two-wheeler are more prone for accidents as compared with three and four wheeler vehicles. Most of chest injuries included contusion and laceration.

Gururaj et al (2004)²⁸ In a multicentre Hospital based study done in Bangalore to examine the association of alcohol in injury occurrence, and its

impact on severity and outcome from TBIs. Subjects were identified from 7 major hospitals in the city of Bangalore, India with data collection undertaken by standardized methods. Alcohol users (n=243) and non-users (n=1310) were compared on various characteristics and injury details. Sixteen percent of the injured patients were intoxicated at the time of hospital registration. While the incidence of road traffic injuries was similar in both the groups, falls were higher in the alcohol user group.

Sharma BR et al (2002)²⁹ In an another study conducted by the Department of Forensic Medicine and Toxicology at Government Medical College and Hospital, Chandigarh, India from 1994 to 2000 to know the various parameters of road traffic fatalities. Out of 1885 autopsies were conducted 795 cases were the victims of road traffic accidents, 270 (33.96%) cases were young adults of age groups 21-30 years were the major victims, followed by age group 31-40 years 163 (20.50%). Where as least number of victims were seen in 0-10 years and more than 60 year were 29 (3.65%) and 33 (4.15%) respectively. Majority of victims were males involved in 642 (80.88%) of deaths, while females involved were 152 (19.12%). 335 (42.14%) victims were pedestrians, followed by two wheeler users 372 (39.15%). Buses were the most common offending vehicles 210 (26.42%), followed by cars 156 (19.62%). 490 (61.63%) of victims died within 24hrs of the accident and head injury was the most common cause of death. A continuing decrease in the rate and a persistent increase in the female fatalities following road traffic accidents were concluded.

Mohan D et al (2002)³⁰ The higher the speed, the shorter the time a driver has to stop and avoid a crash. The higher the speed, the more severe the impact is when a crash occurs. The probability that a crash will result in injury is proportional to the square of the speed; for serious injury, proportional to the cube of the speed; and for fatal injury, proportional to the fourth power of the speed. Vulnerable road users, outside motor vehicles, are at especially high risk of injury from speeding motor vehicles. The probability of a pedestrian dying as a result of a car crash increases exponentially as the speed of the car increases. Older pedestrians are more vulnerable than younger ones. The probability that a pedestrian aged 65 years or more will be killed by a car going 75 km/h is more than 60% versus 20% for a pedestrian younger than age 15 years

Mohan D et al (2003)³¹ As per Mohan (2004a), nearly 80% of those killed in Delhi and Mumbai are

vulnerable road users. Collision of heavy vehicles like buses and trucks with these road users results in greater number of severe injuries and deaths. In urban and suburban areas, buses and trucks are involved in higher proportion of fatal crashes with VRUs. Among fatalities during peak hours, 62% of responsible vehicles for crashes were buses or trucks, while those killed were primarily pedestrians, bicyclists or motorcyclists. Even on national highways, pedestrians constitute 30% of fatalities and 65% of all deaths occur among VRUs.

Gururaj G et al (2004)²⁸ As per NCRB report (2002), 63% of deaths occurred in 16-44 years with children and elderly constituting 8.6% and 7.5% respectively. The male and female rates were 13.0 and 3.0/100,000 respectively. Among men, highest rates of 45% were noticed in 30-59 years. Data from SCD (n=1,049,) reveal that the age group of 25-34 years recorded highest number of RTI deaths (21%), followed by 15-24 years (19%), 35-44 yrs (16%), 45-55 yrs (15%), 60+ yrs (14%) and 5-14 yrs (11%), with a total 71% in 15-54 years. As per MCCD report, 69% of RTI deaths were in the age group of 15-54 years, Children (<15yrs) constituted 7.2% and 15% of motor vehicle deaths in MCCD and SCD reports, while elderly (65+) accounted for 10% and 21%, respectively. Gururaj et al (2004) studied that nearly 60-70% of RTI subjects were in 15-44 years age group. The limited number of population-based studies also indicate that the age groups of 15-44 yrs constitute nearly 2/3 to 3/4 of total RTI patients by Varghese and Mohan. Gururaj and Suryanarayana, studied that Children and elderly have contributed for approximately 10-15% of deaths in these studies.

Verma PK et al (2004)³² in a study of 5412 households covering 30,554 populations in Delhi noticed that two wheelers (46%), pedestrians (25%) and bicyclists (14%) were involved in very high numbers.

Pramod KV et al (2004)³³ (Delhi) In a community based survey in the area of MCD among 30554 population, there were 680 traffic injuries with (IR) 22.3 per 1000 population. Of the total injuries 69% occurred in the age group of 15 to 35 and males were four time more affected than females. The business group had a higher incidence (IR 44.0) followed by the service group (IR 40.1) and the labour group (IR 28.9) The annual incidence was highest among people with sixth to eighth class education level (5.3), followed by graduates (3.6). Limbs (62.2%) were the most affected part followed by head injury (11.2%). Superficial

injuries were the most common (47.4%) followed by fractures (20.7%), crush injuries (14.1%) and concealed injuries (12.41%). 19.3% injuries occurred during recreational activities. Majority of the injured victims (92.4%) were administered treatment within six hours of injury. While 70% availed treatment within one hour of injury. Majority of injured victims took treatment from a nearby private clinic (44.4%) followed by treatment from govt. hospitals (26.8%) and private hospitals (16.0%). Outpatient treatment was required by 47.1%. 5.9% were hospitalized, 9% of patients were critically ill due to injuries, 1.8% had to be operated upon, and 1.3 % had to be admitted to ICU. Most of the victims resumed work within 2-4 days of injury (19.3%), followed by 5-7 days absence from work (14.7%), while 13.4% could not resume normal work for 1-2 months. Injury was more common among two-wheelers used by the victims (46.3%) and among pedestrians. (24.85%).

Gururaj G et al (2004)³⁴ Evening and night time consumption of alcohol was a major risk factor for injuries. Drivers and occupants of motorized two wheeler vehicles, and pedestrians were involved in crashes to a greater extent among alcohol users. Severity of brain injuries (based on Glasgow coma scale), duration of hospital stay, death and post-traumatic disabilities among alcohol users were significantly higher compared with non-users. The external causes of head injuries was predominantly road traffic injuries (64% and 66% in alcohol and non-alcohol groups respectively) Interestingly 22% of the injuries among Alcohol users was due to falls, compared with only 16% of the non alcohol group. The status of the person at the time of road traffic injury in the total series was predominantly motorcycle occupants (42%), pedestrians (20%) and passengers in heavy vehicle (18%). This differed significantly in alcohol users and non-users. Among alcohol users, motorcyclists and pedestrians constituted 54% and 22%, compared with 40% and 19% of non-alcohol group. In the present study, 54% of the two-wheeler occupants (mainly riders) and 22% of the pedestrians were intoxicated at the time of injury along with 6% of heavy vehicle drivers. These groups are at greater risk of brain injury due to their higher exposure and a greater probability of crash.

In India, Non Communicable Diseases (NCDs) such as cancer, cardio-vascular disease, and cerebrovascular disease, chronic respiratory disease, diabetes, and other metabolic diseases, road traffic accidents, etc.

have become the dominant cause of health problems (eight out of 10 adult deaths in urban areas and six out of 10 deaths in rural areas, for example are now due to them in India).³⁵

Dandona R et al (2004)³⁶ Road Traffic Accident (RTA) is one among the top five causes of morbidity and mortality in South-East Asian countries including India.

Nakahara et al (2005)³⁷ The study by Nakahara et al (2005) investigated the temporal distribution of risky behaviors among injured motorcyclists, that is, riding un-helmeted or while intoxicated, and showed how they are associated with risk of fatal injuries. Un-helmeted riding peaked late in the evening and riding while intoxicated peaked around midnight. Both were associated with increased fatality risk after stratification by time of day; the odds ratios were 3.49 (95% CI =1.49-9.36) and 3.01(CI=1.71-5.19), respectively. Un-helmeted driving was prevalent and associated with higher fatality risk among younger drivers, whereas intoxicated was less prevalent among teens but associated with increased among those aged 20-39 years. This study shows that riding un-helmeted or while intoxicated can explain the increased fatality risk at night, suggesting that safety education or enforcements should be targeted at specific age groups and appropriate times”.

Gururaj G et al (2005)² In a recent Cochrane review on the role of Helmets for preventing injury in motor cycle riders based on 53 studies from around the world it was observed the “motorcycle helmets were found to reduce the risk of head injury; from five well conducted studies the risk reduction is estimated to 72% (OR 0.28, 95% CI 0.23-0.35)”. The study confirmed that helmets have no effect on the risk of neck injuries and are protective for facial injuries.

Gururaj G (2008)³⁸ To identify various human, vehicle and environmental factors responsible for causation of RTIs, 1508 RTI persons were interviewed in the casualty with the help of semi structured questionnaire after completion of treatment procedures. The written history was undertaken for factor analysis with classification made in human, vehicle, and road related factors alone, along with their interaction. Nearly 98% of injuries were due to a combination of more than one factor (mean 5±2). The five major human factors responsible for injury were over speeding, overtaking another vehicle in speed, not

wearing helmet, driving under the influence of alcohol and sudden road crossing without observation. The prominent five vehicle factors were poor visibility of vehicles, loss of balance, brake failure, problem with head and tail lights and overloaded vehicles. The predominant environmental/road/system factors were absence of efficient and reliable public transport, poor street lighting conditions, obstacles on existing roads, poorly designed roads and absence of traffic systems. Immediate emergency care was not available for more than half of the patients.

Shah B (2006)³⁹ In India, 11% of deaths due to non-communicable diseases are due to injuries and 78% of injury deaths are due to RTAs. The Indian Council of Medical Research (ICMR) study on "Causes of Death by Verbal Autopsy" has revealed that injury rank among the first five major cause of death in adults. It is the leading cause of mortality for young adults less than 45 years and a major burden of disease across all age group.

WHO (2006)⁴⁰ The Indian road network is the second longest in the world covering more than 3 million kilometers. Eighty eight percent of the road length consists of village and other roads and 12% constitute major district roads. About 85% of the passenger load and 70% of the freight load is being carried on roadways daily. It is estimated that in the year 2004, in India alone, nearly 1, 00,000 people were killed, 1.5 million hospitalized and about 7 million sustained minor injuries due to RTI. A recent review estimates the annual loss in India to be Rs.550 billion every year.

Rostogi (2006)⁴¹ The analysis of accidents based on phases of day indicated that fatal accidents were occurring more during day time (between 06:00 and 17:00 hours) Major injuries were occurring more during evening (between 17:00 and 19:00 hours). Accidents due to physical features of roads like number of lanes and provision of median were also studied. It was noted that more accidents were occurring on a two-lane road without median as compared to two lane roads with median and single lane road taken in order. In case of single lane road the accidents were more due to rough surface whereas in two lane roads it was reverse. Spectrum of vehicles involved in accidents indicate two wheelers were involved in about 36% cases, cars and jeeps in 18%, trucks minibus and tempos followed with 14% each. In case of bus and trucks the fatality rate was 1 out of every 4 and 2 out of every 9 involvements respectively.

Ganveer GB et al (2007)⁴² In a cross-sectional study done in Indira Gandhi Medical College, Nagpur during 1999-2000, 423 non-fatal cases of Road Traffic Accidents reporting at the hospital were studied. Out of the total 423 subjects, 363 were male (85.8%) while only 60 were female subjects (14.2%). Majority of the subjects were in the age group 18-37yrs. Sideways collision was the most common type of accident seen in 269 (63.59%) cases. Two wheelers and LMV were the common vehicles involved in accidents (69.97%) and these accidents were almost equally distributed in both half the day. Fracture of the bones was the common injury afflicted to the victims followed by multiple injuries like blunt injury, abrasions and lacerations. Lower extremity was involved in 192 (45.39%) cases while multiple sites were affected in 114(26.95%) cases.

National Crime Record Bureau⁴³ The distribution of 'Traffic Accidents' in each State/UT/City during the 8 classified time periods (Prahara) of the day. Maximum 'Road Accidents' (63,565) were reported during 3 p.m. to 6 p.m. (16.3%), 62,915 cases during office hour i.e., 9 a.m. to 12 noon (16.1%) and least number (28,387) of these accidents (7.3%) were reported during 12 O'clock to 3 AM in the night.

Patil SS et al (2008)⁴⁴ 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 km.

Ruikar M (2013)⁴⁵ Between 1970 and 2010, the number of accidents increased by 4.4 times with 9.3 times increase in fatalities and 7.5 times increase in the number of persons injured, while there was an increase of 82 times in the number of registered motor vehicles and more than three times increase in the road network.

In India every year RTA accounts for over 1,00,000 deaths, 2 million hospitalization, 7.7 million minor injuries and an estimated loss of 55,000 crores or nearly 3% of the GDP every year. If the present scenario is continued, it is projected that deaths due to RTAs will 1, 85,000 deaths and 3.6million victims will be hospitalized by 2015. The social and psychological suffering of the injured persons is increased and their families and also families with RTA deaths are

phenomenal. It is sad to note that life saved due to advancements in health and health related sector is now being wasted on the roads.⁴⁶

Age Group:

Young drivers and riders are in more risk of crash accidents. Young often tend to be overconfident, less experienced, run with high speed and use of alcohol makes the worse combination of risks. Unnecessary travel and joy ride and choice of less safe travel modes are a habit with adolescents.⁴⁷

Chunli C et al (1991)⁴⁸ The people of the most active and productive age group are involved in RTAs, which adds a serious economic loss to the community. Similar observations were also made by another study.⁴⁹

Nilambar Jha et al (2004)⁵⁰ The study conducted at Pondicherry showed that below and above the age of 20 and 49 years, there was less accident. The reasons may be that children are taken care of by elders and less use of vehicles in the adolescent age group. Lower proportion of RTAs in those aged 60 and above could be due to the generally less mobility of the people.

Ganveer GB et al (2005),⁴² in a hospital based study found that majorities of the victims were in the age group 18 to 37 years and 17.97% cases were aged more than 37 years. The study by Gururaj found that mortality rate among different age groups was: 8.2% (<14 years), 62% (15–44 years), 20% (45–59 years) and 9.2% (>60 years).³⁸

Moshiro et al (2005)⁵¹ A study from Tanzania concludes that the transport related injuries to be much common among adults, 15 years and above.

Ghimamire et al (2009)⁵² showed that injury was common in the age group of 40-49 years (4.6%).

Agarwal et al (2012)⁵³ in study, showed that the fifty nine percent of RTA victims were in age group of 20 to 40 years with mean age was 36.5 years with a range from 3 years to 60 years.

Khare et al (2012)⁵⁴ in a study done at a tertiary hospital from Bhopal shows that the highest number of victims 634 (50%) were from 16 – 30 years of age group. It was followed by 31 – 45 years age group. Age wise mortality among RTA cases was higher in 16-30 years 12(30%) age group followed by 31-45 years (27.5%).

Dandona et al³⁶ had shown that majority of the persons killed in RTA were aged between 16 and 49 years of age, followed by 16 and 29 years of age.

Education

In a study, Agarwal et al⁵³ showed that sixty five percent were educated up to secondary level. Lack of knowledge on road traffic rules resulting either from illiteracy or poor literacy may have been a contributory factor to the causation of RTA.⁵⁵ It was observed that more people with lower levels of education were involved in Road traffic accidents, similar result were also observed by others.^{56,57}

Occupation

A study from Delhi³⁶ showed that students were commonly involved in accidents followed by labourers and other study from south India⁵⁰ had shown that, the labourers constituted the largest group (27.6%) involved in RTA followed by students (24.1%). Joly M F et al,⁵⁷ had shown that more accidents were seen among low socioeconomic group of people. A study by Agarwal et al,⁵³ had shown that out of total injured persons 18% were students and equal numbers were unskilled workers.

Location: Rural and Urban

A study Agarwal et al,⁵³ had shown that 54% of RTA victims belonged to rural habitants. A report from New York⁵⁸ had shown that the overall mortality due to RTA in India in one block (rural area) was 2.8% in the year 1996 and it is expected to be much more in urban areas. In 2012, the total number of accidents that occurred in rural areas was more than that in the urban areas; the former accounting for 53.5 per cent (2,66,231) and the latter accounting for 46.5 per cent (2,31,455) of total accidents. Rural areas had more fatalities (63.4 per cent) than urban areas (36.6 per cent). The number of persons injured was also more in rural areas (59.4 per cent) as compared to urban areas (40.6 per cent).⁵⁹

Socio economic status

In a study in India by Agarwal et al,⁵³ forty nine percent of the victims of accidents had Rs 1001 to Rs 2000 per capita income per month.

Speed of the vehicle

Clark et al,⁶⁰ in a study had found that high speed vehicle is a predisposing factor in 65% of the accidents. The literature available had shown that non usage of speed limits and non usage of indicator lights were the

2 main causes in more than half of total RTAs. A report from India has described how Speeding increases the risk of a crash and the severity of the crash outcome. The risk of causing death or injury in an urban 60km/h speed zone increases rapidly even with relatively small increases in speed. The casualty crash risk at 65km/h is about twice the risk at 60km/h.⁶¹ At 70km/h, the casualty crash risk is more than four times the risk at 60km/h. and at 80 km/h is 32 times. This speed limit was considered in our study. A key issue in speeding-related crashes is that most motorists underestimate the distance needed to stop. A car travelling at 60km/h in dry conditions takes about 38 metres to stop, while a car travelling at 80km/h needs an extra 20 meters.

Time of accident

A study conducted by Ranganathan et al,⁶² had observed that more than 60% of accidents took place in the day time (6AM to 6PM). These times coincide with the period when people are more active and mobile during the day. A study by Ganveer G B et al,⁴² observed that when temporal distribution of the accidents was studied, about 53.19% of the accidents took place in the daytime. This is mainly because of the increased activities on road during daytime such as commercial activities, activities like attending the schools, colleges and offices. In contrast to the findings of this study Singh A et al,⁶³ had shown that most (40.15%) of the RTA's occurred in the evening hours from 6pm to 12 midnight. In a study done in Nagpur when temporal distribution of the accidents were studied it was observed that 53.18% accidents took place in day time⁴²

Type of road

As per report Ministry of Road Transport & Highways Government of India, the total surfaced road length grew from 3, 97,948 km (accounting for 43.5% of the total road length) in 1971 to 20, 36, 063 km (accounting for 49.5 % of the total road length) in 2008 reflecting a more than fivefold increase in surfaced road length. Category wise classification of road length showed that during this period, the length of National Highways (NHs) increased from 23,838 km to 66,754 km – an increase of over 180 % or CAGR of 2.8 %. During the same period, the length of State Highways (SHs) increased from 56,765 km to 1,54,522 km (an increase of over 172 % or Compound Annual Growth Rate (CAGR) of 2.7 %) and the length of other PWD roads increased from 2,76,833 km in 1971 to 8,63,241 km in 2008 (an increase of about 212 % or CAGR of 3.1 %). Various categories of urban roads together expanded in length from 72,120 km to 3, 04,327

km reflecting an increase of over 322% or CAGR of 3.97 %. The highest growth over these 37 years took place in respect of Rural Roads which increased from 3,54,530 km to 24,50,559 km (including 10,61,809 lakh km roads constructed under JRY & PMGSY) registering an increase of nearly 591% and a CAGR of 5.4 %.⁶⁴ Singh A et.al,⁶³ had shown that majority of the accidents took place on main roads (73.8%), followed by near junctions, (14.2%) and cross roads (12%). Majority (84.41%) of the victims responded that the road on which the RTAs took place was tarred, 12.04% of the victims reported that the road was bumpy and 3.88% of them said that the road was wet at the time of injury.

Visibility

Poor visibility due to foggy conditions or smoke of vehicles or dust storms decreases the visibility. At night, driving needs extra precautions as vision is seriously affected by head lights. Pedestrians, cyclists and mixed traffics like bullock carts or camel carts, tractors often get hit by motor vehicles as they do not observe the rules and often these have no lights/indicators.⁴⁷

Type of vehicle

Singh A et al⁶³ had observed that, majority of the victims 41.52% were 2 wheeler occupants. Occupants of HMTV accounted for 9.8% of the victims, 5.8% of victims were cyclists. Pramod et al⁶⁵ had shown that majority of the victims were 2 wheeler users (46.3%) and 24.9% are pedestrians, followed by cycle users (14.1%). The studies by Mehtha et al,⁵⁶ Ghosh et al,⁶⁶, Dhingra et al,⁶⁷ and Balogun et al,⁴⁹ had shown that Motorized two-wheelers and light motor vehicles were the common vehicles involved in road traffic accidents. This could be attributed to the fact that the present study is carried out in an urban area where these types of vehicles are most common. Similar findings were also observed in studies carried out in other cities of the country. Agarwal et al,⁵³ at JIPMER had shown that the maximum number of RTA victims were using two wheeler (68%), followed by 17% were using four wheeler, 10% were using three wheeler and bicycle user only 5%. A study from western Nepal⁶⁸ had shown that occupants of the two wheelers constitute to the majority to be affected in road traffic injuries. The study conducted at Bhopal, Madhya Pradesh⁵⁴ shows that motorized two wheeler occupants were highest in number i.e. 929 (73%) followed by occupants of four wheelers 137 (11%), other hit by heavy vehicle 76 (6%) followed by bullock cart, pedestrians, & bicycle 126 (10%) and also shows that deaths among users of 2 wheeler 26(65%) was higher than users of 4 wheeler

14(35%). As per road safety report NIMHANS,⁶⁹ the Asia/Pacific region has only 16% of world's motor vehicles, but 54% of world population and contributes for 45% of total road deaths.

Light at the place of accident:

Light plays a dominant role in occurrence of the accidents. A study conducted by Pramod et al,⁶⁵ had shown that about 66.2% of the victims revealed that the lighting was adequate at the time of occurrence of RTA while 27.46% and 6.22% of the victims reported absence or inadequacy of lighting at the sight of injury. Majority of the victims were 2 wheeler users (46.3%) and 24.9% are pedestrians, followed by cycle users (14.1%).

Safety measures:

Use of safety belts is picking-up but many drivers and occupants of vehicles do not use seat belts. Seat belt use reduces the impact of accident. Similarly, motorized two-wheelers do not use crash helmets and non use of bicycle helmets adds to the risk of fatal head injuries. The use of light during day time by two-wheeled vehicle reduces the chances of accidents.⁷⁰ In a study by Jha et al,⁵⁰ had shown that, among road traffic victims 29% of two wheeler passengers was wearing helmet when they were injured whereas 71.01% of them did not wear helmet. He also showed that between HMV and LMV users only 13.42% of them used seat belt and rest of them did not use a seat belt. A study by Pramod K V et al,³³ had shown that nearly 80% of the victims did not receive the First aid, strictly showing the lack of emergency medical infrastructure and bus we lose the benefit of managing the person in the golden period. More than 42% of the victims were brought to the hospital after a period of 3 hours which is a significant delay with respect to management of trauma cases, the main reason being the inadequacy of infrastructure. In another study by Agarwal et al,⁵³ had shown that sixty eight percent of the victims were driving at the time of accident. Only 27% were wearing protective equipment (helmet and seat belt).

Cause of accident:

A study by Singh A et al,⁶³ had shown that majority of the victims were injured while crossing the road (70.68%), 18.66% of them were injured while they were walking or riding by the side of the road (footpath). 10.58% of them were injured while they were boarding a vehicle, not using indicator lights, not following speed limits, no proper road signs were most common causes responsible for RTA's. A study from UK⁶⁰ had

shown that 'Negligence of the driver' was recorded as the cause of crash for all road traffic crashes in the police database. No one mention about the driver's behaviour in any newspaper report.

Time gap between injury and reaching hospital:

A study by Sharma et al,⁷¹ had shown that 63 (14.90%) RTA victims reached hospital in less than half an hour and 140 (33.20%) reached in the following half an hour. Observations made by Thomas V et al,⁷² and Singh H(2004) et al⁷³ regarding the time taken to shift patients to road traffic accidents to hospital revealed that 24% reached within half an hour and 57% reached in next one hour. Studies by Patil et al (2008)⁴⁴ and Sharma et al (2011)⁷¹ had shown that fatality rates were 0.8% and 1.65% respectively.

In a study conducted by Khare et al⁵⁴ in a tertiary care hospital shown that, out of total 1268, RTAs 774 (61%) victims reach the hospital less than 30 minutes followed by 370(29%) cases reach the hospital within 30 – 60 minutes & 124 (10%) cases were reach the hospital more than 60 minutes and also it was observed that time factor (To reach hospital) is very crucial for increase the chance of survival among RTA victims, death rate significantly low 2 (5%) among those who reached within 30 minutes in comparison to those who reached above 60 and more minutes 25(62.5%). In a study by Dandona et al³⁶ shown that, the time of death in the police database, all the deaths were recorded as 'spot dead'. According to the newspaper, only half of the victims had died on the spot and data for the time of death for 18% were not available. The data suggest that 30% of the victims died on the way to, or in, the hospital.

As per Trinca et al (1988),⁷⁴ road deaths occur in one of the clearly defined three time periods. The first is within few minutes after crash generally due to injury of vital organs like brain and is estimated that nearly 50% of those who die immediately are due to this major insult. The second peak is generally within 1-2 hours after crash and accounts for nearly 30 – 40% of deaths in highly motorized countries. It is acknowledged that this is much higher in India and other LMICs due to lack of early care (Vargees, 200; Sethi, 2000).^{75,76} Remaining 5-10% of deaths are generally late deaths due to brain death, organ failure and septicemia. Among few Indian studies, Sahadev et al (1995)⁷⁷ in an autopsy study of 177 RTI deaths in New Delhi noticed that 23% were dead on the spot, 13% en route to hospital and 64% during hospital stay.

As per road safety report NIMHANS⁶⁹ four peaks of death at within one hour, 2-3 hours, 24- 48 hours and 2 days - 2 weeks were noticed among deaths. Delayed transport and failure to recognize internal injury were cited as primary reasons. Data from Bangalore city police for 2003 reveal that 38% died at crash site, 14% during transport, and 48% during or after hospital contact (Personal Communication). In an autopsy study from Jammu, Delhi and Chandigarh, 28%, 24% and 23% had died on the spot/brought dead to hospital within one hour of accident.⁷⁷ Dandona et al³⁶ reported from Hyderabad that 53% died at crash site, 9% on the way to hospital, 21% in hospital and 18% later, based on analysis of media reports (as mentioned earlier, only major crashes catch the attention of media).

Alcohol:

Alcohol and driving should never be mixed. Increased use of alcohol and other drugs in drivers expose them to the risk of accidents as the judgment gets impaired and control over vehicles is lost due to the effect of alcohol and other drugs. National maximum legal blood alcohol concentration is 30 mg/100ml.⁷⁰ A study by Sood S et al,⁷⁸ and Ghosh⁶⁶ have shown that the 4.6% and 8% alcohol level was found among RTA victims reported from the Delhi study. The study by Singh A et al,⁶³ had shown that among the victims 18.01% gave a history of having consumed alcohol within 6 hours before the RTA whereas 81.99 % of them have not consumed. In the WHO supported study in Nepal, a much higher (16.9%) drivers were found to consume alcohol 2 to 3 hours prior to accident. 11% of RTIs and 29% of night time crashes linked to alcohol, 17% under alcohol influence, 40% of total crashes at night time and 15% under the influence alcohol. In another study by Agarwal et al,⁵³ showed that about 26% of subjects had the history of alcohol consumption. He also showed that consumption of two or three pegs per day were involved in accidents. Twenty six percent used take alcohol occasionally. A total 15 out of 26 (57.7%) had accident under the influence of liquor.

Severity of the injury:

If death occurs at once or within a week after the accident, it is called fatal accident; if death occurs after a week but within a month, it is called death due to accident or killed in accident and if death occurs after one year it is called sequel of accident for every fatal accident, there are about 10 to 15 serious injuries and about 50 minor injuries.⁷⁹ Another study by Ganveer et al,⁴² had shown that the prevalence of minor injury was 3.5% per month and the prevalence of major injury was 0.7% per year and occurred more among 50 – 59

years age group (1.7%). The commonest place for major injury was at road (53.1%) and service holders were at more risk (1.4%). Varghese (1990),⁷⁵ in a population-based survey, observed that only 11% had sustained injuries of Abbreviated Injury Score (AIS) category 2 or 3 while 87% were in AIS 1 category. Studies at Bangalore (Guru raj et al. 2005; Guru raj et al 2000)^{2,80} revealed that minor, moderate and severe brain injuries (due to RTIs) were recorded in 60% - 65%, 16% - 20% and 15% - 20% of cases as per the Glasgow Coma Scale (GCS) grading. Mortality was higher among those with severe brain injuries. Poly trauma was documented in 1% – 21% of cases. Facial, chest, abdominal and limb injuries were documented in 48%, 3%, 1% and 10% of cases, respectively. Bharti et al. (1993)⁸¹ in Meerut reported that based on the GCS grading, 32% had severe, 25% moderate and 42% minor brain injuries at the time of admission.

Mortality rates were higher among those with severe brain injuries (41%). The study at Chennai by Sathyasekaran (1991)⁸² revealed that among the victims of road accidents, 11% had life-threatening injuries, 11% had serious disabling injuries and 38% had mild disabling injuries. Thirty-eight per cent of injured persons had a serious injury to the head and face region. The study conducted by Ghimire et al,⁵² showed that the prevalence of minor injuries was highest (4.6%) among 40-49 years age group, followed by 4.5% among 0-9 years. But the prevalence of major injuries was the highest (1.7%) among 50-59 years of age group, followed by 30-39 years and 20-29 years age groups, 1.0% and 0.7% respectively.

Injury patterns:

The Global burden of disease study reveals that nearly ¼ sustain brain injuries, 10% suffer from open wounds and ¼ have fracture of long bones.⁸³ Majority of Indian studies have documented greater occurrence of injuries to brain, face and long bones. Bharti P et al (1993)⁸¹ noticed that 42% had poly trauma, while Guru Raj et al (2008 & 2005)^{38,2} noticed poly trauma in nearly 25% of patients. Brain injuries among RTI patients have been documented in 50-60% of patients. However, in neurosurgical settings it has accounted for 1/3 of patients. Facial injuries have also been seen in nearly 40-50% of injured subjects. Long bone injuries, especially lower limb injuries have been noticed to the extent of 14-40% among hospitalized subjects. Fractures have been observed in 18-22% of patients. Injury to chest and abdomen has been comparatively less, seen among 2-10% of injured persons.⁸⁴ Observations from pooled data of RTI study among 3,077 patients from

23 hospitals in Bangalore (Guru Raj et al, 2000)⁸⁰ has shown that head and face, upper and lower limbs are the most commonly injured areas (varies as per road user category). Motorcyclists had more injuries to face and lower limbs, while pedestrians had greater injuries to lower limbs. Sathyasekaran (1991)⁸² noticed that head, thorax and abdomen, upper and lower extremities were damaged in 38%, 7%, 22% and 32% in a study of 1096 trauma patients. It was observed within the same study that 11% had life threatening injuries, 11% had serious disabling and 38% mild disabling injuries. Ganveer et al⁴² from Medical College, Nagpur, reported that fracture of long bones in lower limb was the commonest injury (46%) among RTI patients, apart from multiple injuries (27%) and lacerations. Very few studies have studied severity distribution using standard methods. Minor injuries with Abbreviated Injury Scale (AIS) <3 constituted 35%, 66%, 74% in studies in Delhi and Chennai, respectively. Severe injuries (life threatening) with AIS 4, 5 and 6 accounted for 65%, 10%, 11%, respectively. Jha et al (2003) utilized trauma scale and noticed that 48% were in the score of 8-18 with 1% being >18 (very severe). Two of the studies on brain injuries in 2008 and 2000 at NIMHANS^{38,80} revealed that nearly 60% were mild, 15- 20% moderate and 15-20% serious based on Glasgow Coma Scale. Similarly, Bharti et al (1993)⁸¹ from Meerut noticed that 42% were mild, 25% moderate and 33% severe in nature among head injuries.⁸⁴

Driving experience:

A study by Agarwal et al,⁵³ showed that a total of 39% had 6 to 15 years of driving experience.

Driving License:

The study by Trivedi A and Rawal D⁸⁵ found that 15.7% of the accident victims were driving without a driving license. The reason for not carrying license is probably that people feel it is not necessary to carry the license for short distance and some victims forgot it at home.

Mobile Phone:

Driving with hand held telephones has become a fashion, it is risky and misuse of telephones. It affects the reaction time and maintenance of lane, hence more risk of RTA. In many countries use of hand held mobile phones have been banned.⁴⁷ A study by Bener A et al⁸⁶ reported that 42.3% of the victims had a habit of using mobile phone while driving vehicle. A study by Hassen A et al⁸⁷ found that 42.3% of the victims had habit of using mobile phone while driving vehicle.

CONCLUSION

It is clear from this review that majority of the victims being in the productive age group places an economic burden on the family apart from the physical pain and mental suffering. It is also a loss to the country due to productive days of life lost. Not using safety gears and influence of Alcohol plays a vital role in RTA. Helmet and seat belt use should be a felt need by the two wheeler and four wheeler users. Road traffic accidents are on a rise globally. It has emerged as a major public health problem, which can be prevented and controlled. It places an undue burden on the health care system, which is struggling to cope up with prevailing disease burden of communicable diseases and other non-communicable diseases. Efforts need to be made in all are as concerned with Road safety, be it engineering, enforcement, education and emergency care, after all Road safety is no accident. Based on this study it is evident that prevention and control of most of the modifiable factors can bring about a change in the statistics that would ensure our future to be safer.

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