***International Journal of Biomedical and Advance Research***
ISSN: 2229-3809 (Online); 2455-0558 (Print)
Journal DOI: https://doi.org/10.7439/ijbar
CODEN: IJBABN

**Original Research Article**

# An Autopsy Study of Fatal Road Traffic Accidents (RTA) at Medico legal Centre of a Tertiary Health Care Hospital in South Western Maharashtra: Six Year Retrospective Study

**Sachin Chourasia**[1], Janender Baghel[*2], Ravi Rautji[3], K V Radhakrishna[4], Shivakumar DK[5]

[1]*Assistant Professor, Department of Forensic Medicine, AFMC, Pune, India*
[2]*PG Resident, Department of Forensic Medicine & Toxicology, AFMC, Pune, India*
[3]*Professor & Head of the Department, Department of Forensic Medicine & Toxicology, AFMC, Pune, India*
[4]*Associate Professor, Department of Forensic Medicine & Toxicology, AFMC, Pune, India*
[5]*PG Resident, Department of Forensic Medicine & Toxicology, AFMC, Pune, India*

## Abstract

Every year the lives of approximately 1.35 million people are cut short as a result of road traffic accidents. Road traffic injuries cause considerable economic losses to individuals, their families, and to nations as a whole. In developing countries Road traffic accident (RTA) is a major contributor to unnatural deaths which are preventable. Both human and environmental factors are responsible for it. The present 6 year retrospective study was undertaken to study the profile of RTAs. Out of the 1467 medico-legal autopsies performed during the study period, 263 (17.9%) were due to fatal RTAs. There were 217 (82.5%) males and 46 (17.5%) female fatalities with an overall male and female ratio of 4.72:1 and 21 to 30 years age group showed highest number of victims in both males (28.6%, n=62) and females (26.1%, n=12). The winter season took the maximum toll of road traffic deaths (28.5%, n=75) followed by summer season (26.6%, n=70). Most of the accidents involved two wheelers (78.3%, n=206) and timing for most of the accidents was between 12 PM to 6 PM (29.6%, n=78). Spot death was noted in 26 cases (9.89%) and in most of the cases the survival period was between 2-6 days (18.6%, n=22). The most common mechanism of death was craniocerebral trauma (72.2%, n=190) followed by haemorrhagic shock in 44 cases (88.2%). Road traffic injuries can be prevented. Governments need to take action to address road safety in a holistic manner. This requires involvement from multiple sectors such as transport, police, health, education, and actions that address the safety of roads, vehicles, and road users. This study intends to highlight the magnitude of problem and suggest measures which can help in reducing mortality.

**Keywords:** Autopsy, Road Traffic Accidents (RTA), Cause of Death, Mortality.

***Correspondence Info:**
Dr. Janender Baghel,
PG Resident,
Department of Forensic Medicine & Toxicology,
AFMC, Pune, India

***Article History:**
**Received:** 20/04/2019
**Revised:** 01/05/2019
**Accepted:** 07/05/2019
**DOI:** https://doi.org/10.7439/ijbar.v10i5.5152

**QR Code**

**How to cite:** Chourasia S, Baghel J, Rautji R, Radhakrishna K V, Shivakumar DK. An Autopsy Study of Fatal Road Traffic Accidents (RTA) at Medico legal Centre of a Tertiary Health Care Hospital in South Western Maharashtra: Six Year Retrospective Study. *International Journal of Biomedical and Advance Research* 2019; 10(5): e5152. Doi: 10.7439/ijbar.v10i5.5152
Available from: https://ssjournals.com/index.php/ijbar/article/view/5152



## 1. Introduction

"Accidents" according to WHO are considered to be an unpremeditated event resulting in recognizable damage. The American Safety Council defines it as "Occurrence in a sequence of events which usually produces unintended injury, death or property damage."[1] Road Traffic Accident is any vehicular accident occurring on the roadway i.e. originating on, terminating on, or involving a vehicle partially on the roadway.[2,3] Road traffic accident ranks among the top causes of death in the world and after Ischemic Heart disease it is projected to become the second leading cause in 2020.[4] The World Health Organisation (WHO) states that 1.24 million people die annually on the world's roads in its Global status report on road safety 2013.[5] India accounts for about 10 percent of road accident fatalities worldwide, 85% of all road accident deaths occurring in developing countries, and nearly half in the Asia-Pacific region.[6] The increased rate of fatal road traffic accident worldwide has been attributed to population explosion and increased motorization.[7]

RTA is the public health issue and cost a lot to individuals, families, communities and nations. The estimated cost is around 1-2% of a country's GNP in lower income countries.[8,9] Injuries due to RTA depend upon a number of factors-human, vehicle and environmental factors play vital roles before, during and after a serious RTA. The important factors are human errors, driver fatigue, poor traffic sense, mechanical fault of vehicle, speeding and overtaking, violation of traffic rules, poor road conditions, traffic congestion, road encroachment etc.[10] It has been estimated that by the year 2020 road traffic injuries will rank the 3rd in cause of disability adjusted life years lost (DALYS). The vulnerable groups most affected are pedestrian, elderly, children and cyclists.[11-13] The aim of present study is to describe the distribution of injuries and demographic profile from autopsy cases due to fatal RTA which can be used for development of strategy for prevention of mortality due to RTAs and public education on road safety.

## 2. Material and Methods

The present study is a cross-sectional retrospective study of medico legal autopsies of all fatal cases of Road Traffic Accident brought to the Medico legal Centre of a tertiary healthcare centre of a metropolitan city in South-Western India from January 2012 to December 2017. From that period out of 1467 autopsies, 263 cases of Fatal Road Traffic Accidents were noted in the present study. Necessary permission was taken from the Institutional ethical committee prior to the study. All the medico legal autopsy cases of Road Traffic Accident during the above-mentioned period were included in the study. The decomposed bodies and doubtful RTA cases were excluded from this study. There was a detailed proforma prepared to capture and record the epidemiological data and details of injuries sustained etc. and the observations were thereafter statistically analyzed. Data was collected from Post mortem registers/records, Inquest papers and Post mortem reports. Analysis of the data involved the use of chi-square tests and Poisson regression analysis in order to determine specific trends. Data analysis was performed by using SPSS 10 software. The results were studied using appropriate statistical methods. Microsoft word and excel were used for generating charts and graphs. Extreme care was taken to ensure confidentiality of all data.

## 3. Observation and Results

During the study period from 01 January 2012 to 31 December 2017, total number of medico legal autopsies performed in this medico legal centre of a tertiary care hospital were 1467 out of which number of Road Traffic Accidents (RTA) were 263 (17.9%).

Out of these 237 cases, the numbers of males were 217 (82.5%) and the numbers of females were 46 (17.5%). The male/female ratio was approximately 4.72:1 [Table 1]

**Table 1: Sex wise distribution**

| Sex | No. of cases | Percentage (%) |
|---|---|---|
| Male | 217 | 82.5 |
| Female | 46 | 17.5 |
| Total | 263 | 100 |

The maximum number of RTA fatalities was recorded in the age group of 21-30 years in both in both males (28.6%, n=62) and females (26.1%, n=12) and the minimum no of RTA cases were noted in elderly above 80 years of age in both males (0.46%, n=1) and females (2.17%, n=1). [Table 2]

**Table 2: Age and Sex Distribution Of Cases**

| | Total Male | | Total Female | |
|---|---|---|---|---|
| Age Group (yrs) | No | Percentage | No | Percentage |
| 0 to 10 | 6 | 2.76 | 4 | 8.7 |
| 11 to 20 | 18 | 8.29 | 1 | 2.17 |
| 21 to 30 | 62 | 28.6 | 12 | 26.1 |
| 31 to 40 | 47 | 21.7 | 8 | 17.4 |
| 41 to 50 | 23 | 10.6 | 5 | 10.9 |
| 51 to 60 | 36 | 16.6 | 6 | 13 |
| 61 to 70 | 16 | 7.37 | 8 | 17.4 |
| 71 to 80 | 8 | 3.69 | 1 | 2.17 |
| 81 and above | 1 | 0.46 | 1 | 2.17 |
| **Total** | **217** | 100 | **46** | 100 |

According to seasons, the maximum number of fatal RTA cases occurred in the winter season (28.5%, n=75) followed by summer season (28.5%, n=75) and least number of cases were seen in autumn season (28.5%, n=75). [Table 3]

**Table 3: Seasonal Variation of Cases**

| Season | Total | % Age |
|---|---|---|
| Summer (Jun to Aug) | 70 | 26.616 |
| Autumn (Sept to Nov) | 60 | 22.814 |
| Winter (Dec to Feb) | 75 | 28.517 |
| Spring (Mar to May) | 58 | 22.053 |
| **Total** | **263** | 100 |

According to the type of vehicle involved in the accident the maximum were involving the two wheeler (78.3%, n=206) followed by light motor vehicle (15.9%, n=42) and heavy motor vehicle (5.7%, n=15) [Table 4]

**Table 4: Distribution according to Type of Vehicular Occupants**

| Type of Vehicle | Total | % Age |
|---|---|---|
| Two wheeler | 206 | 78.3 |
| Light motor vehicle (LMV) | 42 | 15.9 |
| Heavy motor vehicle (HMV) | 15 | 5.7 |
| **Total** | **263** | 100 |

The maximum numbers of RTA cases (43.7%, n=115) were reported to occur between 12 noon to 6 PM followed by the period of 6 PM to 12 midnight (29.6%, n=78)) and lowest between 12 midnight to 6 AM (9.1%, n=24). [Table 5]

**Table 5: Diurnal Variation**

| S. No | Time | No. of cases | % Age |
|---|---|---|---|
| 1 | 12 Midnight-6 AM | 24 | 9.1 |
| 2 | 6 AM-12 Noon | 46 | 17.4 |
| 3 | 12 Noon-6 PM | 115 | 43.7 |
| 4 | 6 PM-12 Midnight | 78 | 29.6 |
| | **Total** | **263** | 100 |

In this study Abrasions (29.8%, n=210) and Contusions were found in (23.4%, n=165) number of deaths each, Laceration was found in (21%, n=148) number of cases, while Fractures both of long bones and flat bones was found in (22.9%, n=161) number of deaths. While it was seen that crush injury of head was present in (2.56%, n=18) cases only in two persons crush injury of abdomen was found (0.28%, n=2). [Table 6]

**Table 6: Magnitude of Injuries**

| S. No | Injuries | Male | Female | Total | |
|---|---|---|---|---|---|
| | | | | No | % |
| 1 | Abrasion | 180 | 30 | 210 | 29.8 |
| 2 | Contusion | 145 | 20 | 165 | 23.4 |
| 3 | Laceration | 131 | 17 | 148 | 21 |
| 4 | Fractures | 140 | 21 | 161 | 22.9 |
| 5 | Crush injury head | 17 | 1 | 18 | 2.56 |
| 6 | Crush injury abdomen | 1 | 1 | 2 | 0.28 |

In this study it was also found that lower limbs (23.7%, n=173) and upper limbs (26.5%, n=194) received injuries in maximum number of RTAs; Head & Neck were injured in (21.8%, n=159) cases; Abdomen injured in (12%, n=88) cases, pelvis injured in (6.43%, n=47) and Chest injured in (9.17%, n=67) number of RTA cases respectively. While it was found that spinal injuries were seen in only (0.41%, n=3) deaths due to RTAs. [Table 7]

**Table 7: Parts of the Body Injured**

| S. No. | Body Parts Involved | Male | Female | Total | |
|---|---|---|---|---|---|
| | | | | No | % |
| 1 | Head & Neck | 128 | 31 | 159 | 21.8 |
| 2 | Chest (Thorax) | 53 | 14 | 67 | 9.17 |
| 3 | Abdomen | 69 | 19 | 88 | 12 |
| 4 | Pelvis | 42 | 5 | 47 | 6.43 |
| 5 | Spine | 2 | 1 | 3 | 0.41 |
| 6 | Upper limb | 169 | 25 | 194 | 26.5 |
| 7 | Lower limb | 152 | 21 | 173 | 23.7 |

Following the road traffic accidents, most of the victims (30%, n=79) died in 12-24 hours. While 49 (18.6%) of them died within 2-6 days after the accident, 42 (16%) survived for a periods of more than 7 days, 39 (14.8%) cases died within 2-6 hours, 4 (1.52%) died between 7-24 hours, number of spot death cases were 26 (9.89%) and 24 (9.13%) died within 1 hour of accident. [Table 8]

**Table 8: Periods of Survival of Victims**

| S. No. | Survival Period | Male | Female | Total | |
|---|---|---|---|---|---|
| | | | | No | % |
| 1 | Spot Death | 20 | 6 | 26 | 9.89 |
| 2 | within 1 hour | 20 | 4 | 24 | 9.13 |
| 3 | 12 - 24 hours | 59 | 20 | 79 | 30 |
| 4 | 2 - 6 hours | 29 | 10 | 39 | 14.8 |
| 5 | 7 - 24 hours | 4 | 0 | 4 | 1.52 |
| 6 | 2 - 6 days | 47 | 22 | 49 | 18.6 |
| 7 | 7 days or more | 22 | 20 | 42 | 16 |
| 8 | **Total** | 201 | 82 | 263 | 100 |

The cause of death was opined to be coma as a result of head injury in majority of the cases (72.2%, n=190). Second commonest cause of death was hemorrhagic shock (16.7%, n=44) [Table 9].

**Table 9: Pattern of Cause of Death**

| Cause of Death | Freq | %age |
|---|---|---|
| Craniocerebral | 190 | 72.2 |
| Shock and Haemorrhage | 44 | 16.7 |
| Crush Injury of Skull & Brain | 7 | 2.65 |
| Spinal Injury | 6 | 2.27 |
| Septicamia | 15 | 5.68 |
| Pulmonary Thromboembolism | 1 | 0.38 |
| **Total** | **263** | |

## 4. Discussion

Road traffic accidents are the leading cause of death by injury globally and now make up a significant portion of the worldwide burden of ill-health. A large number of people from all walks of life and of all age groups become victims of this tragedy. According to WHO, Approximately 1.35 million people die each year as a result of road traffic crashes.[14] Road traffic accidents (RTAs) are increasing with rapid pace and presently these are one of the leading causes of death in developing countries like India.

In this study out of a total of 1467 medico legal autopsies over a period of 6 years, 263 cases were due to RTAs. Here number of males outnumbered females. This has been seen by many other studies.[15-23] Reason being males are often exposed to out of the household surroundings for earning that puts them at more risk, therefore explaining the increased males involved in fatal RTA.

The highest road traffic deaths according to age groups were from 21 to 30 years in both in both males (28.6%, n=62) and females (26.1%, n=12). This was mostly similar to other studies.[19-26] Individuals in this age group are found frequently outdoors due to their social, job related, educational and other commitments. Therefore, awareness on road safety should be focused at this age group as they at a higher risk then other age groups.

The maximum number of fatal RTA cases occurred in the winter season (28.5%, n=75) which is similar to other studies.[30-31] Fog and associated low visibility in these months along with beginning of new year celebration when people are in high spirits and hurry might be the reason for more such incidents in this season.

In the present study, main offending vehicle involved in the accidents were two wheeler (78.3%, n=206). It is due to the fact the total numbers of two wheelers outnumber the four wheelers and are popular mode of transport in young generation in the city where this study was conducted. This creates massive traffic management issues in most parts of the city, also leads to traffic rule violations and increase in number of RTAs. However, other studies have noted different findings due to the fact that mode of conveyance is different in different cities as per the infrastructural setup of that city.[31,32]

In the present study, maximum numbers of RTA cases (43.7%, n=115) were reported to occur between 12

noon to 6 PM followed by the period of 6 PM to 12 midnight (29.6%, n=78). This is due to the fact that around this time many office goers in this city which is an IT hub begin their home journey. These findings are similar to many other studies.[3,30]

Abrasions (29.8%, n=210), Contusions (23.4%, n=165), Lacerations (21%, n=148) and Fractures both of long bones and flat bones (22.9%, n=161) were noted in multiple injuries cases due to RTAs. Also, it was found that lower limbs (23.7%, n=173) and upper limbs (26.5%, n=194) received injuries in maximum number of RTAs. These findings were also noted in other similar studies but in different proportions. [3,33] The reason for this variation might be due to the fact that our injuries were predominantly involving the two wheelers which was not the case in other similar studies.

Following the road traffic accidents, most of the victims (30%, n=79) died in 12-24 hours. While 49 (18.6%) of them died within 2-6 days after the accident, 42 (16%) survived for a periods of more than 7 days, 39 (14.8%) cases died within 2-6 hours, 4 (1.52%) died between 7-24 hours, number of spot death cases were 26 (9.89%) and 24 (9.13%) died within 1 hour of accident. These findings were different from what has been seen in other similar studies. [3,31]

Mechanisms of death in majority of the cases (72.2%, n=190) was coma as a result of head injury. Second commonest cause of death was hemorrhagic shock (16.7%, n=44). This is similar to findings of Dipak Kumar Das [3] but different from other studies [17,32,34,35] where haemorrhagic shock due to multiple injuries was the predominant cause. As predominantly the present study involved two wheeler accidents and most of the victims were drivers who were without helmets leading to severe head injury.

## 5. Conclusion & Recommendations

Road traffic crashes cost most countries 3% of their gross domestic product. 93% of the world's fatalities on the roads occur in low- and middle-income countries, even though these countries have approximately 60% of the world's vehicles. The 2030 Agenda for Sustainable Development has set an ambitious target of halving the global number of deaths and injuries from road traffic crashes by 2020. This requires involvement from multiple sectors such as transport, police, health, education, and actions that address the safety of roads, vehicles, and road users. Effective interventions include designing safer infrastructure and incorporating road safety features into land-use and transport planning, improving the safety features of vehicles, improving post-crash care for victims of road crashes, setting and enforcing laws relating to key risks, and raising public awareness. It is thus necessary that studies similar to the present study be undertaken at Medico-Legal centre's across the country to determine the extent of the problem nationally.

## Limitations

Due to record based and its retrospective design in very few cases not all the information pertaining to our study format was available for comparison and compilation.

**Declaration of conflicting interests:**

The authors declare that there is no conflict of interest.

**Funding:** None

**Ethical approval:** Necessary ethical approval was obtained.

## References

[1]. Satyasi Panda & Shaikhkhaja, *et al*. "A study on pattern of Fatal injuries in road traffic accidents in costal belt of Orrisa": *Journal of Indian Academy of Forensic Medicine*: 2009, 31(4): 354-359.

[2]. WHO ICD-10 'International Statistical Classification of Diseases and Related Problem' 10th revision; Volume 1. Geneva: World Health Organization; 891-943.

[3]. Dipak Kumar Das. "Study of Road Traffic Accidental (RTA) Deaths in and around Barpeta District: An Autopsy Based Study". *Journal of Evidence based Medicine and Healthcare*; 2015; 2(22): 3329-3337.

[4]. World Health Organisation. 10 facts on global road safety [Internet]. Available from: http:// www.who.int/features/factfiles/roadsafety/en/. (Cited 2014, May 4)

[5]. National Highway Traffic Safety Administration. Traffic Safety Facts 2007: Motorcycles. National Highway Traffic Safety Administration. Washington DC; Report No: DOT HS 810 990, 2007.

[6]. World Health Day 2004: Road Safety is No Accident. http://www.thinkroadsafety.gov.uk accessed on 2-9-2007.

[7]. Atubi, Augustus .O *et al*, Determinants of Road Traffic Accident Occurrences in Lagos State: Some Lessons for *Nigeria International Journal of Humanities and Social Science* 2012; 2(6) [Special Issue – March 2012]

[8]. Arvind K, Sanjeev L, Deepak A, Ravi R, Dogra TD. Fatal road traffic accidents and their relationship with head injuries: An epidemiological survey of five years. *Indian Journal of Neurotrauma (IJNT)* 2008; 5(2): 63-67.

[9]. Archana K, Sinha US, Kapoor AK, Pathak YK, Susheel S, Aparajita S, Sanju S. An epidemiological study of fatal road traffic accidents in Allahabad region. *IIJFMT* 2005; 3(1).

[10]. Institute of Road Traffic Education, a nongovernmental organization based in New Delhi. http://www.newsindiatimes.com/2002/09/13/med30-poor.html as accessed on 2nd June 2008.

[11]. Nantulya, V.M. and Reich, M.R. The Neglected Epidemic: Road Traffic Injuries in Developing Countries. *BMJ: British Medical Journal,* 2002; 324, 1139. DOI: 10.1136/bmj.324.7346.1139

[12]. MacKenzie, E.J. Epidemiology of Injuries: Current Trends and Future Challenges. *Epidemiologic Reviews*, 1999; 22: 112-119. DOI: 10.1093/oxfordjournals.epirev.a018006

[13]. Lagarde, E. Road Traffic Injury Is an Escalating Burden in Africa and Deserves Proportionate Research Efforts. *PLoS Medicine*, 2007; 4: 170. DOI: 10.1371/journal.pmed.0040170.

[14]. World Health Organisation. Facts on global road safety [Internet]. Available from: http:// www.who.int/features/factfiles/roadsafety/en/.

[15]. Kalougivaki JJVP, Goundar RPS. Retrospective Autopsy Based Study of Fatal Road Traffic Accidents in Fiji. *J Forensic Res* 2014; 5: 243 doi:10.4172/2157-7145.1000243

[16]. Harish D, Sharma BR, Kumar S and Vij K. Analysis of pelvic fractures in fatal vehicular accidents. *JFMT.* 2004; 21(1): 30 -33.

[17]. Biswas G, Verma S K, Sharma JJ and Aggarwal NK. Pattern of road traffic accidents in Northeast Delhi. *JFMT.* 2003; 20(1): 27 - 29.

[18]. Tirpude BH, Naik RS, Anjankar AJ and Khajuria BK. A study of the pattern of cranio – cerebral injuries in road traffic accidents. *JIAFM*. 1998; 20 (1): 9 – 12.

[19]. Kumar A, Lalwani S, Agrawal D, Rautji R, Dogra TD. Fatal road traffic accidents and their relationship with head injuries: An epidemiological survey of five years. *The Indian Journal of Neurotrauma*. 2012; 9(2):156-157. DOI: 10.1016/j.ijnt.2012.10.002.

[20]. Salgado MS, Colombage SM. Analysis of fatalities in road accidents. *Forensic Sci Int* 1988; 36: 91-96.

[21]. Sahdev P, Lacqua MJ, Singh B, Dogra TD. Road traffic fatalities in Delhi: 1994; 26: 377-384.

[22]. Friedman Z, Kugel C, Hiss J, Marganit B, Stein M, *et al*. The Abbreviated Injury Scale. A valuable tool for forensic documentation of trauma. *Am J Forensic Med Pathol* 1996; 17: 233-238.

[23]. Jha N, Agrawal CS. Epidemiological Study of Road Traffic Accident Cases: A Study from Eastern Nepal. Regional Health Forum WHO South-East Asia Region, 2004; 8: 15-22.

[24]. Malhotra C, Singh MM, Garg S, Malhotra R, Dhaon BK, *et al*. Pattern And Severity Of Injuries In Victims Of Road Traffic Crashes Attending A Tertiary Care Hospital Of Delhi *Anil Aggrawal's Internet Journal of Forensic Medicine and Toxicology* 2005; 6: 2

[25]. Meel BL. Trends in fatal motor vehicle accidents in Transkei region of South Africa. *Med Sci Law* 2007; 47: 64-68.

[26]. Wong ZH, Chong CK, Tai BC, Lau G. A review of fatal road traffic accidents in Singapore from 2000 to 2004. *Ann Acad Med Singapore* 2009 38: 594- 596.

[27]. Kumar SB, Tanuj K, Ritesh GM, Shankar MB, Vinod CN, *et al*. Victim Profile and Pattern of Thoraco-Abdominal Injuries ustained in Fatal Road Traffic Accidents. *J Indian Acad Forensic Med* 2012; 34: 17-20.

[28]. Singh YN, Bairagi KK and Das KC. An epidemiological study of road traffic accident victims in medicolegal autopsies. *JIAFM*. 2005; 27(3): 166-169.

[29]. Menon A and Nagesh KR. Pattern of fatal head injuries due to vehicular accidents in Manipal. *JIAFM*. 2005; 27(1): 19 – 22.

[30]. Kachre R V, Kachre VH and Asawa SS. Pattern of vehicular accidents in Pravera region: A rural region of Ahmadnagar district of Maharashtra. *JMFT.* 2003; 20(2): 29 -31.

[31]. Singh H and Dhattarwal SK. Pattern and distribution of injuries in fatal road traffic accidents in Rohtak (Haryana). *JIAFM*. 2004; 26 (1): 20 – 23.

[32]. Singh H, Dhattarwal SK, Mittal S, Aggarwal A, Sharma G and Chawla R. A review of pedestrian traffic fatalities. *JIAFM.* 2007; 29(4): 55 – 57.

[33]. Mehrotra O.N, Crabb DJ. 'The pattern of hand injury sustained in the overturning motor cycle'; *Hand*. 1979 Oct; 11(3): 321-8.

[34]. Kumar PM, Ziya A, Prashant A, Sudhir Y, Rajesh C, *et al*. Fatality Due to Chest Injury in Road Traffic Accident Victims of Varanasi and Adjoining Districts, U.P. *Indmedica Medico*-Legal Update 2006; 6: 3.

[35]. Kool B, Raj N, Wainiqolo I, Kafoa B, McCaig E, *et al*. Hospitalised and fatal head injuries in Viti Levu, Fiji: findings from an island-wide trauma registry (TRIP 4). *Neuroepidemiology* 2012; 38: 179-185.