

Determination of the Mechanism of Causation of Various Types of Injuries Due to Road Traffic Accidents: A Descriptive and Single Center Study

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Abstract

Background: Road traffic injury (RTI) has assumed major public health importance world-wide, and the burden is heavier on the health-care infrastructure of developing countries like India. In India, RTI is the leading cause of trauma related morbidity and mortality. While there are some published epidemiological reports on RTI in the region, studies on the mechanism of causation of road traffic crashes (RTC) are not available. The current study aimed to determine the mechanism of causation of various types of injuries and to submit suggestions to the planners to reduce the incidence of road traffic accidents and to reduce the morbidity and mortality due to it and thereby reducing the economic loss to nation.

Materials and Methods: This descriptive and single center study carried out in the Department of Forensic Medicine, Government Medical College Hospital, Thiruvananthapuram, Kerala from 1st March 2012 to 31st March 2013 was aimed to determine the mechanism of causation of various types of injuries and to submit suggestions to the planners to reduce the incidence of road traffic accidents and to reduce the morbidity and mortality due to it and thereby reducing the economic loss to nation. Study variables under assessment included Occupation of the study participant involved in the crash, hearing impairment, drug intake, alcohol intake, nature of road, road lighting, incidence of rain and road repair work going on. Data collected from this study using the appended proforma were entered in Microsoft Excel and its analysis was carried out in SPSS software version 16.0.

Result: Maximum set (26.86%) of crash victims belonged to business, followed by students (22%). The least number of crash victims belonged to driver profession. Only 1, 54 and 16 crash victims suffered from hearing impairment, or had drug and alcohol intake, respectively. The curve nature of road inflicted the maximum crash (83.71%) among the victims, followed by a road junction (12.86%). No availability of road lightning caused crash in 33.43% of crash victims. Rain was also a causative factor for only 9 cases and road repair work caused crash in only 5 cases.

Conclusion: this paper has elucidated the mechanisms involved in causation of RTIs and submitted the suggestions to the planners to reduce the incidence of road traffic accidents.

Keywords: Crash, Death, India, Road traffic accident.

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Introduction

The World Health Organization (WHO) has attributed this increase to rapid urbanization and motorization and has aptly identified Road Traffic Injury (RTI) as the price humanity must pay for modernization [1]. The cost burden is heavier in developing countries like India where modernization is approached with inappropriate road engineering and poorly implemented injury prevention programs. Governmental agencies, non-governmental set-ups and automobile Industry have given much attention to the accidents that occur in relation to vehicles [2]. Vehicular accidents outdistance any other class in the losses they cause, whether judged by deaths, by the permanent defects that follow, or by temporary disability. If vehicular accidents are primarily a public health problem, then that problem is reasonably to be approached in the scientific manner [2, 3].

Studies on mechanism of causation of RTI are few and far in between [4-6]. In view of this, this descriptive and single-center study carried out in the Government Medical College Hospital, Thiruvananthapuram, Kerala, India from 1st March 2012 to 31st March 2013 was aimed to determine the mechanism of causation of various types of injuries and to submit suggestions to the planners to reduce the incidence of road traffic accidents and to reduce the morbidity and mortality due to it and thereby reducing the economic loss to nation.

Materials and Methods

This descriptive and single-center study was carried out between 1st March 2012 to 31st March 2013 on consecutive 350 road traffic accident cases who were occupants of vehicles. This study carried out in the Department of Forensic Medicine, Government Medical College Hospital, Thiruvananthapuram, Kerala, India from was aimed to determine the mechanism of causation of various types of injuries and to submit suggestions to the planners to reduce the incidence of road traffic accidents and to reduce the morbidity and mortality due to it and thereby reducing the economic loss to nation. A systematic external examination was made and the details were entered in the proforma.

Statistical analysis

Data collected from this study using the appended proforma were entered in Microsoft Excel and its analysis was carried out in SPSS software version 16.0. Descriptive analysis was performed on all patient data (means and standard deviations). The results were tabulated in the form of tables.

Results

This descriptive and single-center study was carried out in the Department of Forensic Medicine, Government Medical College Hospital, Thiruvananthapuram, Kerala from 1st March 2012 to 31st March 2013.

Table 1: Tabulated view of the causative factor of crashes

| Factor | Variables | Frequency | Percentage |
|---------------------------|--------------------|----------------------|------------|
| Occupation | Business | 94 | 26.86 |
| | Driver | 6 | 1.71 |
| | Government servant | 8 | 2.29 |
| | Housewife | 7 | 2.00 |
| | Manual laborer | 24 | 6.86 |
| | Shopkeeper | 69 | 19.71 |
| | Student | 77 | 22.00 |
| Hearing impairment | No | 349 | 99.71 |
| | Yes | 1 | 0.29 |
| Drug intake | No | 296 | 84.57 |
| | Yes | 54 | 15.43 |
| | Mean Duration | 6.79 days (1-20days) | NA |
| Alcohol intake | No | 334 | 95.43 |
| | Yes | 16 | 4.57 |
| | Duration | 6.12 days (2-10days) | 0 |
| Nature of road | Straight | 0 | 0 |
| | Curve | 293 | 83.71 |
| | Junction | 45 | 12.86 |
| | Narrow | 10 | 2.86 |
| Road lightning | No | 117 | 33.43 |
| | Yes | 233 | 66.57 |
| Incidence of Rain | No | 341 | 97.43 |
| | Yes | 9 | 2.57 |
| Road repair work going on | No | 345 | 98.57 |
| | Yes | 5 | 1.43 |

The above table provides tabulated view of the causative factor of crashes among the study population. Our study enlists 8 causative factors for the crashes. These 8 causative factors include Occupation of the study participant involved in the crash, hearing impairment, drug intake, alcohol intake, nature of road, road lighting, incidence of rain and road repair work going on. We consider that there are two major categories for causative factors, which are the personal factor and the environmental factor. Personal factor can include Occupation of the study participant involved in the crash, hearing impairment, drug intake, alcohol intake. Whereas, environmental factor can include nature of

road, road lighting, incidence of rain and road repair work going on.

As evident from the above table, there were 356 cumulative instances in our study where Personal factor was the cause of crash, whereas 595 cumulative instances where environmental factor was the cause of crash.

Among the study variable of occupation, the maximum set (26.86%) of crash victims belonged to business, followed by students (22%). The least number of crash victims belonged to driver profession. Only 1, 54 and 16 crash victims suffered from hearing impairment, or had drug and alcohol intake, respectively. The curve nature of road inflicted the maximum crash (83.71%)

among the victims, followed by a road junction (12.86%). No availability of road lightning caused crash in 33.43% of crash victims. Rain was also a causative factor for only 9 cases and, road repair work caused crash in only 5 cases.

Discussion

India has been identified to carry one of the highest road traffic death rate[7]. The official figures are likely to be higher considering the level of under-reporting in India when compared to developed countries. Around 87% of victims being males and about 56% being active young adults (11-40 years) from this study underscores the economic impact this has on the society. Road crashes have been documented as a cause of poverty. The loss or incapacitation of a bread winner is catastrophic as he is not only responsible to his nuclear family but also the extended family in a typical Indian setting [8]. Previous reports documented similar vulnerable population group with about 50% fatality and 59% disability adjusted life years lost due to RTI [9].

In our study, we recorded that business and student population experienced maximum crashes. This observation was in accordance with study undertaken by Koubenan. In this study, the accident and risk perception was studied by means of three independent variables: the subjects' occupation, driving experience, and accident history [10].

In our study, only one crash victim suffered from hearing impairment. This observation was in agreement with study by Hickson et al, who concluded that older adults with poor hearing have greater difficulty with driving in the presence of distracters than older adults with good hearing [11].

Fifty-four and sixteen crash victims consumed drugs and alcohol in our study. These results were in accordance with a

retrospective cohort study involving large population and conducted in California from 1990 to 2005. This study found elevated risks of motor vehicle accidents mortality across all cohorts of individuals with alcohol- or drug-use disorders [12].

In our study, rain caused crash in 9 cases. A Japanese study by Chung et al on the Tokyo Metropolitan Expressway studied the effect of rain on road traffic accidents. This study found that the average frequency of accidents, during periods of rainfall, was significantly different from the average frequency at other times [13].

The following recommendations are suggested to policy makers to reduce the causation of RTI: 1) Strict regulation and enforcement of speed limit. The governmental traffic resources should be equipped with speed detectors in their patrol cars and our roads must have speed detectors at strategic points with camera facilities. 2) Appropriate road engineering with road signs and conspicuously displayed speed limits to- guide road users. Provision of road shoulders and service lanes will prevent broken down vehicles from being impediments to traffic. 3) Construction of new roads to open new network of roads so as to decongest the major roads. 4) Regular road maintenance to eliminate potholes.

Conclusion

In conclusion, this paper has elucidated the mechanisms involved in causation of RTIs and submitted the suggestions to the planners to reduce the incidence of road traffic accidents.

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References

1. Adeoye PO, Kadri DM, Bello JO, Ofoegbu CK, Abdur-Rahman LO,

- Adekanye AO, Solagberu BA. Host, vehicular and environmental factors responsible for road traffic crashes in a Nigerian city: identifiable issues for road traffic injury control. *The Pan African Medical Journal*. 2014;19.
2. Das A, Gjerde H, Gopalan SS, Normann PT. Alcohol, drugs, and road traffic crashes in India: a systematic review. *Traffic injury prevention*. 2012 Nov 1;13(6):544-53.
 3. Fitzgerald M, Dewan Y, O'Reilly G, Mathew J, McKenna C. India and the management of road crashes: Towards a national trauma system. *Indian J Surg*. 2006 Aug 1;68(4):226-32.
 4. Wangdi C, Gurung MS, Duba T, Wilkinson E, Tun ZM, Tripathy JP. Burden, pattern and causes of road traffic accidents in Bhutan, 2013–2014: a police record review. *International journal of injury control and safety promotion*. 2018 Jan 2;25(1):65-9.
 5. Srinivas Goli S, Siddiqui MZ, Gouda J. Road Traffic Accidents and Injuries in India. *Economic & Political Weekly*. 2018 Apr 7;53(14):52-60.
 6. Dandona R. Making road safety a public health concern for policymakers in India. *National medical journal of India*. 2006 May 1;19(3):126.
 7. Kumar GA, Dilip TR, Dandona L, Dandona R. Burden of out-of-pocket expenditure for road traffic injuries in urban India. *BMC health services research*. 2012 Dec;12(1):1-0.
 8. Reddy GM, Negandhi H, Singh D, Singh AJ. Extent and determinants of cost of road traffic injuries in an Indian city. *Indian journal of medical sciences*. 2009 Dec 1;63(12):549-56.
 9. Garg N, Hyder AA. Road traffic injuries in India: a review of the literature. *Scandinavian journal of public health*. 2006 Jan;34(1):100-9.
 10. Kouabenan DR. Occupation, driving experience, and risk and accident perception. *Journal of Risk Research*. 2002 Jan 1;5(1):49-68.
 11. Hickson L, Wood J, Chaparro A, Lacherez P, Marszalek R. Hearing impairment affects older people's ability to drive in the presence of distracters. *Journal of the American Geriatrics Society*. 2010 Jun;58(6):1097-103.
 12. Callaghan RC, Gatley JM, Veldhuizen S, Lev-Ran S, Mann R, Asbridge M. Alcohol-or drug-use disorders and motor vehicle accident mortality: A retrospective cohort study. *Accident Analysis & Prevention*. 2013 Apr 1; 53:149-55.
 13. Chung E, Ohtani O, Warita H, Kuwahara M, Morita H. Effect of rain on travel demand and traffic accidents. In *Proceedings. 2005 IEEE Intelligent Transportation Systems, 2005*. 2005 Sep 16:1080-1083.