Research Article

Risk factors for road traffic accidents with head injury in Aligarh

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Abstract

Background: Road traffic accidents (RTAs) have become a growing public health and development problem. RTA is the most common cause of head injury in 15–45 years of age group. There are number of host and environmental factors which determine the occurrence of RTAs.

Objective: To study the risk factors related to RTA with head injury and to study the relationship between risk factors and severity of head injury.

Materials and Methods: A hospital-based cross-sectional study was carried out in casualty and neurosurgery ward, JNMCH, AMU, Aligarh. All patients of RTAs with head injury in the age group of 15–45 years who have registered themselves in casualty were included in the study. Purposive sampling was used for patient inclusion in the study. Study period was 1 year from August 2010 to July 2011. Data were analyzed with SPSS 20.0 and χ^2-test was applied to assess the relationship of severity of head injury with risk factors.

Result: Significant deterioration in severity of RTAs was noted whenever road accident took place over inadequate roads or in poor visibility. Vehicles functioning inadequately at the time of accident also led to significant increase in proportion of moderately and severely injured patients. Excessive speed noted in one-fifth of accidents and consumption of alcohol prior to accident also led to significant increase in moderate-to-severe accidents.

Conclusion: Road conditions and poor visibility are identified environmental risk factors for RTAs. Vehicular status along with rising speed and alcohol intoxication are important risk factors.

KEY WORDS: Road traffic accident, head injury, road condition, visibility

Introduction

The category of injuries worldwide is dominated by those incurred in road traffic accidents (RTAs).[1] A RTA results from a combination of factors related to the components of the system comprising road condition, the environment, vehicle condition, and the safety measures used by the road user. Some factors contribute to the occurrence of a collision and are therefore part of crash causation. RTAs are not evenly distributed throughout the network. Road defect directly triggers a crash, where some element of the road environment misleads a road user and thereby creates error.[2] The phenomenon of pedestrians and vehicles not being properly visible is frequently a serious problem, particularly in low-income and middle-income countries.[2] Poor visibility of vehicles, loss of balance, brake failure, problem with head and taillights, and overloaded vehicles are some of the prominent vehicular-related factors which may lead to accidents.[3] The speed of motor vehicles is at the core of the RTA problem. Speed influences both crash risk and crash consequence.[2] Excessive speed contributed in 70% of RTAs in Aligarh.[4] Other factors such as use of alcohol by the road user aggravate the effects of the collision and thus contribute to injury severity. Seat-belt usage is substantially lower in fatal crashes than in normal traffic. Helmet-wearing rates vary from slightly over zero in some low-income countries to almost 100% in places where laws on helmet use are effectively enforced.[2] Wearing a motorcycle helmet correctly can cut the risk of

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death by almost 40%, and the risk of severe injury by 70%.[5] Thus to supplement the previous evidences, to further explore the risk factors contributing to RTAs in and around Aligarh, to help the policy-makers in implementing evidence-based strategies to prevent such accidents in future, this study was planned in high-risk group of 15–45 years of patients who had head injury following RTA. The objectives were to study the risk factors related to RTA with head injury and to study the relationship between risk factors and severity of head injury.

Materials and Methods

This hospital-based cross-sectional study was conducted in casualty and neurosurgery ward of Jawaharlal Nehru Medical College Hospital, Aligarh Muslim University, Aligarh for a period of 1 year from August 2010 to July 2011. Study subjects comprised of all the patients of RTAs with head injury in age group of 15–45 years admitted to this hospital during the study period. The study was undertaken using purposive sampling technique. The criteria were to include all patients of RTAs with head injury in age group of 15–45 years who have registered themselves in casualty and admitted to Jawaharlal Nehru Medical College Hospital. The presence of head injury following RTA was confirmed by residents of neurosurgery unit of hospital who first came in contact with patient. The patients excluded were those who did not give consent to be part of study, who were immediately referred to higher center, or patients brought dead. Ethical clearance was obtained from Jawaharlal Nehru Medical College ethics committee. A pretested and semi-structured proforma modified from WHO Injury surveillance guidelines was used for interview of patients. Informed consent (verbal) was taken from patient or concerned attendants or relatives after they were told the purpose of study and assured that confidentiality would be maintained. Severity of head injury was assessed using Glasgow coma scale (GCS) by the neurosurgery unit. Head injury was classified as mild, moderate, or severe as per GCS score. Environmental risk factors assessed were condition of road, visibility at the time of accident, vehicle status and speed, and consumption of alcohol prior to accident. Patients were also enquired into use of safety measures such as seat belt and helmet at the time of accident. A total of 463 patients were included in the study. Data were analyzed using the SPSS version 20. χ^2-test was used to assess the relationship of severity of head injury with the studied risk factors. Operational definition of RTA used in study was: a collision involving at least one vehicle in motion on a public or private road that results in at least one person being injured or killed.[6,7]

Result

A total of 463 patients were interviewed during the study period. Table 1 shows the distribution of risk factors present at the time of accident. Road condition was inadequate in 283 (61.1%) accidents. Poor or nil visibility was noted in 164 (35.4%) accidents. Vehicle was working inadequately in 105 (27.0%) with regard to functioning of brakes, tyre status, etc. Excessive speed was risk factor in 101 (21.8%) accidents. Of all, 66 (14.3%) patients had influence of alcohol at the time of accident. Of 463 patients interviewed only 8 used car as mode of transport, however, none used seat belt. Of 341 two wheeler road user in this study, only 40 (11.7%) used helmet [Table 1]. With regard to road user, 262 were drivers of which 40 (15.3%) used helmet. In the remaining 79 pillion riders or passengers none used helmet [Table 2].

GCS could not be assessed in 2 out of 463 patients because of overwhelming effect of alcohol. Among the remaining 461 patients, 345 (74.8%) had mild injury, 79 (17.2%) had moderate injury, and 37 (8.0%) had severe injury [Figure 1]. Severity of injury was assessed with regard to different risk factors. Of all the risk factors inadequate road condition, poor or nil visibility, and inadequate functioning of vehicles bore

Table 1: Distribution of environmental/risk factors

Risk factors	Total
Road condition	
Rough (kutchha)	58(12.5%)
Smooth (tarred)	180(38.9%)
Wet (slippery)	39(8.4%)
Rumble strips)	35(7.6%)
Deep side cuts	42(9.1%)
Ditches	109(23.5%)
Total	463(100.0%)
Visibility	
Nil	37(8.0%)
Poor	127(27.4%)
Adequate	299(64.6%)
Total	463(100.0%)
Vehicle status	
Adequate	284(73.0%)
Inadequate	105(27.0%)
Total	389(100.0%)
Speed	
Yes	101(21.8%)
No	362(78.2%)
Total	463(100.0%)
Alcohol	
Yes	66(14.3%)
No	397(85.7%)
Total	463(100.0%)
Helmet used	
Yes	40(11.7%)
No	301(88.3%)
Total	341(100.0%)
Seat belt	
Yes	-
No	8(100.0%)
Total	8(100.0%)

Table 2: Helmet users among two wheeler motorized vehicle

Helmet	Type of road user		Total
	Driver	Passenger	
Yes	40(15.3%)	0(0.0%)	40(11.7%)
No	222(84.7%)	79(100.0%)	301(88.3%)
Total	262(100.0%)	79(100.0%)	341(100.0%)

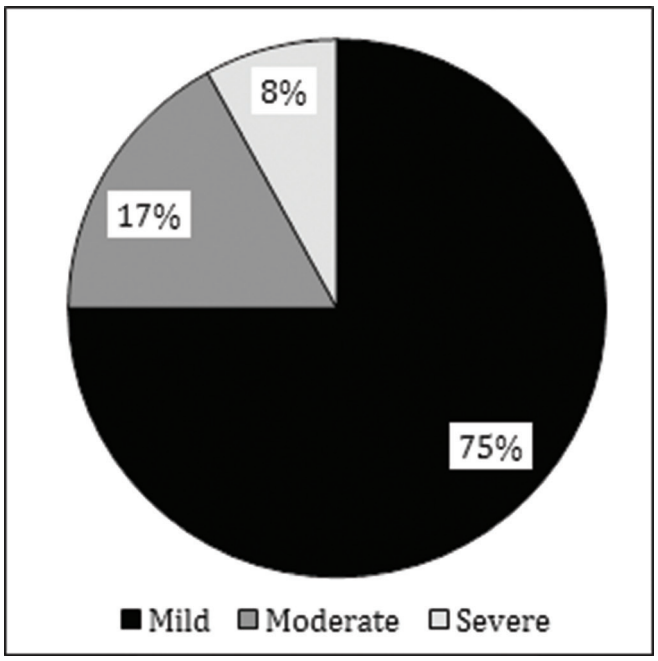

Figure 1: Distribution of severity of head injury

significant relationship with severity of head injury. Accidents occurring in presence of excessive speed and under the influence of alcohol too bore significant relationship with severity of head injury. Fewer patients using helmet had moderate or severe head injury but relationship was insignificant.

Discussion

In this study, 345 (74.8%) patients had mild injury, 79 (17.2%) had moderate, and 37 (8.0%) had severe injury. Road condition was inadequate in 61.1% of all accidents. The study revealed poor visibility condition in 27.4% and nil visibility in 8.0% of all accidents. Of all, 27.0% vehicles were functioning inadequately at the time of accident and led to increase in proportion of moderately and severely injured patients. Excessive speed was noted in 21.8% accidents and it also led to increase in proportion of moderately and severely injured patients. Of all, 66 (14.3%) patients were found to be under the effect of alcohol at the time of accident. None of the car user used seat belt in this study. Helmet was used as a protective device by 11.7% two wheeler users, all being drivers. None of the pillion riders used helmet. All risk factors discussed above with the exception of helmet use were related significantly with the severity of head injury.

Lower number of severe injury cases in this study may be due to adequate road conditions in almost 60% accidents and lesser incidences of excessive speed and alcohol intoxication. Similar injury profile was noted by Jha et al.[8] where mild injury was the most common of three with 51.2%, whereas 48.1% victims had moderate and 0.7% had severe injuries. Agnihotri and Joshi[9] too found mild injury as most common (57%) but the rest (43%) suffered from grievous injury. The cause of higher number of grievous injury needs to be explored. Khan et al.[4] while studying pattern of nonfatal head injury in adult cases in Aligarh found similar pattern of road conditions where road was smooth in 30% events, damaged in 60% and badly damaged in 10%. However, Ackaah and Adonteng in Ghana found 86.6% crashes occurred on road segments which the police described as good.[10] The difference between the two studies show apart from road structure other conditions may also determine RTA. There are roads with inadequate illumination in and around Aligarh and some may not be lit at all. In addition, there are vehicles with no lights or reflectors which further enhance the chance of RTA.[2] Ackaah and Adonteng[10] also noted 15.2% vehicles involved in fatal accidents had some form of defect which shows the vehicle functioning appropriately is another important force in prevention of RTAs. Khan et al.[4] also noted similar findings where vehicle brake devices were functional in 80% accidents and condition of vehicles was apparently not bad in 60% events.[4] Khan et al. noticed similar vehicle profile as the study was carried out in Aligarh. Shah et al.[11] found that excessive speed was the cause of road traffic crashes in 19% accidents which is similar to this study. Enhanced speed was noted in almost 38% RTAs in Ghana.[10] Jha et al.[12] and Mishra et al.[13] also noted 50% accidents were due to high speeding vehicles. In these studies, better road conditions may have led to increase in number of accidents due to enhanced speed. Fitzharris et al.[14] suspected or confirmed alcohol intake in 14.3% accidents which was in corroboration with findings of this study. Agnihotri and Joshi[9] noted 17.24% and Jha et al.[8] noted 14.9% of drivers consumed alcohol when they met RTA. This shows that alcohol consumption has a role in one out every sixth RTA. None used the seat belt in this study. This is in corroboration with findings of Khan et al.[4] and Singh and Dhattarwal.[15] Similar to this study Jha et al.[12] noted 8% and Gururaj et al.[3] noted less than 5% helmet use in their respective studies. This clearly brings out lack of strict implementation of road traffic laws. However, 50% victims used helmets in a study by Suryanarayana et al.[16] The reason for increased use of helmet in the above study was as it carried out in the city of Bangalore where law regarding road traffic are followed more stringently.

The study brings out probable risk factors for RTAs with head injury and subsequently their association with severity of head injury. These factors need to be further explored for their role in RTAs and incorporate or modify them in

Table 3: Severity of head injury with risk factors

	Glasgow coma scale				
	Mild	**Moderate**	**Severe**	**Total**	***P*-value**
Road condition					
Adequate	129(72.1%)	40(22.3%)	10(5.6%)	179(100.0%)	
Inadequate	216(76.6%)	39(13.8%)	27(9.6%)	282(100.0%)	0.029
Total (n = 461)	345	79	37	461	
χ^2 = 7.104; df = 2					
Visibility					
Adequate	231(77.5%)	40(13.4%)	27(9.1%)	298(100.0%)	
Inadequate	114(69.9%)	39(23.9%)	10(6.1%)	163(100.0%)	0.013
Total (n = 461)	345	79	37	461	
χ^2 = 8.716; df = 2					
Vehicle					
Adequate	222(78.7%)	46(16.3%)	14(5.0%)	282(100.0%)	
Inadequate	67(63.8%)	23(21.9%)	15(14.3%)	105(100.0%)	0.002
Total (n = 387)	289	69	29	387	
χ^2 =12.492; df = 2					
Excessive speed					
Yes	67(66.3%)	19(18.8%)	15(14.9%)	101(100.0%)	
No	278(77.2%)	60(16.7%)	22(6.1%)	360(100.0%)	0.011
Total (n = 461)	345	79	37	461	
χ^2 = 8.968; df = 2					
Alcohol					
Yes	34(53.1%)	15(23.4%)	15(23.4%)	64(100.0%)	0.000
No	311(78.3%)	64(16.1%)	22(5.5%)	397(100.0%)	
Total (n = 461)	345	79	37	461	
χ^2 = 28.396; df = 2					
Helmet					
Yes	34(85.0%)	4(10.0%)	2(5.0%)	40(100.0%)	
No	222(74.2%)	55(18.4%)	22(7.4%)	299(100.0%)	0.325
Total (n = 339)	256	59	24	339	
χ^2 = 2.246; df = 2					

prevention of these accidents. This study was limited to hospital premises thereby certain RTAs are bound to be missed as they never report to a health-care facility. In the absence of community-based study, the results of this study cannot be generalized for whole population as such and is subject to further research.

There is need to strictly enforce the road safety legislations and also to educate the road user regarding safe driving if we aim to decrease the burden of RTA with head injury.

Conclusion

Road conditions and poor visibility are identified environmental risk factors for RTAs. Vehicular status along with rising speed and alcohol intoxication are important risk factors and significantly determine the severity of head injury.

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