Risk factors for road traffic accidents with head injury in Aligarh

Urfi, Ali Amir, Salman Khalil, Md. Fakhrul Hoda

Department of Community Medicine, Jawaharlal Nehru Medical College & Hospital, Aligarh Muslim University, Aligarh, Uttar Pradesh, India
Correspondence to: Urfi, E-mail: urfislam@yahoo.com
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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 $\chi^2$-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). 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
death by almost 40%, and the risk of severe injury by 70%.[6]
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 pur-
pose of study and assured that confidentiality would be main-
tained. 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 ver-
sion 20. $\chi^2$-test was used to assess the relationship of severity
of head injury with the studied risk factors. Operational defini-
tion 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>
<thead>
<tr>
<th>Risk factors</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Road condition</td>
<td></td>
</tr>
<tr>
<td>Rough (kutchha)</td>
<td>58(12.5%)</td>
</tr>
<tr>
<td>Smooth (tarred)</td>
<td>180(38.9%)</td>
</tr>
<tr>
<td>Wet (slippery)</td>
<td>39(8.4%)</td>
</tr>
<tr>
<td>Rumble strips</td>
<td>35(7.6%)</td>
</tr>
<tr>
<td>Deep side cuts</td>
<td>42(9.1%)</td>
</tr>
<tr>
<td>Ditches</td>
<td>109(23.5%)</td>
</tr>
<tr>
<td>Total</td>
<td>463(100.0%)</td>
</tr>
<tr>
<td>Visibility</td>
<td></td>
</tr>
<tr>
<td>Nil</td>
<td>37(8.0%)</td>
</tr>
<tr>
<td>Poor</td>
<td>127(27.4%)</td>
</tr>
<tr>
<td>Adequate</td>
<td>299(64.6%)</td>
</tr>
<tr>
<td>Total</td>
<td>463(100.0%)</td>
</tr>
<tr>
<td>Vehicle status</td>
<td></td>
</tr>
<tr>
<td>Adequate</td>
<td>284(73.0%)</td>
</tr>
<tr>
<td>Inadequate</td>
<td>105(27.0%)</td>
</tr>
<tr>
<td>Total</td>
<td>389(100.0%)</td>
</tr>
<tr>
<td>Speed</td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>101(21.8%)</td>
</tr>
<tr>
<td>No</td>
<td>362(78.2%)</td>
</tr>
<tr>
<td>Total</td>
<td>463(100.0%)</td>
</tr>
<tr>
<td>Alcohol</td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>66(14.3%)</td>
</tr>
<tr>
<td>No</td>
<td>397(85.7%)</td>
</tr>
<tr>
<td>Total</td>
<td>463(100.0%)</td>
</tr>
<tr>
<td>Helmet used</td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>40(11.7%)</td>
</tr>
<tr>
<td>No</td>
<td>301(88.3%)</td>
</tr>
<tr>
<td>Total</td>
<td>341(100.0%)</td>
</tr>
<tr>
<td>Seat belt</td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>-</td>
</tr>
<tr>
<td>No</td>
<td>8(100.0%)</td>
</tr>
<tr>
<td>Total</td>
<td>8(100.0%)</td>
</tr>
</tbody>
</table>
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.[6] 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.[6] 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.[6] 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 highspeeding 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.[16] and Singh and Dhattarwal.[15] Similar to this study Jha et al.[2] 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 2: Helmet users among two wheeler motorized vehicle

<table>
<thead>
<tr>
<th>Helmet</th>
<th>Driver</th>
<th>Passenger</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>40(15.3%)</td>
<td>0(0.0%)</td>
</tr>
<tr>
<td>No</td>
<td>222(84.7%)</td>
<td>79(100.0%)</td>
</tr>
<tr>
<td>Total</td>
<td>262(100.0%)</td>
<td>79(100.0%)</td>
</tr>
</tbody>
</table>

#### Figure 1: Distribution of severity of head injury

![Image of severity distribution](image-url)
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.

**Acknowledgment**

I thank Chief Medical Officer and other casualty staff of Jawaharlal Nehru Medical College along with residents of neurosurgery department for their support in data collection and making the work feasible for me.

**References**

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