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**Original Research Article**

# Road traffic injuries and their associated risk factors in Dibrugarh district, Assam: a cross-sectional study

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## ABSTRACT

**Background:** Road traffic injuries (RTIs) are a leading cause of mortality and morbidity throughout the world and especially in developing countries like India, out of which many goes unreported. As such, this study was conducted to estimate the prevalence of RTIs and their associated risk factors in Dibrugarh district of Assam.
**Methods:** This was a cross-sectional study conducted among 820 samples taken from both urban and rural areas of Dibrugarh district. Data was collected by personal interview using a pre-designed, pre-tested structured questionnaire. Data is presented in percentages and association was tested using logistic regression analysis.
**Results:** The overall prevalence of RTIs was found to be 4.4%. Prevalence of RTI was higher amongst males (6.85%), people belonging to age group of 18-30 yrs and people who were unemployed (26.2%). Also, most of the accidents were found to occur during night time (47.2%), amongst two wheelers (52.8%) and more in the rural areas than the urbans. A high prevalence of alcohol consumption (58.3%) and usage of mobile phones (16.7%) while driving was seen with the RTIs. Also only 25% and 13% of the RTI victims were using helmets and seatbelts respectively while riding their bikes/cars.
**Conclusions:** Prevalence of RTIs was quite high amongst the population of Dibrugarh district along with high prevalence of risky behaviour while driving. As such, awareness regarding this hazardous problem amongst people and how to take proper preventive measures is of utmost importance.

**Keywords:** Road safety, Road traffic accidents, Road traffic injuries

## INTRODUCTION

Roadways remain the most favoured mode of transport for both private and public transportation in India. Our country India is a developing country and with its fast growing population coupled with its exceptional rate of motorization and with the ever growing urbanization has made people more vulnerable to road accidents resulting in either injuries or disabilities or in worst case scenario death. A road traffic injury is any injury caused due to crashes originating, terminating or involving a vehicle partially or fully on a public highway.[1]

Road traffic injuries can result in fatal or a non-fatal injury that occurs as a result of a collision or incident involving at least one vehicle in motion in a private or a public road that results in one or more person being injured or killed.

According to WHO (World Health Organisation) approximately 1.35 million people die each year as a result of road traffic crashes. Most vulnerable groups of road users are: pedestrians, cyclists, and motorcyclists. 93% of the world fatalities on road occur in low and middle income countries, even though these countries have 60% of world's vehicles. Road traffic injuries are

the leading cause of death for children and young adults aged 5-29 years.[2]

Road traffic accidents (RTAs) is an emerging public health issue and hence a big financial burden to a lot to individuals, families, communities and nations as a whole. The state of Assam in the north eastern part of India has a high rate of accidents. A total of 2342 persons lost their lives during 2011, And 2291 persons lost their lives in 2012. The death toll increased to 2441 in 2013. Dibrugarh, a north-eastern district of Assam, has a high rate of road traffic accident. As per the data of Medical Records Department of Assam Medical College and Hospital, Dibrugarh, a total of 757 road traffic accident cases were admitted in Assam Medical College and Hospital in 2011, 577 cases in 2012 and 711 cases in 2013.[3] In a study done in Benghazi 2006-07 the major road traffic accidents occurred as a result of environmental factors and stress. The accident fatalities and the seriousness of the accidents depended on various factors such as age of the vehicle, safety measures, and human errors.[4]

Most of the studies on road traffic injuries done in this part of North East region of India are hospital based studies. Hospital based studies have a few disadvantages. They tend to underestimate the burden of injury. Deaths due to injury that occur outside the hospital environment will not be covered by such systems; they also fail to capture those injuries that do not receive hospital attention (either because the injury was not severe enough to warrant medical treatment or because help was sought elsewhere).[5]

But in community based study all the cases will be captured which will show the true magnitude of the road traffic injuries. As such, this community based study was undertaken to assess the magnitude of road traffic injuries at the community level in this part of India.

Research question: What is the prevalence of Road traffic injuries (RTIs) in Dibrugarh district, Assam?

This study aims to estimate the prevalence of road traffic injuries in Dibrugarh district, Assam and to determine the factors associated with road traffic injuries in Dibrugarh district, Assam.

## METHODS

### *Study design, setting and subjects*

The study was a community based cross-sectional analytical study carried out from June 2021 to May 2022 among people from 2 blocks (1 urban and 1 rural) of Dibrugarh district. People who refused to participate in the study or whose questionnaires were incompletely filled were excluded from the study.

### *Sample size and sampling design*

Taking the prevalence (p) of RTI incidence from previous studies to be 20.7%, with 20% relative error(d), with a 95% level of confidence interval and using formula

Sample size=$z^2(1-p)/d^2$

The sample size was calculated to be 384.[6] Taking a design effect of 2 and a non-response rate of 5%, sample size was 807 which was increased upto 817. So the final sample size calculated and used for the study was 817.

Multi stage cluster sampling was done. The sample (817) was divided between rural and urban population according to rural urban population proportion in Dibrugarh district in the ratio 4:1 as per Census data. So rural sample to be taken was 656 and urban sample was 164.[7]

Average household size was taken as 5 members as per national census data 2011.[8] For the rural population sample, 656/5=132 households and for the Urban population sample 164/5=33 households were taken from the selected areas. There are 7 blocks in Dibrugarh consisting of 6 rural blocks and one urban block. From the 6 rural blocks one block was selected as per operational feasibility (Panitola block). And urban sample was taken from the urban block. In the selected rural block, 12 villages were selected by Probability Proportional to Size (PPS) method from the list of villages obtained from census website. Similarly, in the urban block, 3 wards were selected by PPS method. In each selected villages/ward 11 households were selected by systematic random sampling (Figure 1).

### *Inclusion criteria*

Persons of all ages, residing in the place of study for at least 6 months were included in the study.

### *Exclusion criteria*

Residents of hostels, jail, and community halls in the place of study as well as visitors or guests residing for less than 6 months were excluded.

### *Data collection method*

Data collection was done by personal interview using a pre designed pre tested questionnaire. The questionnaire was developed in English and also translated in the local language. Pilot testing of the questionnaire was done and modifications were made as necessary. The purpose of the study was explained to the respondents in their local language. Information of socio demographic details was recorded from head of the household or knowledgeable adult person available at the time of visit in all the families that were visited. If there was a history of RTI in any such household, further information was collected

from the victim. In case the victim has expired/unavailable, the history was taken from head of the household or next to kin (proxy).

For non-fatal injuries, history about last 3 months of any RTI was taken.[9]

For fatal injuries, recall up to last 12 months was taken.[9]

## RESULTS

In the present study, the overall prevalence of RTI was found to be 4.4% (Table 1).

**Table 1: Overall RTI prevalence among the study participants.**

| Prevalence of RTI | Frequency | Percentage |
|---|---|---|
| **Yes** | 36 | 4.40 |
| **No** | 781 | 95.60 |
| **Total** | 817 | 100 |

A total of 817 participants, from both rural and urban areas, participated in the study and the prevalence of RTI was higher amongst males (6.85%) compared to females (1.77%). RTI was also significantly higher among participants in the age group of 18-30 years and among people who were unemployed (26.2%) (Table 2).

**Table 2: Prevalence and association of RTI with respect to different factors.**

| Variables | | RTI | | U-OR* (95% CI) | P Value |
|---|---|---|---|---|---|
| | | Yes (%) | No (%) | | |
| **Age group (years)** | 0-17 | 3 (1.6) | 179 (98.4) | 2.13 (0.35-12.91) | 0.397 |
| | 18-30 | 20 (8.6) | 212 (91.4) | 12.02 (2.77-52.05) | <0.001 |
| | 31-50 | 11 (7.5) | 135 (92.5) | 10.38 (2.26-47.54) | <0.001 |
| | >50 | 2 (0.8) | 255 (99.2) | Ref | 0.408 |
| **Gender** | Male | 29 (6.9) | 394 (93.1) | 4.1(1.75-9.37) | 0.0010 |
| | Female | 7 (1.8) | 387 (98) | Ref | - |
| **SES** | Class I | 14 (3.5) | 385 (96.5) | Ref | - |
| | Class II | 13 (4.4) | 281 (95.6) | 1.2 (0.58-0.27) | 0.540 |
| | Class III | 8 (8.1) | 91 (91.9) | 2.4 (0.98-5.93) | 0.054 |
| | Class IV | 1 (4.3) | 22 (95.7) | 1.2 ((0.15-9.94) | 0.833 |
| | Class V | 0 (0.0) | 2 (100) | 0.00 (0.00) | 0.999 |
| **Locality** | Rural | 27 (4.3) | 603 (95.7) | Ref | - |
| | Urban | 9 (4.8) | 178 (95.2) | 0.88 (0.40-1.91) | 0.7579 |
| **Occupation** | Cultivator | 8 (9.8) | 74 (90.2) | Ref | - |
| | Businessman | 6 (6.0) | 94 (94) | 0.59 (0.19-1.77) | 0.348 |
| | Unemployed | 11 (26.2) | 31 (73.8) | 3.2 (1.20-8.94) | 0.020 |
| | Student | 4 (1.3) | 316 (98.8) | 0.11 (0.03-0.39) | 0.001 |
| | Daily wage earner | 4 (9.8) | 37 (90.2) | 1.0 (0.28-3.53) | 1.00 |
| | Service holder | 1 (1.4) | 70 (98.6) | 0.059 (0.13-0.01-1.08) | 0.059 |
| | Home maker | 2 (1.2) | 159 (98.8) | 0.007 (0.24-0.024) | 0.007 |
| **Marital status** | Married | 30 (6.5) | 429 (93.5) | 4.1 (1.68-9.96) | 0.0018 |
| | Unmarried | 6 (1.7) | 352 (98.3) | Ref | - |
| **Education** | Illiterate | 1 (16.7) | 5 (83.3) | ref | - |
| | Primary school | 14 (8.9) | 144 (91.9) | 0.48 (0.05-4.4) | 0.523 |
| | Middle school | 5 (4.1) | 116 (95.9) | 0.21 (0.02-2.2) | 0.196 |
| | High school | 7 (3.6) | 190 (96.4) | 0.18 (0.01-1.79) | 0.145 |
| | Higher secondary | 7 (3.1) | 219 (96.9) | 0.16 (0.01-1.55) | 0.114 |
| | Graduate | 1 (1) | 100 (99) | 0.05 (0.003-0.92) | 0.044 |
| | Post graduate | 1 (12.5) | 7 (87.5) | 0.71 (0.03-14.3) | 0.826 |

*Unadjusted odds ratio.

Majority of the accidents was found to have occurred at night time (47.20%), followed by afternoon (19.40%). Majority of the victims was driving 2 wheelers (52.80%), followed by 4 wheelers (30.60%), and pedestrian and non-motorized vehicle consisted 8.30% each. Prevalence of RTI was seen to have occurred more in the rural areas (14.43%) compared to the urban areas (1.42%).

Only 25% of the RTI victims on motorbikes were using helmets at the time of accident and only 13% among the RTI victims in cars were using seatbelts at the time of accident.

Regarding other risk factors, 58.30% of the victims gave history of consumption of alcohol the previous day/prior to RTI, while 16.70% gave history of using mobile

phones while driving. In the final multi-variate analysis, people belonging to age group of 18-30 years and >50 years, unemployed, married and having graduation degree were found to be significantly associated with RTIs (Table 3).

**Table 3: Factors associated with RTI-multiple logistic regression analysis.**

| Variables | | Adjusted Odds Ratio | 95% Confidence interval | | P value |
|---|---|---|---|---|---|
| | | | Lower | Upper | |
| **Age group (years)** | 0-17 | Reference | - | - | - |
| | 18-30 | 16.53 | 1.985 | 137.663 | 0.009 |
| | 31-50 | 3.704 | 0.423 | 32.431 | 0.237 |
| | >50 | 0.021 | 0.002 | 0.237 | 0.002 |
| **Gender** | Female | Reference | - | - | - |
| | Male | 3.823 | 0.987 | 14.805 | 0.052 |
| **SES** | Class I | Reference | - | - | - |
| | Class II | 1.368 | 0.468 | 4.001 | 0.567 |
| | Class III | 3.414 | 0.877 | 13.287 | 0.077 |
| | Class IV | 0.482 | 0.014 | 16.396 | 0.685 |
| **Occupation** | Cultivator | Reference | - | - | - |
| | Businessman | 1.674 | 0.337 | 8.319 | 0.529 |
| | Unemployed | 16.079 | 2.217 | 116.642 | 0.006 |
| | Student | 0.628 | 0.064 | 6.137 | 0.689 |
| | Daily wage earner | 1.431 | 0.188 | 10.892 | 0.729 |
| | Service holder | 0.388 | 0.032 | 4.67 | 0.456 |
| | Home maker | 0.26 | 0.034 | 1.968 | 0.192 |
| **Marital status** | Unmarried | Reference | - | - | - |
| | Married | 7.525 | 1.41 | 40.159 | 0.018 |
| **Education** | Illiterate | Reference | - | - | - |
| | Primary school | 0.729 | 0.02 | 26.037 | 0.863 |
| | Middle school | 0.081 | 0.002 | 3.641 | 0.196 |
| | High school | 0.076 | 0.002 | 3.285 | 0.18 |
| | Higher secondary | 0.051 | 0.001 | 2.277 | 0.125 |
| | Graduate | 0.005 | 0 | 0.377 | 0.016 |
| | Post graduate | 0 | 0 | . | 0.999 |

## DISCUSSION

In this study majority of the RTI victims belonged to the age group 18-30 years (8.6%), followed by age group 31-50 (7.5%). As per ministry of road transport report, the detailed age profile of accident victims other than the drivers, for the year 2012, reveals that the age group (25-65 years) accounted for the largest share of 53.1 per cent of total road accident casualties, followed by the age group (15-24 years) with a share of 32.3 per cent. More than half of the road traffic casualties are in the wage earning age group. The loss of the main earning member can be disastrous, leading to fall in income of the household and lower living standards.[10] Similar observations were also made by Mishra et al, WHO, Dandona et al, Agarwal et al, Guru et al and Ghimamire et al.[11-16] This can be attributed to the fact that this age group is a more frequent road user due to educational and occupational purposes thus predisposing them to RTIs.

In this study majority of the victims involved in RTI were males (6.85%), followed by females (1.77%). The study conducted by Ganveer et al.[17] found a male:female ratio of 6:1 which can be attributed to the fact that proportion of males as compared to females is more and in our society. Also as males are the bread earners for the family and are therefore involved usually in outdoor activities thus exposing themselves to accidents. Sharma et al also observed a similar higher male:female ratio.[18]

In our study, majority of the RTI victims were unemployed (11.90%), closely followed by cultivators and daily wage earners at 9.75%. This might be due to the fact that unemployment may lead to increased levels of stress which in turn might cause decreased concentration while driving thus leading to increased incidence of RTIs. On the contrary, in studies from Delhi, students were commonly involved in accidents followed by labourers.[19] Similar types of results were seen in studies conducted by Agarwal et al. and Jeepara P.[20,21]

Majority of the accidents was found to have occurred at night time (47.20%), followed by afternoon (19.40%). This was probably because of poor visibility during night time as observed in one qualitative study from NIMHANS.[22] Also, foggy conditions or smoke of vehicles or dust storms decreases the visibility. At night,

driving needs extra precautions as vision is seriously affected by headlights of vehicles. On the contrary, a study by Ganveer et al observed that about 53.19% of the accidents took place in the daytime.[23] And 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 our study, majority of the victims were driving 2 wheelers (52.80%), followed by 4 wheelers (30.60%), and pedestrian and non-motorized vehicle consisted 8.30% each. Similar type of results were found in studies conducted at Bijapur where maximum number of vehicles were 2-wheeler accounting for 40% whereas least number of vehicles were bullock cart.[24] This was likely because majority of the RTIs were seen in young age group population who were mostly using 2 wheeler vehicles. Also as four wheelers are dual track vehicles and two wheelers being single track vehicles, the two wheelers are more unstable thus predisposing to higher RTIs.

In our study, only 25% of the RTI victims involved were using helmets and 13% among the RTI victims were using seatbelts at the time of accident. Similar findings were observed in the study by Agarwal et al. where it was seen that only 27% of the accident victims were wearing protective equipment (helmet and seat belt) at the time of accident.[14] This fact highlights the need for imparting and implementing both awareness and stronger legislations regarding usage of protective equipment amongst the general public to prevent fatal injuries during RTIs.

In our study, 16.70% of RTI victims were using mobile phones while driving. A study by Flatley et al also reported that 42.3% of the RTI victims in their study had a habit of using mobile phone while driving vehicle.[25] Using mobile phone while driving vehicle has become a fashion, though it is risky. Use of mobile phone while driving diverts the attention; it affects the reaction time and maintenance of lane, hence increasing the risk of RTA.

In this study, it was also seen that 58.30% of the victims had a history of consumption of alcohol the previous day/prior to RTI. Similar findings were seen in other studies like Bharadwaj et al which found that 18.01% victims had h/o alcohol consumption within 6 hrs before accident.[26] Also in a WHO supported study in Nepal, higher percentage of drivers of RTI (16.9%) were found to consume alcohol 2 to 3 hours prior to accident and Sreedharan J in the year 2010 had found that 20 % of the motorcycle riders with RTI had consumed alcohol.[27,28] This is so because increased use of alcohol and other drugs in drivers causes impairment in judgment and control over vehicles is lost due to those effects. As such, the national maximum legal blood alcohol concentration is 30 mg/100ml.[29]

In our study, majority of the RTI victims were from the rural area (14%), compared to the urban areas (1%). Also as per WHO fact sheet in India (2011), the total number of accidents that occurred in rural areas was more than that in the urban areas; the former accounting 53.5 per cent (2,66,231) and the latter accounting for 46.5 per cent (2,31,455) of total accidents.[30] The reasons for more number of RTI cases in rural areas may be due to the inadequate knowledge about road safety among rural people and also due the bad condition of the rural roads. Also in our study, a new Dibrugarh-Tinsukia bypass highway (NH-37) was constructed in the vicinity of the rural area in which the study was done for which, a higher prevalence of RTI might have had occurred amongst the rural participants.

This study has few limitations. Our study had collected data by self-reporting of the participants. As such, the accuracy of the answer by the respondent on the occurrence of road traffic injuries and resultant disabilities could not be independently verified. Also while data collection, we had to rely on interview method where history of 3 months for non-fatal injury and 12 months for fatal injury was taken, which itself might have led to a recall bias. Also, during data collection, we had to use proxy respondent in the absence of the 1st choice respondent. As such, this might have led to underreporting or over reporting of the events.

## CONCLUSION

Our present study found a high prevalence of RTIs in Dibrugarh district with risk factors like young age group, male gender, alcohol consumption and driving in rural areas. A constant increase in the number of motor vehicles, rampant encroachment of roads, unscientific construction of subways and under passes at highways, extremely high speed driving at the highways, ignorance regarding wearing helmets among riders of two wheelers, nasty tendency of violating traffic rules, anarchic traffic systems and population explosion have greatly contributed to rapid increase in road traffic accidents and thus RTI injury cases. Hence, preventing the occurrence of such injuries can greatly reduce fatalities. Therefore, as the old saying goes, “PREVENTION IS BETTER THAN CURE” holds true even here.

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