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Quick Response Code:

Website: www.jehp.net
DOI: 10.4103/jehp.jehp_1065_21

# Factors associated and knowledge on road traffic accidents, rules among private university students in Chengalpattu district, Tamil Nadu, India – A cross-sectional study

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## Abstract:

**BACKGROUND:** Road traffic accidents (RTAs) are an emerging public health issue of global concern causing 1.35 million deaths per year. They are the leading cause of death among 5–29 years who contribute to the future and current productive population of the country. The outcome of mortality and permanent disability are public health concerns. We determined the factors associated with RTAs among medical undergraduates and assessed their knowledge of road traffic rules.

**MATERIALS AND METHODS:** This study had 500 medical undergraduates from a tertiary hospital located in Chengalpattu district, Tamil Nadu. Data were collected using questions from “Road safety question bank” issued by Ministry of Road Transport and Highways, Government of India, sent as Google forms to students. Descriptive statistics were used and multivariate analysis was performed to identify risk factors associated with RTAs.

**RESULTS:** The mean age of the students was 21.4 (standard deviation = 1.7) years. About 30.4% of students suffered from RTAs in the past 2 years. Practice of drunken driving and mobile phone usage showed significant association with RTA occurrence ( $P < 0.001$ ). Multiple logistic regression revealed that students crossing speed limits and jumping signals had 3.19 and 2.04 times more risk of sustaining RTAs. Seventy-five percent of students had good knowledge on road traffic rules.

**CONCLUSION:** Nearly half the subjects have suffered RTA in the past 2 years. Students who over speed, jumped signals and used mobile phones while driving sustained more RTAs. Overall, road traffic rules knowledge was satisfactory. Students need education on risky driving behaviors and aftermath of crashes.

## Keywords:

Knowledge, medical students, rules, safety, traffic accidents

## Introduction

Road travel has become a pivotal part of everyday life in the present world. With the increasing economy and a rapid spurt in the number of people owning motor vehicles, there is high traffic and congestion on the roads. This brings the issue of concerns about road safety for passengers, pedestrians, and road infrastructure. The

World Health Organization has estimated that 1.35 million dies of road traffic accidents (RTAs) each year.<sup>[1]</sup> An accident is an unfortunate incident that occurs unexpectedly and unintentionally, which leads to damage or injury.<sup>[2]</sup> According to the Global status report on road safety 2018, RTAs are the eighth leading cause of death on a global scale and without proper

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**How to cite this article:** Vijayakrishnan G, Priyadharshini P, Ramraj B, Anantharaman VV. Factors associated and knowledge on road traffic accidents, rules among private university students in Chengalpattu district, Tamil Nadu, India – A cross-sectional study. *J Edu Health Promot* 2022;11:148.

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Received: 20-07-2021  
Accepted: 23-09-2021  
Published: 11-06-2022

and timely interventions, they are predicted to become the fifth leading cause of death by 2030. RTAs are the number one cause of death among children and young adults between 5 and 29 years who contribute to the future and current productive population of the country, respectively.<sup>[3]</sup>

The occurrence of an accident or RTA is a complex phenomenon involving the human host, vehicles as agent and the environment as explained by the “Haddon’s matrix”<sup>[4]</sup> personal factors such as speeding, inebriated driving, nonuse of helmets, seatbelts, defying road traffic rules, distracted driving due to mobile phone use or external factors such as poor road infrastructure, poor vehicle quality, weak traffic law enforcements, and inadequate posttrauma treatment.<sup>[1]</sup> The United Nations has adopted a resolution for improving global road safety in August 2020 and has declared 2021–2030 as the “Decade of action for road safety” the goal of which is to prevent deaths and injuries due to RTAs by 50% by 2030.<sup>[5]</sup> The United Nations Sustainable Development Goal number 3.6 aims to halve the number of deaths due to road traffic injuries by 2020.<sup>[6]</sup> Goal number 11.3 aims to provide safe, affordable, accessible, and sustainable transport systems to all by 2030.<sup>[7]</sup>

Although India has implemented laws for road safety like the Central Motor vehicle act, 1988, National drink driving law, National motorcycle helmet law, National seat belt law and recommended speed limits, the burden of deaths and injuries due to RTAs is still high. In 2019, the national figure of deaths due to RTAs was 212,595.<sup>[8]</sup> Due to the high burden of RTAs, India launched the “National road safety policy” in 2010, the aim of which was to increase road safety awareness, launch a national database on road safety information, ensure safer vehicles, and enhance the road infrastructure.<sup>[9]</sup>

The state of Tamil Nadu has recorded around 63,920 RTAs and 12,216 deaths due to RTAs in the year 2018, which is lesser than in 2016 and 2017.<sup>[10]</sup> The government of Tamil Nadu has launched the Road Accident Data Management System funded by the World bank. This is a software based on the geographical information system used for the collection, compilation, and analysis of accident-related data. Based on the analyzed data, it provides remedial measures to prevent future accidents.<sup>[11]</sup>

RTAs require effective interventions as they are avoidable causes of death, disability, handicap, socioeconomic loss of the young and middle-aged population of the country. The rationale for conducting this study among medical undergraduates of a private teaching hospital is attributed to the fact that the location of the medical college, hospital is on the Grand Southern Trunk road

which connects the city to the southern part of Tamil Nadu and it is known for its frequency of road crashes and accidents. Furthermore, medical students are known to have regular, long duty hours adding to the academic pressure, which can reflect in their driving practices. Since RTAs are also a cause of mortality and permanent disability, medical students need to know and practice road safety measures. This study aimed to determine the factors associated with road traffic injuries among undergraduate medical students and assess their knowledge of road traffic rules.

## Materials and Methods

### Study setting and design

This was a descriptive cross-sectional study conducted among 500 undergraduate medical students studying in a tertiary care teaching hospital in Chengalpattu district, Tamil Nadu, India.

### Study participants and sampling

A sampling frame was created with the list of all undergraduate students, namely 1<sup>st</sup>-year MBBS students (freshers), 2<sup>nd</sup> years, prefinal years, final years and interns undergoing Compulsory Residential Rotatory Internship. Using universal sampling method, students who knew to drive (two-wheelers, four-wheelers or both) and students who consented to participate in the study were included. Out of the total 750 (150 in each year) undergraduates in the teaching hospital, 500 consented to participate in the study.

### Data collection tools and technique

Data were collected in September and October 2020 (2 months) using a pretested, semi-structured questionnaire which was sent to the students using Google forms. The questionnaire consisted of details regarding the sociodemographic profile of the students including the year of study, ownership of driving license, and experience of a RTA in the past 2 years. Furthermore, information on the type of vehicle used, most common time of driving and speed limit of driving was obtained. Questions were framed to assess risky road behaviors such as drunk and driving, jumping signals, and usage of mobile phones while driving.

The knowledge of road safety rules of students was assessed using ten questions prepared based on the “Road safety question bank” issued by the Ministry of Road Transport and Highways.<sup>[12]</sup> The questions tested the knowledge on safety protection measures while driving, traffic light signal interpretation, the importance of zebra crossing, speed limits for two and four wheelers, and lane rules like overtaking. The questions had two options out of which one was right. The Correct option was awarded 1 point. Based on total points obtained, the

students were grouped into having “Poor” and “Good” knowledge levels on road traffic rules. Data were entered in an Excel sheet and analyzed using SPSS Statistics for Windows, Version 22.0. Armonk, NY: IBM Corp. Chi-square test was applied for the categorical variables and multivariate analysis was performed to determine the strength of association of the factors.

**Ethical considerations**

Ethical clearance was sought and the study was approved by the Institutional Ethics committee (IEC Number: 2883/IEC/2021).

**Results**

Out of the 500 students who participated in the study, 333 students (66.6%) were aged between 21 and 23 years. The mean age of the students was (21.4 ± 1.7) years. 308 males (61.6%) and 192 females (38.4%) took part in the study. Concerning the year of study, the majority of students (134) were from final year, constituting 26.8% of the total study population followed by 131 students (26.2%) from 2<sup>nd</sup> year. About 77.8% (389) of the students owned a driving license. Only 30.4% (152 students) had suffered from road traffic injuries in the past 2 years [Table 1].

Four wheeler users were more in number 259 (51.8%) when compared to 2 wheeler users (241, 48.2%). 62 students and 90 students had suffered from RTA while using 2 wheelers and 4 wheelers, respectively. Furthermore, the type of vehicle used was found to have a significant association with the occurrence of RTA (P = 0.018). 236 students (47.2%) had used vehicles between 2 pm and 8 pm, out of which 88 (37.2%) had met with road traffic injuries. 87 students have used vehicles between 8 pm and 8 am, of which 37 had suffered RTA. The most common time of vehicle usage

**Table 1: Sociodemographic profile of undergraduate medical students (n=500)**

Variable	Category	n (%)
Age (years)	17-20	139 (27.8)
	21-23	333 (66.6)
	24 and above	28 (5.6)
Gender	Male	308 (61.6)
	Female	192 (38.4)
Year of study	I (freshers)	63 (12.6)
	II	131 (26.2)
	III (prefinal)	117 (23.4)
	IV (final)	134 (26.8)
	Internship (CRRRI)	55 (11)
Ownership of driving license	Yes	389 (77.8)
	No	111 (22.2)
Suffered RTA in the past 2 years	Yes	152 (30.4)
	No	348 (69.6)

RTA=Road traffic accidents, CRRRI=Compulsory residential rotatory internship

has shown a significant association with the occurrence of RTA (P < 0.001). 42 students have exhibited risky driving behavior of over-speeding (above 100 kmph), out of which 8 have suffered RTA. 175 students have driven at a speed between 50 and 100 kmph, of which 27 have sustained RTA. Speed of driving the vehicle has shown a significant association with the occurrence of RTA (P < 0.001). 69 students (13.8%) admitted to having practiced drunk and driving, out of which 30 had suffered from RTA showing a significant association with RTA occurrence (P < 0.001). Similarly, 148 and 120 students had admitted to having used mobile phones while driving/riding and jumping signals, respectively, showing a significant association with the occurrence of RTA (P = 0.001 and 0.012, respectively) [Table 2].

Using multiple logistic regression analysis, the role of predictors/risk factors in causing the outcome of road traffic injuries was assessed. It was found that students who were over-speeding (crossing the permitted speed limits) were 3.19 times at higher risk of sustaining RTAs (adjusted odds ratio [AOR]: 3.19, 95% confidence interval [CI]: 0.32–0.62) than vehicles following the permitted speed limits. The second predictor with a higher risk of causing RTA was jumping signals (AOR: 2.04, 95% CI: 1.24–3.34). Students who used mobile phones and hands-free devices were 1.92 times at the risk of sustaining RTAs than students who did not use (AOR: 1.92, 95% CI: 1.23–3.01). The last predictor with risk of causing RTAs was the most common time of vehicle usage (AOR: 0.45, 95% CI: 0.32–0.62) [Table 3].

As far as the knowledge levels of students regarding road traffic rules, 492 students (98.4%) knew that helmet is compulsory for riding a two wheeler in India. Furthermore, 476 students (95.2%) knew that the pillion rider should also wear a helmet. Four hundred and nine students (81.8%) were aware that overtaking of any vehicle should be done on the right side of the lane/road. 387 participants (77.4%) knew that zebra lines over the road are meant for pedestrian crossing. 69.2% and 64.4% of students knew permissible speed limits of a motorbike and car on a national highway to be 50 kmph and 70 kmph, respectively. 347 students (69.4%) were aware that all the passengers of a car should wear seatbelts [Table 4]. Out of 500 students, 375 students had a “good” knowledge level and 125 had a poor knowledge level regarding road traffic rules [Figure 1].

**Discussion**

This observational cross-sectional study was carried out among 500 medical undergraduates of a tertiary care teaching hospital in Tamil Nadu with the objectives of determining the risk factors associated with RTAs and assessing their knowledge of road traffic rules. The mean

**Table 2: Factors associated with road traffic accidents among medical students (n=500)**

Predictor	Category	Suffered RTA in the past 2 years		$\chi^2$	df	P
		Yes, n (%)	No, n (%)			
Type of vehicle	2 Wheeler	62 (12.4)	179 (35.8)	4.803	1	0.018*
	4 Wheeler	90 (18)	169 (33.8)			
Most common time of vehicle usage	8 am to 2 pm	28 (5.6)	149 (29.8)	28.034	2	<0.001*
	2 pm to 8 pm	88 (17.6)	148 (29.6)			
	8 pm to 8 am	36 (7.2)	51 (10.2)			
Speed of vehicle (kmph)	0-50	117 (23.4)	166 (33.2)	37.113	2	<0.001*
	50-100	27 (5.4)	148 (29.6)			
	>100	8 (1.6)	34 (6.8)			
Practice of drunk and driving	Yes	30 (6)	39 (7.8)	37.113	2	<0.001*
	No	122 (24.4)	309 (61.8)			
Use of mobile phones and hands-free devices during driving	Yes	60 (12)	88 (17.6)	10.217	1	0.001*
	No	92 (18.4)	260 (52)			
Practice of jumping signals	Yes	47 (9.4)	73 (14.6)	5.735	1	0.012*
	No	105 (21)	275 (55)			

\*P value of <0.05 is considered significant, Chi-square test applied. RTA=Road traffic accidents

**Table 3: Multivariate analysis of predictors of road traffic accidents (n=500)**

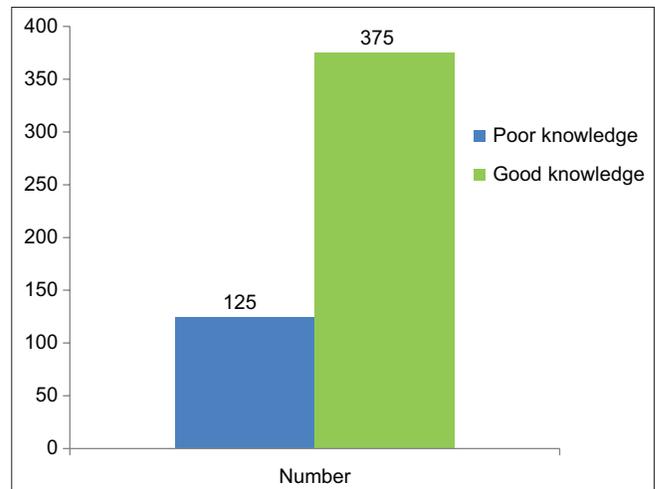
Predictors	AOR (95% CI)	df	P
Type of vehicle used	0.73 (0.48-1.11)	1	0.146
Most common time of vehicle used	0.45 (0.32-0.62)	1	<0.001*
Speed of vehicle	3.19 (2.20-4.63)	1	<0.001*
Practice of drunk and driving	1.61 (0.88-2.94)	1	0.120
Practice of mobile phone usage during driving	1.92 (1.23-3.01)	1	0.004*
Practice of jumping signals	2.04 (1.24-3.36)	1	0.005*

\*P value of <0.05 is considered significant. AOR=Adjusted odds ratio, CI=Confidence interval

age of the students was 21.4 ± 1.7 years. The majority of the study participants were males, accounting for 61.6%. Four-wheelers were used more (51.8%) than two wheelers (48.2%) and 77.8% of students owned a driving license.

In this study, the prevalence of road traffic injuries as reported by the study participants in the past 2 years was 30.4%. In a study done by Helal *et al.*,<sup>[13]</sup> 40% of the participants had sustained injuries in the past year, out of which the majority had experienced injuries as pedestrians. In one another study done by Balaji *et al.*,<sup>[14]</sup> 41.32% of the students had experienced RTA. These prevalence figures from the latter two studies are high when compared to our study. This can be attributed to the fact that nearly 80% of the students in our study owned a driving license and hence were aware of road safety rules leading to fewer RTAs.

The Government of India has formulated legislations such as “The Motor Vehicle Act of 2019” under which offenses such as drunk and driving, jumping red lights, and over speeding can be punished with charging fine, extending to imprisonment. A few high-risk driving behaviors were observed among study participants in our study. Mobile phone and hands-free device usage



**Figure 1:** Distribution of students according to the knowledge of road traffic rules (n = 500)

during driving were reported by 29.6% of students, while Kalbandkeri *et al.*<sup>[15]</sup> reported the usage of mobile phones while driving to be 19.9%. Sixty-Nine students (13.8%) have admitted to having drunk and driven in our study. This figure is much less when compared to as reported by a study done by Kulkarni *et al.*<sup>[16]</sup> (25.2%) and much higher than the figure reported by Ramya *et al.*<sup>[2]</sup> where only 2.4% of the students had practiced drunken driving. The figures mentioned in the above studies can be far less from the actual numbers as students would not have disclosed their original habits. Driving under the influence of alcohol can increase the risk and severity of the crash.

Jumping signals was another risky driving behavior admitted by 24% (120) students in our study. This figure is much less when compared to a study done by Ramya *et al.*<sup>[2]</sup> where 46.1% of students have admitted to jumping signals on multiple instances.

**Table 4: Knowledge of road traffic rules among medical students (n=500)**

Road traffic rules	Response	n (%)
Is helmet compulsory?	Yes	492 (98.4)
	No	8 (1.6)
Should the pillion rider wear a helmet?	Yes	476 (95.2)
	No	24 (4.8)
Yellow light of traffic signal tells drivers to stop when it is safe to, as the light is about to turn red	Yes	381 (76.2)
	No	119 (23.8)
Which side to overtake a vehicle?	Right side	409 (81.8)
	Left side	91 (18.2)
Zebra lines are meant for	Pedestrians crossing	387 (77.4)
	Stopping the vehicle	113 (22.6)
On a road without a footpath, the pedestrians should walk on the	The right side of the road	359 (71.8)
	The left side of the road	141 (28.2)
The maximum permitted speed of a motor car on a national highway (km/h)	70	322 (64.4)
	80	178 (35.6)
The maximum permissible speed of a motorcycle (km/h)	50	346 (69.2)
	60	154 (30.8)
Should all the passengers of a car wear a seat belt?	Yes	347 (69.4)
	No	153 (30.6)
The continuous yellow line in the center of the road means	Do not overtake	267 (53.4)
	No parking	233 (46.6)

69.4% of students in our study had the knowledge that in a four-wheeler, the seatbelts have to be worn by all passengers. However, in a study conducted by Reang *et al.*,<sup>[17]</sup> Ninety-six percent of students had this knowledge, which is higher than that was found in our study. Eighty-two percent of students in our study had the knowledge that overtaking a vehicle should be done on the right side of the lane/road. In a study done by Ramya *et al.*,<sup>[2]</sup> the knowledge of students regarding this was higher (90.7%) when compared to our study.

Concerning the overall knowledge of road traffic rules among medical students in our study, 75% had good knowledge and 25% had poor knowledge. According to a study done by Kabandkeri *et al.*,<sup>[14]</sup> gender-based knowledge levels were assessed and the students were regarded as having high and moderate levels of knowledge where, 99.6% and 91.1% of Females and Males, respectively, had high knowledge. This is higher when compared with the figure of 75% of students having good knowledge in our study. Although a larger proportion of the study participants had a good knowledge of road traffic rules, it is important to curb nonadherence to road rules and risky driving practices as reported by a small proportion of students as they may lead to permanent disability and loss of workforce of future Doctors.

This study has explored the possible factors associated with the occurrence of RTAs among a population of young, frontline workers. Furthermore, the study highlights basic but important road rules to be followed to follow road safety.

### Limitations

Limitations of this study were involvement of a selected population of young adults belonging to a single institution, making the findings not generalizable to other study groups or the national population. Another shortcoming of the study can be attributed to the recall bias of students who have experienced RTAs. Many students admitted to forgetting details of their experience of RTAs which might have altered the outcomes of the study.

### Recommendations

The study recommends orientation of students to road safety rules. Active trauma care management can be incorporated as a part of the training for undergraduate medical students. Furthermore, strict parental regulations and guidance are required for age-appropriate use of vehicles and avoidance of risky behaviors. The medical undergraduates can be used as a medium for imparting health education to the community on road safety and hazardous road behavior. Rural areas should also be given equal priority as urban in curtailing the epidemic of RTAs. The younger and productive population of the society needs to be sensitized to road safety precautions and rules through behavior change communication, mass media campaigns with strict enforcement of legislation. Further research needs to be done in the field of "Accidentology" regarding personal attributes, human behavior, and the environment of accident occurrence.

### Conclusion

Less than half of the subjects have suffered from RTA in the past 2 years. Although the knowledge levels of road

safety and road traffic rules were satisfactory, certain risky behaviors such as speed driving, drunken driving, and distracted driving are to be addressed properly. Students need insights on the ill effects of speed driving and driving under alcohol influence as both can increase the likelihood and severity of a crash.

### Acknowledgment

The authors would like to thank all the undergraduate students for their active participation in the study. We also extend our gratitude to the undergraduate representatives for their cooperation and help in organizing the smooth conduct of the study.

### Financial support and sponsorship

Nil.

### Conflicts of interest

There are no conflicts of interest.

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