Factors Associated with Road Traffic Accidents in Kathmandu, Nepal: A Cross-Sectional Study

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Background: Road traffic accidents (RTAs) are a leading and disproportionately prevalent cause of mortality and disability, particularly burdening Nepal, primarily within the Kathmandu Valley.

Methods: This cross-sectional study was conducted between March 22nd and April 24th, 2021, involving 185 victims admitted to the emergency department of a private hospital. Respondents were selected using purposive sampling, and data were collected through face-to-face interviews. Socio-demographic characteristics, human factors, and environmental factors data were analyzed using descriptive statistics, and all statistical tests were conducted using SPSS version 20.

Results: Among the 185 RTA victims, the majority (36.8%) fell within the 21-30 age groups. Male victims (55.7%) outnumbered females (44.3%). Students (36.8%) experienced the highest accident rates, with most incidents (21.1%) occurring on Saturdays and 38.4% taking place between 12:00pm and 6:00pm.

Human Factors and RTA: Of the total victims, 80 (43.2%) were drivers, with 43.75% of them reporting the use of emergency brakes. Furthermore, 77.61% indicated that accidents were caused by pedestrians not using zebra crossings when crossing the road.

Environmental Factors and RTA: Rainy weather was associated with the highest number of accidents, accounting for 36.2% of cases. Additionally, narrow routes (28.6%) and slippery roads (25.9%) contributed to a significant number of accidents.

Conclusion: Nepal faces a high rate of road traffic accidents, with critical factors including victim age, vehicle types, speed, road and weather conditions, and traffic rule violations. Authorities must consider these factors to effectively control and prevent RTAs.

Keywords: Public Health, Mortality, Incidence, Global Health

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Introduction

Road traffic accidents (RTAs) are a significant public health and development issue (1). RTA is defined as "an accident in a public street involving at least one moving vehicle, which results in one or more individuals being injured or killed" (2).

RTAs frequently occur as a result of multiple factors rather than a single one. Road conditions, lack of awareness of traffic rules, vehicle speed, the number of passengers, the vehicle type, and the driver's age are major contributing factors. To be more specific, the factors can be divided into three categories: human, technical, and environmental. Many youngsters are seen driving these days, being another major factor for accident (3, 4). RTAs are becoming more common around the world. Road traffic injuries are among the leading causes of mortality and disability, with a disproportionately high incidence in developing countries (5).The issue of injury relates to a major global socioeconomic and health matter (6). The WHO ranks RTA as the tenth largest cause of death worldwide (7). Every year, RTA takes the lives of about 1.3 million people worldwide. Pedestrians, cyclists, motorcyclists, and their passengers constitute more than half of the road traffic injuries and deaths. It is the leading cause of death for children aged 5 to 29 and young adults. RTAs are more common in developing economies; 93% of fatalities occur in low- and middle-income nations (8). According to the Nepalese police website, RTAs are on the rise. In 2011/12, 8,890 RTAs were reported, which increased to 15,554 in the fiscal year 2019/20 (9). In the Kathmandu Valley, there were relatively more reports of accidents than other areas, but fewer fatalities (10). Geographical variances are peculiar in Nepal, where road safety and road construction knowledge are comparatively lacking (11). There have been few national research on the epidemiology of RTAs in Nepal over the last ten years (9). RTAs have emerged as a serious public health concern demanding a multidisciplinary approach to address, yet they continue to be under-prioritized in poor and middle-income countries like Nepal (12, 13). Therefore, the purpose of this study was to find out the factors related to RTA presented to the Emergency Department of a Tertiary Level Hospital.

Methods

Study area and design

This was a cross-sectional study conducted at an emergency department in a private hospital in Kathmandu, Nepal.

Sample size

The prevalence of RTA (p) was assumed 69 % based on a study conducted in Nepal (11). The sample size was obtained using the formula n = Z^2pq/d^2, where Z = 1.96, p = the population proportion (69 %), q = 1 -p, and d = acceptable sampling error, which was set at 7%. The sample size was 168, and after adjusting for a 10% non-response rate, the total sample size (n) was estimated to be 185.

Sampling technique and procedure

A list of admitted victims at the emergency room was obtained. Victims who were able to respond and were assisted by their relatives or caretakers were identified, and a separate list was prepared (sampling frame). Finally, all the eligible respondents were selected using a purposive sampling technique.

Data collection

A semi-structured questionnaire was used to collect data on socio-demographic characteristics, and human, and environmental factors via face-to-face interviews. The data collection tool was prepared by the researcher after a thorough review of the relevant literature. The questionnaire was written in English, translated into Nepali, and pre-tested before being used to collect data.

The data collection procedures were carefully planned in order to ensure the quality of the study. The authors visited the study site and acquired permission from the appropriate authorities before beginning the research. Ethical approval was taken from the Institutional Review Committee (YHSA IRC) of the Yeti Health Science Academy. The purpose of the study was disclosed to the

respondents before collecting data, and written consent was obtained. Those who agreed to take part in the study were taken to a separate room for an interview. The researcher made sure that the respondents would be comfortable and not be disturbed in the room. All the interviews were conducted by the researchers, and the data were collected between March 22nd and April 24th, 2021. Unconscious individuals suffering from a fatal injury and not assisted by caregivers or relatives were excluded. No participants were interviewed against their will. The questionnaire was double-checked for accuracy and completeness on a daily basis.

Data analysis

All the analyses were carried out using SPSS 20, and the data were entered using EpiData (version 3.1). Descriptive statistics were used to analyze data on socio-demographic characteristics, human factors, and environmental factors.

Results

Socioeconomic factors and RTA

The socio-demographic characteristics of the respondents included in the study are shown in Table 1. Among 185 RTA victims, the majority of the cases (36.8%) were between the ages of 21 - 30, and male victims (55.7%) outnumbered females (44.3 %). The study population was dominated by Brahmin / Chhettri and Janjati, with 70 (37.8%) and 58 (31.4%) participants respectively.

Classification by religion, occupation, and educational status revealed that the majority of victims (129) were Hindu, accounting for 69.7% of the total. Among the casualties, 68 students (36.8%) experienced the highest number of accidents. Additionally, a significant portion of RTA casualties (87%) were literate, with most of them pursuing bachelor's degrees (28.6%) or studying at the secondary level (28.1%).

Table 1. Socio-demographic characteristics of RTA victims

Variables	Frequency	Percentage
Age		
< 18	29	15.7%
19-20	10	5.4%
21-30	68	36.8%
31-40	32	17.3%
41-50	26	14.1%
> 50	20	10.8%
Sex		
Male	103	55.7%
Female	82	44.3%
Ethnicity		
Brahimin/Chhetri	70	37.8%
Janajati	58	31.4%
Dalit	26	14.1%
Madhesi	22	11.9%
Muslim	9	4.9%
Religion		
Hindu	129	69.7%
Buddhist	27	14.6%
Christian	16	8.6%
Islam	13	7.0%
Occupation		
Student	68	36.8%
Service provider	41	22.2%
Farmer	23	12.4%
Business	22	11.9%
Laborer	16	8.6%
Housewife	7	3.8%

Variables	Frequency	Percentage
Foreign employment	4	2.2%
Unemployed	4	2.2%
Educational status		
Literate	161	87%
Illiterate	24	13%
Level of education		
Cannot read and write	24	13%
Can read and write	28	15.1%
Basic level	24	13%
Secondary level	52	28.1%
Bachelor's level	53	28.6%
Post-graduate	4	2.2%

Time factors, types of victims, types of vehicles, and the availability of medical history in RTA

Table 2 reveals that the majority of accidents (39, 21.1%) happened on Saturday, with 71 (38.4%) occurring between 12:00pm and 6:00pm, and 61 (33%) occurring between 6:00pm and 12:00am. Vehicles traveling at 40-60 km/h had the highest number of accidents, accounting for 102 (55.1 %) of the cases. Similarly, 80 (43.2%) of RTA victims were drivers, followed by 67 (36.2%) pedestrians and 38 (20.5%) passengers.

In terms of vehicle types, motorcycles accounted for 74 percent of all the accidents, and the majority of the casualties, 156 (84.3%), had no prior medical history.

Table 2. Distribution of RTAs by time, kind of victim, type of vehicle involved, and the medical history of a problem

Variables	Frequency	Percentage
Day of accident		
Sunday	24	13.0%
Monday	16	8.6%
Tuesday	22	11.9%
Wednesday	31	16.8%
Thursday	27	14.6%
Friday	26	14.1%
Saturday	39	21.1%
Time of accident		
6:00am to 12:00pm	46	24.9%
12:00pm to 6:00pm	71	38.4%
6:00 pm to 12:00am	61	33.0%
12:00am to 6:00am	7	3.8%
Speed of vehicles		
20-40 km/hr	14	7.6%
40-60 km/hr	102	55.1%
60-80 km/hr	55	29.7%
> 80 km/hr	14	7.6%
Types of victims		
Driver	80	43.2%
Pedestrian	67	36.2%
Passenger	38	20.5%
Types of Vehicles involved in RTA		
Light	115	62.2%
Heavy	70	37.8%
Heavy (n = 70)		
4 Wheelers (Car/ Jeep/ Van)	25	13.5%
Truck	23	12.4%
Bus	18	9.7%
Tractor	4	2.2%

Variables	Frequency	Percentage
Light (n = 115)		
Motorcycle	74	40.0%
2 Wheelers scooter	35	18.9%
3 wheelers tempo	6	3.2%
Having a history of Medical problem		
Yes	29	15.7%
No	156	84.3%

Human Factors in RTA

Table 3 shows the human factors associated with the RTAs. Drivers: Of the 185 victims, there were 80(43.23%) drivers; over half (58.75%) of the respondents had a driver's license, and the majority (48.75%) had 1 to 5 years of driving experience; 83.75% had no visual problems; and 77.5% did not use a cell phone while driving. Similarly, the majority (85%) reported that they did not consume alcohol while driving, 43.75% claimed that applying the emergency brake was the reason for the accident, and the majority (56.25%) reported that safety equipment like seat belts and helmets was used.

Passengers

Of the passengers, 81.57 % did not keep their heads outside the window while traveling, and 60.53 % sat in the back seat of the vehicle.

Pedestrians: 36.2% of the victims were pedestrians. Among them, 79.10% were not consuming alcohol, while 26.86% were using cell phones at the time of the accident. However, a significant proportion of accidents (77.61%) occurred when pedestrians did not use a zebra crossing.

Table 3. RTA and human factors among drivers, passengers, and pediatricians

Variables	Frequency	Percentage
Drivers with valid driving licenses *(n = 80)*		
Yes	47	58.75%
No	33	41.25%
Driving experience		
Less than six months	9	11.25%
6 to 1 year	14	17.5%
1 to 5 years	39	48.75%
More than 5 years	18	22.5%
Visual problem		
Yes	13	16.25%
No	67	83.75%
Using cellphone while driving		
Yes	18	22.5%
No	62	77.5%
Reasons for accident		
Applying emergency brakes (unexpected appearance of an object/person)	35	43.75%
Improper turns	22	27.5%
Trying to overtake another vehicle	18	22.5%
Not noticing /absence of required traffic sign/signal	17	21.25%
Pedestrians ignored the zebra crossing path	10	12.5%
Using body protection measures while driving		
Yes	45	56.25%
No	35	43.75%
Consuming alcohol while driving		
Yes	12	15%
No	68	85%
Sticking his head outside the window while traveling *(n = 38)*		
Yes	7	18.43%

Variables	Frequency	Percentage
No	31	81.57%
Position of the Passenger's seat (Front or back of the bus)		
Back	23	60.53%
Front	10	26.32%
Others	5	13.15%
Consuming alcohol at the time of accident (n = 67)		
Yes	14	20.90%
No	53	79.10%
Using cell phone		
Yes	18	26.86%
No	49	73.14%
Using a zebra crossing during an accident		
Yes	15	22.39%
No	52	77.61%

Environmental factors and RTA

In table 4, environmental factors associated with RTAs are shown. The result shows that highest number (36.2%) of the accidents occurred when the weather was rainy, followed by a cloudy sky (30.8%), and the lowest (2.7%) occurred when the temperature was extremely cold. Regarding the quality of the road, narrow roads (28.6%), slippery roads (25.9%) and potholes (24.9%) were the major reported causes of the accident. Similarly, 37.3% of the accidents occurred when lighting was not adequate, and 41.1% of accidents happened in situations where vehicles were overcrowded.

Table 4. Environmental factors and RTA

Variables	Frequency	Percentage
Weather on the day of accident		
Sunny	56	30.3%
Rainy	67	36.2%
Cloudy	57	30.8%
Extremely cold	5	2.7%
Poor quality of road		
Yes	120	64.9%
No	65	35.1%
If yes (n = 120)		
Narrow road	53	28.6%
Slippery	48	25.9%
Potholes	46	24.9%
No proper traffic sign	35	18.9%
Bumpy road	33	17.8%
Under-construction	21	11.4%
Adequate lighting		
Yes	116	62.7%
No	69	37.3%
Overcrowded vehicle		
Yes	76	41.1%
No	109	58.9%

Discussion

In this study, more than half of RTA victims were male (55.7%), and most of them (36.8%) were between the ages of 21 and 30. Similar findings were also documented in a report by WHO, as well as a study which was done in India and several parts of Nepal (8, 14-18). However, in a few studies, the age groups of 20 to 50 and 40 to 49 were found to be more involved in RTA(19, 20). The existence of this variation could be

related to the fact that the studies were conducted over a longer period of time. The present study revealed that drivers accounted for the majority of victims (43.2%), which aligns with earlier findings. For instance, a study conducted by Boniface et al. (21) in Tanzania reported a similar rate of 38.3%. However, some studies contradicted our findings. In western Nepal, a study showed that 19.17% of drivers were victims of RTAs (22). Conversely, Joshi (19), and Mishra et al. (20) observed that pedestrians were the most common victims of RTA, with a rates of 48.6% and 56.54%, respectively. The highest number of accidents (38.4%) occurred between 12:00 and 6:00 p.m., in line with findings from studies by Atreya et al. (9), Shrestha et al. (11) and Casado-Sanz et al. (23). In the current survey, 15% of drivers were found to have consumed alcohol, consistent with studies conducted by Jha and Agrawal (17), Abhilash et al. (24) and Manna et al. (25). Similarly, approximately 22.5% of drivers used their cellphones during accidents, which was lower than the rate reported in a study conducted in Saudi Arabia (26). According to this study, 16.25% of drivers had a vision problem. Similar findings were reported in another finding (18).

Motorcycle (40%) was the most common vehicle involved in traffic accidents. This was similar to the studies conducted by Hadaye et al. (18) Pathak et al. (27), and Sedain and Pant (28). In the current study, nearly half (48.75 %) of the respondents with 1 to 5 years of driving experience were involved in an accident. The current research revealed comparable results, with 47.9%, 48.9%, and 35.7 %, respectively (29-31).

In the present study, the majority (36.2%) of accidents happened during rainy weather. Consequently, narrow roads (28.6%) and high speeds of 40-60 km/h (55.1%) were major factors for RTAs. These findings were in line with those of the previous studies (22, 23, 27, 32-34).

Conclusion

Findings of this study revealed that Nepal has a high rate of RTA. The age of the victims, the types of vehicles, the speed of the vehicles, the road and weather conditions, and the violation of traffic rules are all critical factors in accidents. These detected factors must be taken into account by the appropriate authorities in order to control and prevent RTA.

Limitations

The findings may not be generalizable because the study was limited to one hospital, and only used a small sample size.

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Conflict of Interest

The authors declared no conflict of interest.

Authors' contributions

R. K; participated in the writing and designing of the study, performed the statistical analysis, and drafted the manuscript, B. P and S. KS; contributed to data collection, literature search, and preparation of the first draft of the manuscript. All authors contributed to the preparation of the final manuscript and jointly approved the final version for submission.

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