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A cross-sectional observational study on pattern of road traffic injuries presenting to Emergency Department in a tertiary care hospital in Kathmandu, Nepal

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Abstract

Introduction: Road traffic injuries (RTIs) is leading global public health issue, causing approximately 1.2 million deaths and 50 million injuries annually. The burden is high among individuals aged 15–44 years. Regions such as Africa and Southeast Asia report the highest mortality rates. Nepal is facing a rising trend with predominance of young males, emphasizing the urgent need for targeted preventive measures. This study aims to identify patterns of road traffic injuries in our setting, knowledge that can be used for future emergency preparedness.

Method: Cross-sectional observational study was conducted at Nepal Medical College Teaching Hospital, Emergency Medicine Department, from August 2021 to July 2022. Total of 316 patients who met inclusion criteria were selected. A proforma was created to capture demographic profile, vehicles involved, distribution of victims, mechanism of injury, time of accident, severity, and outcomes. Data was obtained and analyzed.

Result: Among 316 patients, 219 (69.30%) were male and 97 (30.70%) were female. 156 (49.37%) accidents occurred on weekends, and 160 (50.63%) occurred on other days. Weekday accidents occurred more from 6 am to 6 pm, whereas on weekends, from 6 pm to 6 am. Laceration was the most common injury, followed by fracture. Collision was the most common mechanism, followed by falling off. Most of the victims were drivers, followed by pedestrians.

Conclusion: RTIs predominantly affect young male drivers, particularly those operating two-wheelers. Laceration was the most common injury type, and personal factors like overspeeding, not using protective helmets, and alcohol consumption while driving were the leading contributors.

Keywords: Emergency road traffic injuries; Injury patterns; Road traffic injuries

INTRODUCTION

Road traffic injuries (RTIs) are defined as injuries, fatal or non-fatal, resulting from collisions involving at least one moving vehicle. Approximately 1.2 million die and 50 million people get injured annually in the world.¹ Low- and middle-income countries account for 85% of deaths and 90% of disability-adjusted life years (DALYs) lost to RTIs.² Age 15–44 years is affected more.³ Developing countries record high injury mortality rates, while North America, Western Europe, and Australia report the lowest.⁴ Africa has the highest RTI mortality rate, 28.3 per 100,000 population, costing 1–2% of its GDP, and South-East Asia contributes about 25% of global RTI deaths.⁵ India recorded 137,000 deaths and 469,000 injuries in 2013; this figure will double by 2027.⁶ In Nepal, RTAs account for 28.75 % of emergency injury visits⁷ and males are three times more likely to be injured than females, and most victims are aged 20–39 years, according to a study by Shrestha et al in 2017.⁸

This study aims to identify demographic factors, injury types, severity, outcomes, and injury patterns to inform preventive measures to reduce the burden of RTIs.

METHOD

This was a cross-sectional observational study conducted at Nepal Medical College Teaching Hospital, Department of Emergency Medicine, from August 2021 to July 2022. All patients who arrived in the Emergency Department of Nepal Medical College, Teaching Hospital, with RTA (Road Traffic Accident) were included in the study. Cases with all other accidental injuries, brought dead cases, and also cases that were not willing to participate in the study were excluded. The sample size for the study was calculated using the formula;

$$n = z^2 * pq/d^2,$$

where P stands for the prevalence of RTA injury (28.9%)⁷, Z stands for 95% confidence interval (1.96), $q=1-p$ (71.1%), d is the margin of error (5%). Replacing the values, a sample size of 316 was calculated.⁷ The study used a consecutive sampling method, in which all patients meeting the inclusion criteria during the study period were enrolled. Data were collected through direct interviews with patients, patient visitors, and security personnel (traffic police), supplemented by relevant clinical information obtained from hospital records. The interviews were conducted using a pre-designed, structured pro forma.

To ensure the inclusion of all eligible patients, data collection was conducted continuously for 24 hours. Trained data collectors (including duty medical officers/ Health Assistants/ Nursing staff) were available round the clock in the emergency department and wards, and patients fulfilling the inclusion criteria were interviewed either at presentation or once clinically stable or by the patient's visitor. This approach ensured that no eligible patient was missed during the study period. Brought dead patients were excluded due to difficulty in collecting data as mentioned in the proforma at the first point.

A proforma was created with demographic profile (Age and Sex), vehicles involved (2 wheelers/4 wheelers), distribution of victims (Passenger/ Driver/ Pedestrian) time of accident (6am-6pm/ 6pm-6am), The time frame was chosen to broadly differentiate daytime and nighttime accidents, as these periods are associated with distinct traffic patterns, visibility conditions, and road usage and is commonly used in trauma and emergency medicine studies for uniform data collection and simplified analysis.⁸ Mechanism of injury (Collision/ Fall/ Roll over), etiology of injury (Personal/ Road condition/ all other causes), in personal causes, over speeding, drinking and driving, and driving without a helmet were grouped. Severity (Urgent/Immediate/Delayed) and outcomes (admission/ discharged/ Referred/ Leave against medical advice) were also included. Severity of injury was assessed using Revised Trauma Score during triage. The primary aim of this study was to find out modes of road traffic injury and the severity of it in patients who presented in the ER; therefore, the patients were not followed for the outcomes of treatment, only those outcomes that were feasible and easily obtainable, like admitted, discharged, or referred, were recorded. For the same reason, dead patients were not included in the study because we found it morally challenging to query about the etiologies of RTA with visitors when they were emotionally not in a state to discuss it. Both verbal and written informed consent were obtained from all patients willing to participate in the study, or from the patient's visitor if the patient was unable to provide consent. Ethical approval was obtained from the IRC of Nepal Medical College and Teaching Hospital (Ref: 28-078/079)

The data were collected and compiled in Excel and analyzed in SPSS version 16.0. Descriptive statistics were reported as means and medians for quantitative data, and proportions for qualitative data. Fisher's exact test was used to study the association between host factors (age and gender), agent factors (types of vehicles and road conditions), and types of road traffic injuries, where feasible; otherwise, the Chi-square test was used. The level of significance was set at 5%, and a P value of < 0.05 was considered statistically significant.

RESULT

Among the 316 patients included in the study for 12 months, 19 (69.30%) were male, and 97 (30.70%) were female. Among males, 27 (8.54%) were from age 0-14, 176 (55.70%) were from age 15-49, and 16 (5.06%) were from age more than 50. Among females, 12 (3.80%) were from age 0-14, 78 (24.68%) were from age 15-49, and 7 (2.22%) were from the age group of more than 50. The mean age of the patients was 29.5 ± 15.4 years. The majority of patients, 254 (80.38%), were in the 15-49 age group (Table 1).

Considering the pattern of accidents, 156 (49.37%) accidents were reported on Friday and Saturday and the remaining accident 160 (50.63%) occurred on the other days of the

Table 1. Demographic characteristics of patients, N=316

Age Group (years)	Male n (%)	Female n (%)	Total n (%)
0-14	27(8.54%)	12(3.80%)	39(12.34%)
15-49	176(55.70%)	78(24.68%)	254(80.38%)
≥50	16(5.06%)	7(2.22%)	23(7.28%)
Total	219(69.30%)	97(30.70%)	316(100.00%)

Table 3. Distribution of types of injury and vehicles involved (n=316)

Particulars	Abrasion n (%)	Fracture n (%)	Hematoma n (%)	Laceration n (%)	Visceral Injury n (%)	Grand Total n (%)
2-wheelers	67(21.20%)	84(26.58%)	21(6.65%)	96(30.38%)	4(1.27%)	272(86.08%)
4-wheelers	12(3.80%)	14(4.43%)	10(3.16%)	8(2.53%)	0(0.00%)	44(13.92%)
Grand Total	79(25.00%)	98(31.01%)	31(9.81%)	104(32.91%)	4(1.27%)	316(100.00%)

Table 4. Distribution based on vehicles involved and mechanism of injury (n=316)

Mechanism	Two-wheelers n (%)	Four-wheelers n (%)	Total n (%)
Collision	129(40.82%)	29(9.18%)	158(50.00%)
Fell down	117(37.03%)	0(0.00%)	117(37.03%)
Roll over	26(8.23%)	15(4.75%)	41(12.97%)
Total	272(86.08%)	44(13.92%)	316(100.00%)

(Chi-Square test P<0.001)

Table 5. Distribution of victims & etiology

Victim Type	Road Condition n (%)	Personal Cause n (%)	Others* n (%)	Total n (%)
Driver	18(5.70%)	113(35.76%)	35(11.08%)	166(52.53%)
Passenger	8(2.53%)	12(3.80%)	8(2.53%)	28(8.86%)
Pedestrian	51(16.14%)	49(15.51%)	22(6.96%)	122(38.61%)
Total	77(24.37%)	174(55.06%)	65(20.57%)	316(100.00%)

*Others: poor lighting, bad weather, bad vehicle condition, slippery road
 week (Sunday to Thursday) among which 42 (13.29%) occurred between 6 am to 6 pm, and 118 (37.34%) occurred in between 6 pm to 6 am. In terms of the time of accidents, 223 (70.57%) occurred between 6 pm and 6 am, while 93 (29.43%) occurred during the morning and daytime (6 am to 6 pm). There was no statistically significant association between time of day and day of the week for road traffic accidents (Fisher's exact test, p = 0.219) (Table 2).

Based on the type of injury, lacerations were the most common, accounting for 104 (32.91%) cases, followed by fractures, which accounted for approximately one-third of the cases (98, 31.01%), and one-fourth were abrasions (79, 25.00%). Hematoma 31 (9.8%) was observed in one tenth of patients. Among the patients with visceral injuries, 4(1.27%) were splenic injuries, two of which occurred due to injury sustained with the handle of a bicycle. The finding suggested that patients involved in accidents with two-wheelers (272; 86.08%) had the highest injury incidence, compared with those in four-wheelers (44; 13.92%). (Table 3).

The most common mechanism of the accidents was collision, accounting for 158 (50.00%), of which 129 (40.82%) were from two-wheelers and 29 (9.18%) from four-wheelers. Falling down accounted for 117 (37.03%) of the accidents, and all involved two-wheelers. Rollovers were responsible for 41 (12.97%) of the accidents and were predominantly associated with two-wheelers (272, 86.08%),

Table 2. Days and time range distribution of RTA (n=316)

Time Range	Friday & Saturday n (%)	Other Days n (%)	Total n (%)
6 AM-6 PM	51(16.14%)	42(13.29%)	93(29.43%)
6 PM-6 AM	105(33.23%)	118(37.34%)	223(70.57%)
Total	156(49.37%)	160(50.63%)	316(100.00%)

(Fisher's Exact P-Value= 0.219)

with four-wheelers involved in the remaining 44 (13.92%). The observed associations between the mechanism of injury and the types of vehicles involved were statistically significant, with a p-value calculated using the Chi-square test of less than 0.001 (Table 4).

Among the RTA victims, 166 (52.53%) were drivers, 122 (38.61%) were pedestrians, and 28 (8.86%) were passengers. Personal causes were found to be the major contributors to road traffic accidents, 174 (55.06%), followed by road conditions such as bad roads, turning, and road hump, 77 (24.37%). Other factors, such as poor lighting, poor vehicle condition, bad weather, and slippery roads, accounted for the remaining 65 (20.57%) cases (Table 5).

The severity of road traffic accidents (RTA) was determined using the Revised Trauma Score (RTS), which revealed 183 cases (57.91%) in the delayed category, 73 (23.10%) in the urgent category, and 60 (18.99%) in the immediate category. Of these patients, 98 (31.01%) were admitted to the hospital, 124 (39.24%) were discharged, 7 (2.22%) were referred, and 87 (27.53%) left against medical advice. Among the injury locations, 195 (61.71%) involved the limbs, 111 (35.13%) involved the head and neck, 6 (1.90%) involved the trunk, and 4 (1.27%) involved visceral injuries.

DISCUSSION

Among victims of road traffic accidents (RTAs), most were male and aged 15-49. The mean age of the patients was 29.5 ± 15.4 years. Similar results were found in studies conducted by Shamim Muhammad at the emergency department in Karachi,⁹ Pakistan, Chaturvedi, et al., at the Emergency Department in Maharashtra,¹⁰ India, Agnihotri and Joshi et al at the emergency department of Manipal Teaching Hospital, Pokhara, Nepal,¹¹ which showed that males were more commonly affected by RTAs than females. The dominance of age and sex in travel behavior reflects differences in social roles and job activities. Younger people are often away from home for education, and males are typically the breadwinners who travel more frequently for work; consequently, they tend to use public and private transport more often and are more prone to accidents.¹² Another study by Marak, et al., in Puducherry, India, showed contrasting results in which the maximum number

of victims belonged to the age group of 51-60 years (22.9%). Diminished vision at an older age while crossing roads was a factor in this result.¹³

Substantial RTAs occurred on Fridays and Saturdays (2 Days), 156 (49.37%), as compared to the rest of the week (5 Days), 160 (50.63%). Similar findings were reported by studies conducted by Shrestha et al.⁸ in the hilly region, and Bhandari B et al,¹⁴ in the Terai region of Nepal. However, another study in Greece by Pikoulis, et al.,¹⁵ found that most accidents occurred during weekdays rather than weekends. This regional variation in RTAs suggests temporal relation with lifestyle, holidays, traffic volume, and habits like drinking and driving with RTAs.¹⁶

Most accidents in our study occurred during evening and night hours, consistent with the findings of Bhandari et al.¹⁴ in Nepal. and Neeraj K, et al.¹⁷ in India. In the evening, traffic on the roads is heavier as many people return home from work. Poor lighting on roads, combined with drink-driving and riding without helmets, contributes to a higher incidence of accidents.¹⁴ However, a study by Shrestha et al in Nepal highlighted that accidents also occur between 6 am and 12 pm, particularly during foggy mornings when visibility on the roads is reduced, and people may be in a hurry to reach their workplaces.⁸

Lacerations were the most common type of injury observed in the present study, accounting for 104 cases (32.91%), with the majority of these injuries occurring among victims involved in two-wheeler accidents, 96 cases (30.38%). This finding is consistent with the study by Sharma et al.¹⁸, which also reported lacerations as the predominant injury pattern, particularly among two-wheeler users, likely due to inadequate physical protection and direct exposure at the time of impact. In our study, lacerations were followed by fractures in 98 cases (31.01%) and by abrasions in 79 cases (25.00%). The higher incidence of fractures and abrasions further highlights the vulnerability of road users, especially riders of two-wheelers, to high-energy trauma resulting from collisions and falls.

In contrast to our findings, a study conducted by Al-Thaifani, et al.¹⁹ in Yemen reported fractures as the most common injury type, predominantly associated with four-wheeler accidents, suggesting variations in injury patterns based on vehicle type, road conditions, and safety practices across different regions. Similarly, Boo and Choi²⁰ identified sprains and dislocations as the major injuries in their study population, reflecting differences in traffic dynamics, preventive measures, and reporting systems. These variations across studies underscore the influence of local traffic environments, vehicle usage patterns, and compliance with safety measures on the spectrum of injuries sustained in road traffic accidents.

In the present study, collision emerged as the most common mechanism of injury, accounting for 158 cases (50.00%), followed by falls from vehicles, which constituted

117 cases (37.03%), while rollover injuries were observed in 41 cases (12.97%). This pattern was evident among both two-wheeler and four-wheeler victims, although the burden was disproportionately higher among two-wheeler users, reflecting their increased road vulnerability. The predominance of collision-related injuries, particularly among two-wheelers, may be attributed to factors such as poor vehicle stability, inadequate physical protection, high speeds, congested traffic, and limited adherence to road safety measures, including helmet use.

These findings are consistent with studies conducted by Poudel, et al.,²¹ Pohrel, et al.,²² and Shrestha et al.⁸ in Nepal, as well as Wangdi, et al.²³ in India, all of which identified collisions as the leading mechanism of road traffic injuries. The similarity in injury patterns across these studies suggests shared regional risk factors, including mixed traffic systems, inadequate road infrastructure, and unsafe driving behaviors. In contrast, a study conducted by Muhammad Shamim⁹ in Karachi, Pakistan, reported skidding as the most common mechanism of injury, highlighting regional variations in road conditions, road traffic, and driving practices. Such differences emphasize the influence of local environmental and behavioral factors on the mechanism of road traffic injuries and underscore the need for region-specific preventive strategies.

The findings of this study recommend strengthening road safety practices, promoting helmet and seatbelt use, improving road infrastructure, and implementing targeted awareness programs focusing on the 15-49 age group. It also recommends drivers to be more aware during the 6 pm to 6 am window and also during weekends. This study, however, is a single-center study with a limited time duration, which may limit the generalizability of findings. Also, because data were collected from hospital records and patient interviews, information and recall biases may have occurred, particularly given the circumstances of the accident. Selection bias is also possible, as only patients presenting to the study hospital were included, potentially excluding less severe cases or fatalities occurring at the scene.

CONCLUSION

Road traffic injuries predominantly affect young male drivers, particularly those operating two-wheelers. Lacerations and fractures were identified as the most common injury patterns, pertaining to limited physical protection by two-wheeler riders which increased their exposure during collisions and falls.

Personal factors like over speeding, not using protective helmets, and alcohol consumption while driving were the leading contributors to road traffic injuries, compounded by poor road conditions, poor lighting, and below par road infrastructure.

DECLARATIONS

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Conflict of Interest

There was no conflict of interest.

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Ethical Clearance

Ethical Approval was taken from the Institutional Review Committee of Nepal Medical College, Jorpati, Kathmandu.

Consent

Written and verbal consent for the study was obtained from the patient or their visitor after explaining the study's purpose in detail.

Data Availability Statement

The data can be assessed from the Nepal Medical College library repository (Ref: 28-078/079).

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