

Road Traffic Accident and its Characteristics in Kathmandu Valley

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ABSTRACT

Introduction: Road traffic accident is alarming in Nepal. The objective of this research is to find out the characteristics of RTA in central part of Nepal.

Methods: A prospective descriptive study was taken from 1 August 2014 to 31 July 2015. Data were collected from postmortem department and nine hospitals in Kathmandu Valley. Inventory sheets with targeted variables for secondary sources were created.

Results: A total of 3461 morbidity cases from hospitals and 265 mortality cases from postmortem department were included in this study. The ratio of male victim to female was 2.3:1. Around 75% of victims were between 15-49 years old. Pedestrians were the most vulnerable (33%) followed by riders of motorized 2-3 wheelers. Two wheeler motorized vehicles were most frequently (67.2%) involved in RTAs. More RTA occurred on daytime, Saturdays, July and November. Around half of the victims did not arrive in hospitals in one hour. The most common injury type was soft tissue injury (37.6%), followed by open wound (20.9%), fracture (18%) and traumatic brain injuries (12.7%).

Conclusions: According to the characteristic of RTA found in this study, following preventive measures are recommended. Helmet was necessary for two wheeled backseat riders. Road safety education towards age group of 15-49 was compulsory. Precaution should neither be omitted regarding road safety on weekends, holidays, nor in rainy and festival season. Future studies could be focused on estimation of burden of disease caused by RTA and its determinants in Nepal.

Keywords: *injury; Nepal; road traffic accident; road safety.*

INTRODUCTION

Road traffic accident (RTA) emerged as second global public health challenge.^{1,2} In 2013, guided by Global Plan for the Decade of Action for Road Safety,³ Nepal government developed its own plan.⁴ However, it is challenging to achieve all targets in time because the availability and validity of RTA data in Nepal are still lacking.⁵

Moreover, the only source of the RTAs data was from Traffic Directorate of Nepal Police Headquarters which

only covered reported police cases with limited variables. Those RTA victims who were sent to hospitals by themselves, relatives, taxi drivers or passerbys might not be recorded by the police. Very few publications related to RTA in Nepal based on single hospitals were available.

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Therefore, this research was set to find out the magnitude of RTA and its characteristics based on data from nine major hospitals and the only postmortem department from Kathmandu Valley.

METHODS

This was a prospective descriptive study on RTAs which was taken from 1 August 2014 to 31 July 2015 in Kathmandu Valley, Nepal.

Study population All patients who visited to hospitals due to RTA and records of dead persons which were taken to Forensic Department.

Study sites and justification This study was undertaken in Kathmandu Valley, the political, economic and cultural center of Nepal. It is bowl-shaped, surrounded by four hill ranges. The valley consists of three districts: Kathmandu, Lalitpur and Bhaktapur, which covering an area of 570 square meters. The population in this valley was around 1.33 million in 2011.^{6,7} Till 2013 July 1st, the registered vehicles Kathmandu Valley is 639,159, while motorbikes took the major percent to 79.4%. The annual growth-rate of vehicle registrations range from 9 to 17%. It was estimated that 54% of total number of accidents by average through 2000-2010 across Nepal.⁸

Nine major hospitals in Kathmandu Valley which were famous for treatment of trauma and injuries were selected for collecting morbidity data: Bir Hospital, Tribhuvan University Teaching Hospital, Kathmandu Medical College (KMC) teaching hospital, Annapurna Hospital, Kathmandu Model Hospital, Patan hospital, KIST teaching hospital, Nepal Medical College (NMC) Teaching Hospital and Bhaktapur hospital.

Mortality data were collected from Forensic Department of Tribhuvan University, Institute of Medicine, which was authorized by the Government of Nepal to conduct postmortem in Kathmandu Valley.

Data collection tools Inventory sheets based on international classification of injuries were (Annex Table D)⁹ were developed.

Morbidity data from hospitals were collected by appointed doctors who have been trained and guided to collect data. When that appointed doctor was on leave, another doctor was assigned for the same task. The data was collected and checked once a week in the first month, and once every two weeks in the next 11 months. Mortality data from traffic police office and department of Forensic Medicine was collected once a week by principle researcher with the assistance of duty doctor and policeman from postmortem department. Both morbidity and mortality data were crossed-

checked with traffic police office.

Inclusion criteria All RTA victims were treated in selected hospitals and reported to Forensic Department from August 1, 2014 to July 31, 2015 were captured in the study.

Exclusion criteria Any injury on the road without involvement of a vehicle or injury involving a stationary vehicle, or RTAs which not occurred in Kathmandu Valley were excluded in this study.

Data management and statistics analysis: Morbidity data were entered through Epidata 3.1 and mortality data was entered in Excel 2007 then exported to SPSS. SPSS version 16 was used to analyze frequency of each characteristic.

Ethical approvals: This study was approved by Institutional Review Board, Institute of Medicine, Kathmandu, Nepal Health Research Council and all relevant hospitals and departments.

RESULTS

The total number of RTA victims collected from 9 major hospitals in Kathmandu Valley during one-year study period was 3498. Among them, 17 patients were issued death certificates, 12 were found to be transferred to one of the study hospitals and 18 repeated visits to the same hospitals. Altogether 37 patients were excluded. So total effective number of RTA morbidity cases in the study was 3461.

Nine victims who were brought from outside of Kathmandu Valley to Forensic Department was exclude. Thus, the valid mortality number was 265.

The sex of 12 victims was missing from hospital hospitals. Among the remaining 3449 cases, 2385 (69.2%) were male, and 1064 (30.8%) were female. The male to female ratio was 2.24:1. For Mortality data, the proportion of male and female were 73.6% and 26.4% respectively, sex ratio was 2.8:1. The total number of male RTA victims was 2.28 times higher than female (Table 1).

There were 26 patients whose age had not been mentioned or could not be identified from the hospital records sheet. Among the remaining 3435 RTA victims, highest occurred on 15-29 age group which comprised 44% of all age group, followed by the 30-49 age group (29%). In the mortality cases, 15-29 and 30-49 age groups were also the top two groups which took up to 33.8% and 31.2% respectively (Table 1).

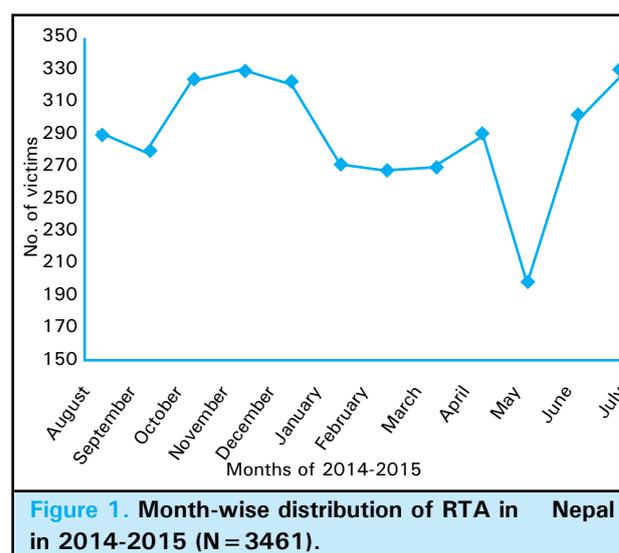
Table 1. Demography distribution among the RTA Victims by sex, age, role of victims and type of involved vehicles in Kathmandu Valley, Nepal from 2014-2015.

Demographics	Morbidity (%)	Mortality (%)	Total
Sex			
Male	2385 (69.2)	195 (73.6)	2580 (69.5)
Female	1064 (30.8)	70 (26.4)	1134 (30.5)
Age,y			
00-04	139 (4.0)	8 (3.0)	147 (4.0)
05-14	368 (10.7)	19 (7.2)	387 (10.5)
15-29	1513 (44.0)	89 (33.8)	1602 (43.3)
30-49	998 (29.1)	82 (31.2)	1080 (29.2)
50-69	337 (9.8)	50 (19.0)	386 (10.4)
70+	80 (2.3)	15 (5.7)	95 (2.6)
Median	25	35	26
Victim Role			
Drivers of 4- or more wheeled vehicles	5 (0.2)	2 (1.5)	7 (0.3)
Riders (motorized 2- or 3-wheelers)	667 (30.0)	28 (21.2)	695 (29.5)
Passengers(all vehicles)	320 (14.4)	48 (36.4)	368 (15.6)
Cyclists	88 (4.0)	5 (3.8)	93 (3.9)
Pedestrians	1143 (51.4)	49 (37.1)	1192 (50.6)
Vehicle type			
Bicycle/ rickshaw/ trolley	120 (4.2)	5 (2.9)	125 (4.2)
Motorcycle/ Scooter	1904 (67.2)	67 (38.7)	1971 (65.6)
Tempo	52 (1.8)	1 (0.6)	53 (1.8)
Car/jeep/SUV/ van	292 (10.3)	10 (5.8)	302 (10.0)
Microbus/ minibus/bus/ ambulance/ pickup	332 (11.7)	56 (32.4)	388 (12.9)
Crane/dozer/ truck/tipper/ tanker	132 (4.7)	34 (19.7)	166 (5.5)

injured and half (51.8%) of killed victims were not identified in the record whether they were pedestrians, passengers or drivers. Among the identified victims, pedestrians occupied the highest proportion (50.6%), next were riders of motorized 2-3 wheelers (motorcyclist, scooter riders and tempo) and passengers of all vehicles. Drivers of 4 or more wheeled vehicles took the lowest composition (Table 1).

Vehicles types involved in RTA: Involved types of vehicles through 1039 (30.0%) RTA morbidity and 152 (55%) mortality victims have not been mentioned. Among the remaining 2422 morbidity cases, 402 cases were involved with 2 types of vehicles, and 4 involved with 3 types of vehicles. Among the 122 mortality cases which mentioned the involved vehicles, 51 cases were involved 2 types of vehicles and the left were self accidents. In both morbidity and mortality cases motorcycles/scooters and microbus/minibus/bus/ ambulance/pickup took the first and second position respectively (Table 1).

Date, day and pre-hospital time interval of RTA: The dates of seven hospitals using Nepali calendar were transformed to International Calendar. July and November were found to have the highest number of RTA following October and December (Figure 1). It was found that Saturdays have the highest rate of RTA (16.1%, Figure 2).

**Figure 1. Month-wise distribution of RTA in Nepal in 2014-2015 (N = 3461).**

Victims of RTA: More than one third (35.8%) of the

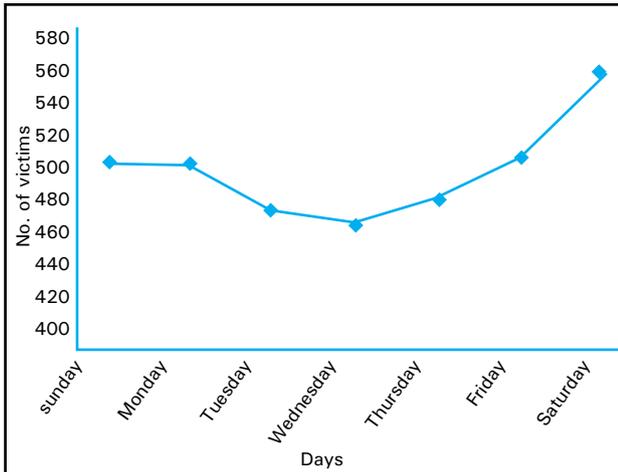


Figure 2. Day-wise distribution of RTA in Nepal (n = 3461).

In the present study, only 1296 RTA cases occurred time have been mentioned. The top number of accidents occurred within 12:00-15:59; following periods 16:00-19:59 and 08:00-11:59. The peak time of emergency arriving time was from 16:00-19:59 (28.9%). Next were 12:00-15:59 and 08:00-11:59 (Figure 3). The time of mortality victims were not recorded. Both emergency arriving and accident occurring time for 1139 cases out of 3461 have been recorded. The mode of time spending between RTA occurred and emergency department arriving time (pre-hospital interval) was 30 minutes, and 59.5% of RTA victim's time spent on road was within 60 minutes. The range of pre-hospital interval time was from 3 minutes to 60 hours.

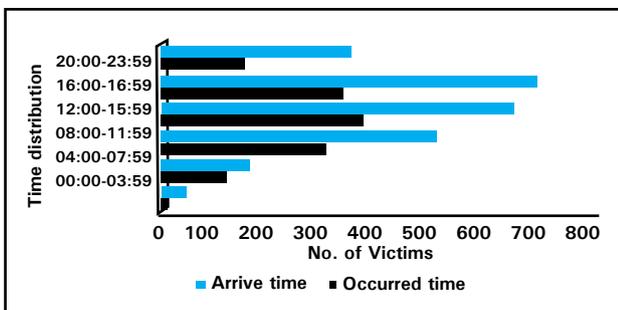


Figure 3. Time of RTA occurred and hospital arrived from 2014-2015.

Injury categories: Out of 3461 RTA cases, in 3408 cases the injury type were recorded. In total, 821 victims (24%) were suffering more than one type of injuries; It was found that injuries of muscle and tendon (37.6%) was the most common injury type among all victims, next were open wound (20.9%), fracture (18%) and traumatic brain injury (12.7%, Figure 4). The injury types of few mortality cases were recorded. So it was not analyzed in this study.

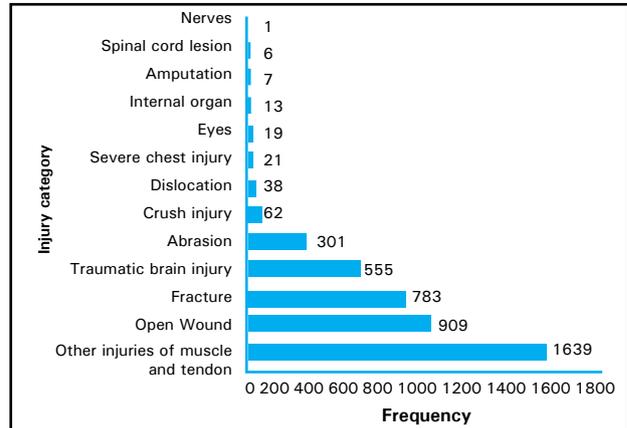


Figure 4. Injury type distribution of RTA in 2014-2015.

DISCUSSION

The selected nine major hospitals in Kathmandu Valley in this study were used to treat trauma and injury; therefore the present study fairly captured the total RTA cases record during the study period.

The differences of patients' number within each district and hospital may be affected by density of RTA where the hospital located. Hospital's fame, scale, transportation convenience and cost of medical services were also important factors for the victims to consider.

The male victims were around 2.3 times higher than female both in morbidity and mortality cases according to this study. The ratio was lower when compared with previous studies (4 and 9).¹⁰⁻¹³ The trend of decreasing of sex ratio also found in one latest review article.¹⁴ This may be due to more and more females were involved in social work. Because we found that more female victims of car drivers, passengers and pedestrians were exposed in this study.

It was found that 43.3% of the victims were in the age group between 15-29 years in this study. While one recent study in Nepal showed that the most common affected age group was 30-44 years. This indicated that more people from younger age group were involved in RTAs, which added a huge burden to the family and society. Similar observations were also made by others.¹⁵

It has to be noticed that passengers took the second position (36.4%) of the mortality cases. This may be due to the overloaded vehicles and extremely narrow and steep road in Nepal.⁸ The proportion of pedestrians(51.4%) being involved in this study is very high when compared with other researches of developing countries (20% being pedestrians).¹⁶ But

the proportion was slightly decreased when compared with one study (56.5%) in 2006 in one of the hospitals in Nepal,¹⁷ This may be due to the increasing number of involved motor vehicles, so proportion of vehicles occupants injuries have been increased.

Motorcycle/scooter also listed as the number one vehicle involved in RTA fatality. From the official report we found that motorcycle/scooter took the highest proportion (85%) in Nepal registered vehicles. The majority of hospital cases involved by motorcycles/scooters (67.2%) in this study were similar to another study (65%) in Nepal.¹⁸ While some study found some other motorized vehicles like trucks were involved in the highest number of accidents.¹³ In this study microbus/minibus/bus/ambulance/pickup was listed in the second position of fatalities in involved vehicles. In Nepal one of the most common modes of transportation used by people are microbus/minibus/bus, this maybe reflected by the fact that their passengers constituted the second highest number (32.4%) of RTA victims.

In the present study, the number of RTA which was over 300 was observed in July, October, November and December. The reason lied in may be due to July is the raining season, therefore, wet conditions of the road. October to December were the Nepali grand festivals season, more parties and relatives' gathering were organized in this time. But in one study in Eastern Nepal it showed the rate of RTA was lowest in October and November and highest in January and July.¹⁰ RTA is less in May of 2016 compared with other months may be due to the destructive earthquakes occurred on April 25 and May 12, almost all shops, schools and offices were closed in that month. People went back to their hometown and most of the foreigners for business or tourism ran away to their own country. In the present study, more RTA occurred on Saturdays and less on Wednesdays. This pattern was same with studies in Delhi and California,^{19,20} where they found the highest occurrence of RTAs were also on Saturdays. In another study from Delhi, the highest number of RTAs was observed on Sundays, Mondays, Wednesdays or Fridays.^{10,21} The reason why Saturdays have more accidents in this study could be that people left homes for various purposes on Saturdays; because it is the only holiday in a week in Nepal.

The highest number of RTA occurred peak time in this study was between 12 and 15:59 (28.9%). The same proportion (28.9%) of RTA hospital arrived time was observed between 16:00-19:59. There are 77% of accidents took place from 8 AM to 8 PM. Similar results were also observed in Delhi, more than 60% of RTA occurred from 6 AM to 6 PM.²² These time periods coincided with the period when people were more active and mobile.

The first 60 minutes after injury occurrence-referred to as the "golden hour"-are vital for saving lives. Where the pre-hospital time in this study is quite long when compared to other studies.^{23,24}

Injuries of muscle and tendon were the most common types of injuries (37.6%). This proportion of injury type was similar with one India study (40.7%).²⁵ But in developing countries like French, it was reported injuries of muscle and tendon took only 7.1% but fractures were 25.6% among all the injuries.²⁶ This may due to the benefit of narrow road and forcefully slow driving in Kathmandu valley. Traumatic brain injuries were also very high in Kathmandu Valley (12.7%). But in that French study brain injuries only took 1.4%.²⁶ It could be explained that motorcycle pillion riders did not wear helmets in Nepal, more brain injuries occurred among pillion riders of motorcycles.

CONCLUSIONS

Majority of RTA victims were found in hospitals from Kathmandu district. In morbidity cases, 15-29 age group male motorcycles riders were more exposed; however, female pedestrians and passengers RTA victims were vulnerable. Common public transportation vehicles like microbus, minibus and bus, heavy special vehicles like crane, dozer, truck, tractor, tipper and tanker took high proportion in mortality cases. More RTAs occurred on Saturdays and in rainy and festival season. Less RTA victims were recorded in the post-earthquake period due to less density of transportation in that month. More accidents occurred and visited hospital at day time. Around 40% of victims' pre-hospital interval time was more than one hour. Soft tissue injury, open wound, fracture and brain injury were the top four injury categories.

Worldwide experience has shown that enforcement of road safety actions, along with mass behavior modification and education are crucial to the rapid improvement of road safety. According to the characteristic of RTA found in this study, following relevant preventive measures are recommended: Pavement, separated lane for bicycles, motorcycles and four wheeled vehicles shall be constructed on the busy roads; Helmet shall be required for backseat riders. There is clearly a need for road safety education towards all road users especially the age group of 15-29. Enough medical staff shall be arranged in Emergency Department from 16:00 to 20:00. More attention shall be paid by all road users on Saturdays and during rainy and festival seasons.

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