

Epidemiology of Road Traffic Accidents in Nepal: Data Review and Qualitative Analysis

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Abstract

Background: Nearly 1.3 million people die each year as a result of Road Traffic Accidents (RTAs). More than nine in every ten (91%) of the world's RTA fatalities were from low and middle income countries such as Nepal. This study aimed to describe epidemiology of RTAs and reasons for delayed post-crash response in one of the major highways in Nepal.

Methods: This study employed a cross-sectional design including both quantitative and qualitative techniques of data collection. The study area was Nagdhunga to Narayangadh road segment of Prithvi Highway. Data collection included key informant interviews, observation of the sites and inventory of road traffic accidents for the years 2011 and 2012. Qualitative data were analyzed through content analysis while quantitative data were analyzed using MS Excel software.

Results: One thousand and twelve accidents were reported over the study period involving a total of 1,383 vehicles. Among the vehicles involved in accidents, truck and tripper were at the top position (27%), followed by two wheelers (25%). Highest number of accidents occurred during the month of October coinciding with the higher traffic during because of major national festivals. Inadequate communication immediately after the crash and narrow and steeper roads delayed post-crash response. Additionally, scarcity of rescue teams and ambulance posed serious barriers in timely hospitalization of the victims.

Conclusion: Truck, trippers and scooters were vehicles involved in majority of accidents. Roads with severe turning, lack of adequate street lighting and the festival seasons were main reasons for RTAs. Establishing trauma centres and strengthening trauma units of tertiary care hospitals, establishing rescue teams at every 10-kilometer long road segment of the highway and formation of effective coordination committees at local level would strengthen post-crash response.

Introduction

Road Traffic Accidents (RTAs) have emerged as an important globally notable public health challenge in the 20th century [1-3]. As per the World Health Organization (WHO) estimates, globally the annual death from RTAs is nearly 1.3 million [4]. In addition, 20-50 million people are injured from these accidents and such injuries are leading cause for disabilities [4].

The largest proportion of road traffic deaths is in middle-income countries (49.6%) followed by low-income countries (41.9%) with remaining 8.5% deaths in high-income countries [5].

The trend in RTA injuries and death is increasing at an alarming rate in Nepal. In 2009/10, RTAs killed more than 1,734 people and an additional 11,000 people were injured [6]. Out of the total RTA-injuries in Nepal, about half were in Kathmandu Valley; however fatalities were higher outside the Kathmandu Valley. Researches indicate that people between 15-40 years of age are most affected in RTAs, among which most of the motorcycle accidents occurred in urban areas while majority of buses and truck accidents occurred in the rural areas. About 40% accidents happened after sunset, although traffic flow reduces at that time period [4-6].

In May 2011, Nepal launched United Nations Decade of Action for Road Safety 2011-2020 with five pillars of action for road safety. One of the important pillars of the plan of action is proper post-crash response in case of RTAs to provide appropriate emergency treatment and longer-term rehabilitation for crash victim.

This study included 140-kilometer-long road segment of Prithvi Highway stretching from Nagdhunga to Narayangadh. Prithvi Highway is a 174-kilometer-long highway connecting Kathmandu, the capital city of Nepal and Pokhara, the headquarters of Western Nepal as shown



in Figure 1. This study aimed to document the places with frequent road traffic accidents, types of vehicles involved in those accidents and reasons for delayed post-crash response.

Methods

This cross-sectional study was conducted during June-July 2013 including two weeks of field works. The Nagdhunga to Narayangadh road segment covering 80% of total length of Prithvi Highway was purposely selected for this study, because of high traffic of vehicles and high number of RTAs every year in this road segment. We divided the road segment into four clusters: Cluster 1 (Nagdhunga – Galchhi), Cluster 2 (Galchhi – Benighat), Cluster 3 (Benighat – Mugling) and Cluster 4 (Mugling – Narayangadh). Both qualitative and quantitative techniques of data collection were used. The Ministry of Health and Population (MoHP), Nepal approved this study.

A total of 70 key informant interviews (KIIs) were conducted. The KIIs included stakeholders – local inhabitants (12), transport workers (12), hotel owners (8), security personnel (16), pharmacy retailers (4), accident survivors (6), victims' relatives (4) and government officials (8). Each KII took 20-30 minutes duration. Recorded information was triangulated with the quantitative information. We developed an inventory sheet of RTAs to collect RTA statistics over the two years period (2011-2012) from the Area Police Office, Armed Police Force office, Traffic Police offices and local health institutions. To report the time of accident in inventory sheet, a 24-hour day was categorized in different 6 time slots with four hours duration in each slot starting from zero hours (midnight). Accident sites were observed on the field.

Table 1: Vehicle types in RTAs by year.

SNo	Vehicle Type	Year		Total	
		2011	2012	No.	%
1	Truck, tripper	153	211	364	26.32
2	Motorcycle, scooter	152	183	335	24.22
3	Bus, minibus	151	167	318	22.99
4	Car, van, jeep, taxi	74	138	212	15.33
5	Microbus	57	33	90	6.51
6	Tractor, mini truck	14	16	30	2.17
7	Tanker	9	12	21	1.52
8	Others	5	8	13	0.94
Total		615	768	1383	100

Table 2: RTAs by timing.

SN	Time (hours)	Year		Total	
		Timing	2011	2012	No. %
1	00 – 04	12 PM-4 AM	22	11	33 3.26
2	04 – 08	4AM- 8 AM	41	59	100 9.88
3	08 – 12	8 AM- 12 PM	104	114	218 21.54
4	12 – 16	12 PM-4 PM	119	144	263 25.99
5	16 – 20	4 PM-8 PM	112	136	248 24.51
6	20 – 24	8 PM-12 PM	60	53	113 11.17
7	N/A	others	8	29	37 3.66
Total			466	546	1012 100.00

Quantitative data were entered and analyzed using Microsoft Excel. The qualitative data were analysed using qualitative content analysis method. The emerging themes identified through content analysis were tabulated for corresponding data and participant characteristics [7].

Results

Accidents over the study period

One thousand and twelve accidents were reported over the study period with 3.6 accidents per km per year. Out of total accidents, 466 were recorded in 2011 whereas 546 in 2012.

Comparing the monthly data, October stands in the top position with 15% of accidents followed by January 9% and September 9%. The lowest accident occurred in the month of April (5.0%).

Vehicle types involved in RTAs

Out of a total of 1,383 number of vehicles involved in the accidents, 615 vehicles were recorded in 2011 and 768 in 2012 as shown in Table 1. When comparing the vehicle types involved in accidents, truck and tripper were in the top position (27%) followed by motorcycle and scooter (25%). The least involved vehicles were ambulance, autorickshaw, rickshaw and bicycle.

RTAs by timing

Most of the accidents occurred in day time between 8 to 20 hours. Ranking total accidents by timing, accidents during 12 to 16 hours ranked the first with 26% of total accidents. Accidents in 16 to 20 hours and 8 to 12 hours ranked in the second and the third position respectively. Accidents during 0 to 4 hours were in the lowest position for both years as shown in Table 2.

Fatalities in RTAs by cluster

We recorded 236 deaths during the study period of two years. This corresponds to a 23.3% fatality rate among accident victims. Out of total fatalities, 200 people died on the spot and 36 died on the way to a health facility. Highest number of on-the-spot death occurred in cluster 4 (Mugling to Narayangadh). In cluster 1 (Nagdhunga to Galchhi), the spot death number is the lowest as shown in Table 3 and Table 5.

Table 3: Fatalities in RTAs by cluster.

SN	Cluster	No. of Accident	Spot	On the Way	Total	
					No.	%
1	Nagdhunga - Galchhi	164	19	13	32	13.56
2	Galchhi - Benighat	300	42	2	44	18.64
3	Benighat - Mugling	230	41	16	57	24.15
4	Mugling - Narayanghat	318	98	5	103	43.64
Total		1012	200	36	236	100

Table 4: Injuries in RTAs by cluster.

SN	Cluster	No. of Accident	Major	Minor	Total	
					No.	%
1	Nagdhunga – Galchhi	164	187	119	306	19.55
2	Galchhi – Benighat	300	161	360	521	33.29
3	Benighat – Mugling	230	148	270	418	26.71
4	Mugling - Narayanghat	318	95	225	320	20.45
	Total	1012	591	974	1565	100

Table 5: Fatalities and injuries in RTAs by timing.

SN	Time (Hours)	No. of Accident	Fatalities	Injuries	Total	
					No.	%
1	00 – 04	33	1	48	49	2.72
2	04 – 08	100	61	181	242	13.44
3	08 – 12	218	48	329	377	20.93
4	12 – 16	263	46	329	375	20.82
5	16 – 20	248	58	420	478	26.54
6	20 – 24	113	18	191	209	11.60
7	N/A	37	4	67	71	3.94
	Total	1012	236	1565	1801	100.00

Injuries in RTAs by cluster

The total number of 1,565 injuries were reported, out of them 591 were major cases and 974 are minor. Cluster 1 (Nagdhunga to Galchhi) had the highest (n=187) number of major injuries whereas cluster 4 (Mugling to Narayanghat) had the lowest (n=95). Out of total minor accidents, cluster 2 had the highest (n=360) and cluster 1 had the lowest (n=119) as shown in Table 4.

Findings from qualitative interviews

Current facilities and practices for post-crash response: For minor injuries, accident survivors availed services from health posts and small clinics nearby served for first aid. However, serious cases of accidents were taken to tertiary hospitals in Bharatpur and Kathmandu. There were no specific hospitals or trauma centres near the highway segment targeted for RTA victims. The local facilities available along the highway were local health posts, Malekhu Hospital, Gajuri Hospital, Mahadev Besi Hospital, Charaudi Hospital and Kurintar Polyclinic. The referral sites for severely injured cases were 'B and B Hospital' and Bir Hospital in Kathmandu; and Bharatpur Hospital and Chitwan Medical College Teaching Hospital in Bharatpur, Chitwan.

Reasons of delay in post-crash response: Key informants perceived resource constraints as major causes of delay in post-crash response. Lack of management of first aid at the crash site was reported in most of KIIs. The facilities providing first aid were not available hence the victims were directly taken to big hospitals in Kathmandu or Bharatpur. Timely availability of rescue teams and ambulance was a problem. Further, the blockage of roads due to strikes posed a serious barrier in timely hospitalization of the victims. Another major reason for delay in post-crash response was accidents happening at nights at the narrow roads. For those accidents where the vehicle fell into river or fell in the difficult terrain; delay in rescuing survivors from crash site due to lack of availability of Crane and insufficient number of security personnel were largely responsible for delayed post-crash response. Some of the respondents also mentioned that lack of communication, irresponsibility of drivers and less cooperation from general public posed a problem in timely response to the accidents.

Discussion

Our observations showed that number of vehicles increased in 2012 compared to the year 2011, however Prithvi highway's capacity

is the same. Higher traffic of vehicles deteriorates condition of road rapidly. In addition, narrowly built road with many twists and turns could be the cause of many accidents. Similar studies also report that infrastructure of road are responsible for most of the accidents [8,9].

Although truck and tripper accident (26.3%) were on the top, motorcycles accidents were also in similar proportion (25.0%). Since it is the only highway to link capital city Kathmandu, it remains with high traffic of heavy transport carriers. Other studies done in developing countries also state motorized two-wheeler occupants were highest in number. Similar results are reported by several studies at other settings [9-17]. Study done by Jha and colleagues [10] also showed the motorized two wheelers, mopeds were involved in RTAs. This could be due to their higher speed and acceleration, which can be achieved over short distances reducing stability of the vehicle.

In our study, out of 1012 accidents total fatalities were 23.3% with 19.8% spot deaths. We recorded 58.9% major injuries and 96.2% minor injuries in those accidents. Tourist areas (Mugling to Narayanghat) with high traffic mobility are more affected by the accident deaths. This gives the seriousness of RTAs consistent with other studies reporting similar findings [8].

Most of the accidents occurred in the daytime between 12-20 hours. Ranking total accidents by timing, during 12-16 hours ranked highest in both years. About 26% of accidents occurred during that time slot of the day. Accidents in 16-20 hours and 8-12 hours ranked second and third position respectively. Accidents in midnight 0 hours to 4 hours are in the lowest position. An earlier study showed the peak time for accidents was between 4 to 5 pm (8.9%) [9]. Between 6-7 pm also a high proportion of RTA observed (7.4%). Two peak times for accidents were also reported in Delhi. These were in between 9-10 am and between 4-5 pm. These hours are the busiest as commuters go to and return from the schools, offices, factories and business places.

An earlier study found that highest number of accidents were observed in January and the number of victims was also highest compared to other months [6,10]. In our study, there was an increase in RTAs in the month of October which may be attributed to the rainy season with resulting damages and wet conditions of the road.

Strength and Limitations

This study can serve as a starting point on detail quantitative study as well as in-depth qualitative study on perceived causes and the preventive measures for road traffic accidents. Because the systematic recording of road traffic accident cases was available only for the past two years preceding data collection, we could not calculate long term trend of the RTA. Further, we could not calculate age and sex distribution due inadequate availability of such data.

Conclusion

Truck, tripper, motorcycles and scooter were vehicles involved in majority of accidents. Number of accidents was higher during the major Nepali festivals (Dashain and Tihar) in the months of October. Roads with severe twists and turns, lack of adequate street lighting and the festival seasons were main reasons for RTAs. Lack of communication immediately after the crash and narrow and steeper roads posed a problem in timely post-crash response. Establishing trauma centres and strengthening trauma units of tertiary care hospitals, establishing rescue teams at every 10-kilometer long road

segment of the highway and formation of effective coordination committees at local level would strengthen post-crash response.

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