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Epidemiology of Road Traffic Injuries in Nepal, 2001-2013

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ABSTRACT

Objective: To investigate the epidemiology of road traffic injury (RTI) in Nepal for the period 2001-2013.

Methods: Two approaches, secondary data analysis and systematic literature review, were adopted. RTI data were retrieved from traffic police records and analysed for the incidence of RTI. Electronic databases were searched for published articles that described the epidemiology of RTI in Nepal.

Results: A total of 95,902 crashes, 100,499 injuries and 14,512 deaths were recorded by the traffic police over the 12-year period 2001-2013. The mortality rate increased from 4/100,000 population in 2001-2002 to 7/100,000 population in 2011-2012. There were relatively more reported crashes yet less deaths in Kathmandu valley than the rest of the country. Of the 20 articles related to RTI, only 11 articles met the eligibility criteria, but were mainly descriptive case series or cross-sectional hospital-based studies. The majority of RTI were reported to occur among motorcyclists and pedestrians, in males, and concerning the age group 20-40 years. The common sites of injury were lower and upper extremities. Only three articles mentioned possible causes of accidents that include pedestrian road behaviour, alcohol consumption and improper bus driving.

Conclusions: Nepal suffers a heavy burden of RTI with higher fatalities in highways caused by bus crashes in hilly districts. The majority of published studies on RTI are descriptive and hospital-based, indicating the need of more thorough investigation of causes of RTI and systematic recording of crashes for the development of effective interventions.

Article Summary

- This study utilised secondary data analysis and systematic literature review to investigate RTI in Nepal.
- The secondary data were retrieved from national traffic police records to analyse incidence patterns in Kathmandu valley and elsewhere.
- The systematic review searched electronic databases to identify and synthesise concepts underlying RTI.
- The study strength included the incorporation of national data and published studies over a 12-year period, highlighting trends on incidence and documenting status of RTI.
- The main limitation for the secondary data was the lack of details on RTI, especially the cause of crashes. None of the reviewed studies were aetiological without testimonies of drivers or other persons involved in the crashes.

INTRODUCTION

Globally, road traffic injury (RTI)is the eighth leading cause of death[1] and is projected to rise to the top five by 2030.[2]Approximately 90% of the estimated 1.2 million deaths from RTIs occur in low and middle income countries.[3] In particular, countries in the Western Pacific Region and the South-East Asia Region of the World Health Organisation account for more than half of all RTI-related mortalities in the world.[3]

In Nepal, the population has increased by 15% from 23.2 million in 2001 to 26.6 million in 2011,[4] while the registration of vehicles jumped from317,284 in the fiscal year 2000-2001 to 1,348,995 in 2011-2012,giving a rise of 325% in the same decade.[5] There are almost two million vehicles registered throughout Nepal by July 2015. Approximately 80% of these vehicles are two wheelers (motorcycles), followed by light vehicles such as cars, jeeps and pickup vans.[5]

Similarly, there has been a dramatic increase in the national road network which is classified into two broad categories: strategic road network and local road network.[6] The strategic road network comprises national highways and their feeder roads, which are constructed and maintained by the Ministry of Physical Infrastructure and Transport, with more rapid increases in earthen road length (171 km in 2000 to 4173 km in 2012) than blacktop road length (2974 km in 2000 to 5573 km in 2012).[7]The local road network is managed by the district authorities. These local roads were constructed to access rural villages in the hilly districts. It is estimated that the total length of the local road network in 2013 was 50,943, of which 34,766 (68%) was earthen or gravelled.[6]

RTI is a common cause of injury and trauma in Nepal.[8-10] According to a hospital-based study, among the 1848 patients with a history of trauma in eastern Nepal admitted within one year, 38%were due to RTI.[11] Moreover, autopsy conducted in hospitals revealed that road accident was a major cause of death.[12, 13] There are multiple causes of road traffic crashes, mainly related to driving and drivers' behaviours, mechanical condition of the vehicle(s) involved, and the road environment.[14, 15] Before developing policy and appropriate interventions to curtail and prevent RTI, it is important to understand its epidemiology. Therefore, the purpose of this study is to investigate the epidemiology of RTI in Nepal during the period 2001 to 2013 in terms of person, place, time, and cause.

METHODS

This study of RTI in Nepal adopted two approaches: (i) secondary data analysis and (ii) systematic literature review. In Nepal, road traffic accidents are recorded by the traffic police in each district, and complied for the whole country in the police headquarter in the capital Kathmandu. Such data were retrieved for the period 2001 to 2013 for the secondary data analysis. In Nepal, RTI refers to an injury or death event of a road user as a result of a traffic-related crash that involves at least one motor vehicle with two wheels.

For systematic review, electronic databases PubMed, EMBASE, CINAHL, PsycINFO and Google Scholar were searched for relevant articles describing epidemiology of RTI in Nepal. Key words used to identify the underlying concepts were: (1) Injury (injur*/disab*/hospital/wound/morbid*/mortalit*/death/fatal);(2) Road (road/traffic/accident/crash/collision);(3) Population (Nepal/Kathmandu). The literature search was initially conducted by combining the first two concepts in the title and abstract field using Boolean terms and word truncation. Later, the population referring to Nepal was added to the search. All articles extracted were then exported to EndNote for identification of relevant articles. Selected articles were those: (i) published between 1980 and 2014; (ii) related to Nepal; (iii) published in peer reviewed journals; (iv) described any epidemiological aspect of RTI. The full texts of the relevant articles were retrieved and results were finally presented in a tabular format.

RESULTS

Incidence of RTI

Table 1 shows that95,902 crashes, 100,499injuries and 14,512 deaths in total were recorded by the traffic police over the 12-year period 2001-2013, with the average death per year being1209 (SD 449). The road traffic related mortality appeared to rapidly increase from 2007 onwards. Specifically, the mortality rate increased from 4 per 100,000 in 2001-2002 to 7 per 100,000 in 2011-2012. However, the corresponding deaths per vehicle and deaths per crash decreased over the same period, as shown in Table 2.

The RTI statistics in Table 1 further indicate relatively higher reported crashes yet lesser deaths in Kathmandu valley than the rest of the country. Consequently, the mortality rate per

crash in Kathmandu valley was relatively low when compared to elsewhere in Nepal. Figure 1 shows that the mortality rate per crash was fluctuating throughout the 12-year period 2001-2012, with a decreasing trend evident from 2007 onwards.

Table 1.Road traffic related deaths and injuries in Nepal, 2001-2013.

	Kathmandu Valley			Out of Kathmandu Valley			Total		
Fiscal Year	Crashes (n)	Deaths (n)	Injuries (n)	Crashes (n)	Deaths (n)	Injuries (n)	Crashes (n)	Deaths (n)	Injuries (n)
2001-2002	2180	75	1520	1643	804	3076	3823	879	4596
2002-2003	2225	180	2052	1639	502	3175	3864	682	5227
2003-2004	3652	86	2365	1778	716	3219	5430	802	5584
2004-2005	3709	127	2323	1823	681	3511	5532	808	5834
2005-2006	1989	83	2132	1905	742	3389	3894	825	5521
2006-2007	2097	93	2670	2449	860	5244	4546	953	7914
2007-2008	2211	120	2774	4610	1011	5134	6821	1131	7908
2008-2009	2765	137	3168	5588	1219	6898	8353	1356	10066
2009-2010	4104	146	3864	7643	1588	7649	11747	1734	11513
2010-2011	4914	171	4185	9099	1518	8336	14013	1689	12521
2011-2012	5096	148	3713	9201	1689	8116	14297	1837	11829
2012-2013	4770	147	3677	8812	1669	8309	13582	1816	11,986
Total	39712	1513	34443	56190	12999	66056	95902	14512	100499

Table 2. Burden of road traffic injuries in Nepal.

Year	Population	Registered vehicles	Crashes	Deaths	Deaths /population	Deaths /vehicle	Deaths /crash
2001-2002	23,151,423	317,284	3,823	879	4/100,000	277/100,000	22.9/100
2011-2012	26,620,809	1,348,995	14,297	1837	7/100,000	136/100,000	12.84/100

Studies on RTI in Nepal

A search of the three concepts (injury, road, population) in the title and abstract field yielded 40 articles. These potential articles were then screened for relevancy. Twenty articles were found not related to RTI and excluded. Of the remaining 20 articles assessed for eligibility, three were reviews and six studies did not describe epidemiology of RTI. Only 11 articles examined some epidemiological aspect and were subsequently included for our detail review.[13, 15-24] Table 3 summarises these 11articles, of which eight were hospital-based studies with data derived from hospital cases. All articles were descriptive in nature: eight case series and three cross-sectional studies.

The majority of articles described characteristics of the injured persons, types of vehicle involved and injury sites. Only three articles mentioned possible causes of accidents that include pedestrian road behaviour, alcohol consumption and improper bus driving.[15, 21,23] The common finding from these studies was that the majority of RTIs occurred among motorcyclist and pedestrians, in males, and within the age group 20-40 years. The common sites of injury were lower and upper extremities.

Table 3. Studies related to epidemiology of road traffic injuries in Nepal.

Reference	Design	Setting	Sample size	Data collection	Aspects studied	Main findings
16	Case series	Hospital-based	217	Medical records	Pattern of injuries; Characteristics of injured persons	Majority of injuries in motorcyclistsfollowed by pedestrian; injured persons were mainly males in the age group 16-30; most commonly affected were head and face followed by lower limbs.
17	Case series	Hospital-based	757	Medical records	Pattern of injuries; Characteristics of injured persons	Pedestrians followed by motorcyclists commonly injured; lower limbs were mostly affected; mostly in the age group 21-40.
18	Caseseries	Hospital-based	615	Medical records	Pattern of injuries;Timing of accidents; Characteristics of injured persons	Most injured were pedestrians in the age group 15-45 with lower extremities affected.
19	Prospective case series	Hospital-based	870	Proforma based interviews; medical records	Pattern of injuries; Characteristics of injured persons; Safety measures	Most affected were males in the age group 20-29 and were pedestrians and passengers in the vehicles; 16.9% drivers consumed alcohol; seat belt not worn by car, jeep and van drivers.
20	case series	Hospital-based	75	Medico-legal autopsy; interview	Pattern of injuries	Fracture was the most common injury followed by laceration.
15	Cross-sectional	Community-based	365 deaths; 1751	Police record and interviews	Characteristics and causes of bus accidents	Bus-only accidents were the most common followed by bus-pedestrian and bus-vehicle collisions; 75% of bus fatalities and injuries occurred during daylight

			injured persons			hours; probable causes includes drivers' habits, vehicle condition and road condition
21	Case series	Hospital-based	360	Proforma-based interviews	Characteristics of injured persons; Causes of accidents	Most commonly affected were passengers and pedestrians in the age group 15-30; personal problems, alcohol consumption and old vehicles were identified.
23	Cross-sectional	School-based	1557	Self-administered questionnaire	Causes of pedestrian injury	Road behaviours such as "looking both ways along the road before crossing" or playing in the road or sidewalks are not significantly associated with pedestrian injury except for compliance with green signals.
22	Cross-sectional	School-based	1557	Self-administered questionnaire	Types of vehicles; Activities of pedestrian	Injuriescaused by motorcycles while crossing the road and walking in urban areas and in semi-urban areas
13	Case series	Hospital-based	4383 autopsies	Medico-legal autopsy record	Characteristics of injured persons	About 18% of fatalities due to road traffic accidents; most common were pedestrians followed by occupants of public transport.
24	Case series	Hospital-based	80	Medico-legal autopsy record	Characteristics of injured persons; Intoxication status	82% of fatalities due to road traffic accidents commonly involving pedestrians and motorcyclists; 34.8% were intoxicated among road traffic deaths.

DISCUSSION

Nepal suffers a heavy burden of RTI. The number of road traffic fatality per year is far more than those caused by natural disasters (for example, 614 deaths in 2009-2010)[25] or by malaria (for example, 200 deaths in the 2006 epidemic)[26]. In fact, RTI ranks 11th among the leading causes of DALYs and 12th among the leading causes of premature death in Nepal.[27] The mortality rate per population due to RTIs almost doubled from 2001 to 2013, suggesting that RTI is a silent epidemic in Nepal.

The rapid increase in deaths from 2007 onwards may be attributed to the overall increase in vehicles as well as road tracks, mostly earthen roads in hilly districts, which incur delay in accessing hospital emergency services in the event of a crash. On the other hand, the apparent reduction in mortality per vehicle or per crash merely reflects the dramatic increases in vehicle registration and associated number of non-fatal crashes.

In Nepal, the death tolls due to road traffic crashes mainly occur at highways and district roads out of Kathmandu valley or other major cities. The majority of such crashes concern bus passengers in hilly districts. The most common form of crashes involves bus-only, where the bus goes off roads in hilly terraces.[15] Because of hilly and rocky terrain, the chance of occupant survival is low. Therefore, it is important to ensure maintenance of district village roads for the safe operation of local buses.

The nature of bus-only crashes also indicates driving-related issues as probable causes. Such issues include high speed, overtaking, overload, overwork and use of alcohol. Indeed, traffic crash data suggested driving-related issues are far more relevant than mechanical fault or pedestrian negligence.[6] Alcohol drinking and motorcycle riding were strongly associated with the risk of experiencing an RTI in Vietnam.[28] Travel in open-back utility vehicles, overcrowding, and alcohol consumption were the main factors for RTI in Pacific island countries.[29] The surveillance by traffic police should be increased to enforce compliance of traffic laws and regulations. Since most of the accidents are related to drivers and driving behaviours, these aspects should be the key focus for future intervention.

Apart from the traffic-police data, the other sources of RTI data are derived from hospital medical records. Previous hospital-based studies found that persons in the age group 20-40, males, pedestrians and motorcyclists contribute the majority of RTI, consistent with findings from China,[30] India,[31] and Vietnam.[28] This is somewhat expected considering the popularity

of motorcycles among the age group 20-40. Drivers of vehicles are predominantly males in Nepal. Traffic education should be strengthened through public campaigning and safety promotion in schools targeting young novice motorcyclists.

Although none of the studies included in our review are aetiological, few have examined possible causes of crashes. The traffic-police recorded data are the only data source for information on RTI in Nepal. Minor injuries or crashes without any dispute or property damage may not have been reported. However, fatal crashes are likely to be reported and captured by traffic police for legal actions. Currently, updated epidemiological data on road traffic crashes are lacking in Nepal. A thorough investigation on causes of RTI with detailed account of drivers and persons involved would provide useful insights for the prevention of RTI in Nepal.

CONCLUSION

Nepal suffers a heavy burden of RTI, with fatalities occurring mainly in highways caused by bus crashes in hilly districts out of Kathmandu valley. Traffic-police data and hospital medical records provide the sources for RTI information. The majority of published studies on RTI in Nepal are descriptive and hospital-based, suggesting that persons in the age group 20-40, males, pedestrians and motorcyclists are commonly injured. A thorough investigation of causes of crashes and systematic recording of road accidents are recommended for the development of effective intervention to curtail and prevent RTI in Nepal.

Contributors

RK conceived the study design, performed analysis and drafted the manuscript. AL assisted with data interpretation and revised the manuscript. Both authors approved the final version.

Competing Interests

None declared for both authors.

Data Sharing Statement

Road Traffic Injuries Data for Nepal is available from websites of Nepal Traffic Police (http://traffic.nepalpolice.gov.np), and Department of Roads, Ministry of Physical Infrastructure and Transport, Government of Nepal (http://www.dor.gov.np/publication)

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Figure 1. Mortality rate per 100 crashes in Nepal and in Kathmandu valley 2001-2013, Nepal.

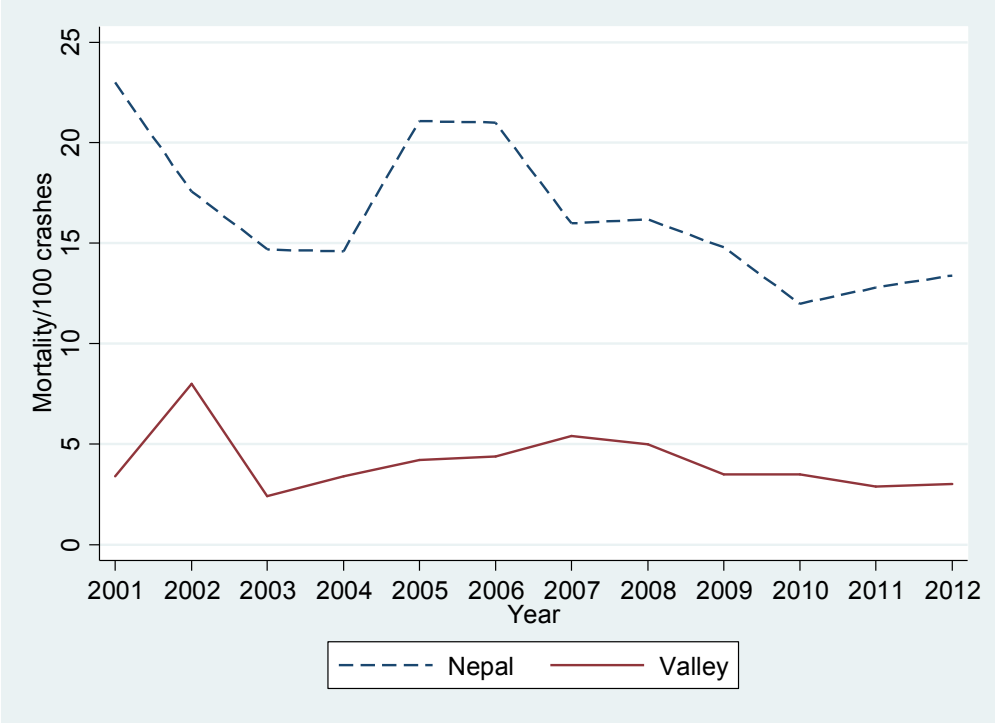

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Table 1. Road traffic related deaths and injuries in Nepal, 2001-2013.

	Kathmandu Valley			Out of Kathmandu Valley			Total		
Fiscal Year	Crashes (n)	Deaths (n)	Injuries (n)	Crashes (n)	Deaths (n)	Injuries (n)	Crashes (n)	Deaths (n)	Injuries (n)
2001-2002	2180	75	1520	1643	804	3076	3823	879	4596
2002-2003	2225	180	2052	1639	502	3175	3864	682	5227
2003-2004	3652	86	2365	1778	716	3219	5430	802	5584
2004-2005	3709	127	2323	1823	681	3511	5532	808	5834
2005-2006	1989	83	2132	1905	742	3389	3894	825	5521
2006-2007	2097	93	2670	2449	860	5244	4546	953	7914
2007-2008	2211	120	2774	4610	1011	5134	6821	1131	7908
2008-2009	2765	137	3168	5588	1219	6898	8353	1356	10066
2009-	4104	146	3864	7643	1588	7649	11747	1734	11513

2010									
2010-2011	4914	171	4185	9099	1518	8336	14013	1689	12521
2011-2012	5096	148	3713	9201	1689	8116	14297	1837	11829
2012-2013	4770	147	3677	8812	1669	8309	13582	1816	11,986
Total	39712	1513	34443	56190	12999	66056	95902	14512	100499

The RTI statistics in Table 1 further indicate relatively higher reported crashes yet lesser deaths in Kathmandu valley than the rest of the country. Consequently, the mortality rate per crash in Kathmandu valley was relatively low when compared to elsewhere in Nepal. Figure 1 shows that the mortality rate per crash was fluctuating throughout the 12-year period 2001-2012, with a decreasing trend evident from 2007 onwards.

Table 2. Burden of road traffic injuries in Nepal.

Year	Population	Registered vehicles	Crashes	Deaths	Deaths /population	Deaths /vehicle	Deaths /crash
2001-2002	23,151,423	317,284	3,823	879	4/100,000	277/100,000	22.9/100
2011-2012	26,620,809	1,348,995	14,297	1837	7/100,000	136/100,000	12.84/100

Studies on RTI in Nepal

A search of the three concepts (injury, road, population) in the title and abstract field yielded 40 articles. These potential articles were then screened for relevancy. Twenty articles were found not related to RTI and excluded. Of the remaining 20 articles assessed for eligibility, three were reviews and six studies did not describe epidemiology of RTI; see Figure 2. Only 11 articles examined some epidemiological aspect and were subsequently included for our detail review.[13, 15-24] Table 3 summarises these 11articles, of which eight were hospital-based studies with data derived from hospital cases. All articles were descriptive in nature: eight case series and three cross-sectional studies.

The majority of articles described characteristics of the injured persons, types of vehicle involved and injury sites. Only three articles mentioned possible causes of accidents that include pedestrian road behaviour, alcohol consumption and improper bus driving.[15, 21,23] The common finding from these studies was that the majority of RTI occurred among motorcyclist and pedestrians, in males, and within the age group 20-40 years. The common sites of injury were lower and upper extremities.

Table 3. Studies related to epidemiology of road traffic injuries in Nepal.

Reference	Design	Setting	Sample size	Data collection	Aspects studied	Main findings
16	Case series	Hospital-based	217	Medical records	Pattern of injuries; Characteristics of injured persons	Majority of injuries in motorcyclistsfollowed by pedestrian; injured persons were mainly males in the age group 16-30; most commonly affected were head and face followed by lower limbs.
17	Case series	Hospital-based	757	Medical records	Pattern of injuries; Characteristics of injured persons	Pedestrians followed by motorcyclists commonly injured; lower limbs were mostly affected; mostly in the age group 21-40.
18	Case series	Hospital-based	615	Medical records	Pattern of injuries;Timing of accidents; Characteristics of injured persons	Most injured were pedestrians in the age group 15-45 with lower extremities affected.
19	Prospective case series	Hospital-based	870	Proforma-based interviews; medical records	Pattern of injuries; Characteristics of injured persons; Safety measures	Most affected were males in the age group 20-29 and were pedestrians and passengers in the vehicles; 16.9% drivers consumed alcohol; seat belt not worn by car, jeep and van drivers.
20	case series	Hospital-based	75	Medico-legal autopsy; interview	Pattern of injuries	Fracture was the most common injury followed by laceration.
15	Cross-sectional	Community-based	365 deaths; 1751	Police record and interviews	Characteristics and causes of bus accidents	Bus-only accidents were the most common followed by bus-pedestrian and bus-vehicle collisions; 75% of bus fatalities and injuries occurred during daylight

			injured persons			hours; probable causes includes drivers' habits, vehicle condition and road condition.
21	Case series	Hospital-based	360	Proforma-based interviews	Characteristics of injured persons; Causes of accidents	Most commonly affected were passengers and pedestrians in the age group 15-30; personal problems, alcohol consumption and old vehicles were identified.
23	Cross-sectional	School-based	1557	Self-administered questionnaire	Causes of pedestrian injury	Road behaviours such as "looking both ways along the road before crossing" or playing in the road or sidewalks are not significantly associated with pedestrian injury except for compliance with green signals.
22	Cross-sectional	School-based	1557	Self-administered questionnaire	Types of vehicles; Activities of pedestrian	Injuries caused by motorcycles while crossing the road and walking in urban areas and in semi-urban areas.
13	Case series	Hospital-based	4383 autopsies	Medico-legal autopsy record	Characteristics of injured persons	About 18% of fatalities due to road traffic accidents; most common were pedestrians followed by occupants of public transport.
24	Case series	Hospital-based	80	Medico-legal autopsy record	Characteristics of injured persons; Intoxication status	82% of fatalities due to road traffic accidents commonly involving pedestrians and motorcyclists; 34.8% were intoxicated among road traffic deaths.

DISCUSSION

Nepal suffers a heavy burden of RTI. The number of road traffic fatalities per year is far more than those caused by natural disasters (for example, 614 deaths in 2009-2010)[25] or by malaria (for example, 200 deaths in the 2006 epidemic).[26] In fact, RTI ranks 11thamong the leading causes of DALYs and 12th among the leading causes of premature death in Nepal.[27] The mortality rate per population due to RTI almost doubled from 2001 to 2013, suggesting that RTI is a silent epidemic in Nepal. The mortality rate of 7 per 100,000 population derived from police data in this study for 2011-2012 is lower than the WHO estimate of 17 per 100,000 population for the year 2013, which suggests that not all road deaths are captured by police data.

The rapid increase in deaths, especially from 2007 onwards, may be attributed to the overall increase in vehicles as well as road tracks, mostly earthen roads in hilly districts, which incur delay in accessing hospital emergency services in the event of a crash. On the other hand, the apparent reduction in mortality per vehicle or per crash merely reflects the dramatic increases in vehicle registration and associated number of non-fatal crashes.

In Nepal, the death tolls due to road traffic crashes mainly occur at highways and district roads out of Kathmandu valley or other major cities. The majority of such crashes concern bus passengers in hilly districts. The most common form of crashes involves bus-only, where the bus goes off road in hilly terraces.[15] Because of hilly and rocky terrain, the chance of occupant survival is low. Therefore, it is important to ensure maintenance of district village roads for the safe operation of local buses.

The nature of bus-only crashes also indicates driving-related issues as probable causes. Such issues include high speed, overtaking, overload, overwork and use of alcohol. Indeed, traffic crash data suggested driving-related issues are far more relevant than mechanical fault or pedestrian negligence.[6] Alcohol drinking and motorcycle riding were strongly associated with the risk of experiencing an RTI in Vietnam.[28] Travel in open-back utility vehicles, overcrowding, and alcohol consumption were the main factors for RTI in Pacific island countries.[29]Surveillance by traffic police should be increased to enforce compliance of traffic laws and regulations. Since most of the accidents are related to drivers and driving behaviours, these aspects should be the key focus for any future intervention.

Apart from the traffic-police data, the other sources of RTI data are derived from hospital medical records. Previous hospital-based studies found that persons in the age group 20-40, males, pedestrians and motorcyclists contribute the majority of RTI, consistent with findings from China,[30] India,[31] and Vietnam.[28] This is somewhat expected considering the popularity of motorcycles among the age group 20-40. Drivers of vehicles are predominantly males in Nepal. Traffic education should be strengthened through public campaigning and safety promotion in schools targeting young novice motorcyclists.

Several limitations should be considered. Although none of the studies included in our review are aetiological, few have examined possible causes of crashes. The traffic-police recorded data provide information on RTI in Nepal, but further analysis of the raw data is not feasible due to the restricted data access. Minor injuries or crashes without any dispute or property damage may not have been reported. However, fatal crashes are likely to be reported and captured by traffic police for legal actions. Currently, updated epidemiological data on road traffic crashes are lacking in Nepal. A thorough investigation on causes of RTI with detailed account of drivers and persons involved would provide useful insights for the prevention of RTI in Nepal.

CONCLUSION

Nepal suffers a heavy burden of RTI, with fatalities occurring mainly in highways caused by bus crashes in hilly districts out of Kathmandu valley. Traffic-police data and hospital medical records provide the sources for RTI information. The majority of published studies on RTI in Nepal are descriptive and hospital-based, suggesting that persons in the age group 20-40, males, pedestrians and motorcyclists are commonly injured. A thorough investigation of causes of crashes, especially bus-only crashes in highways, and systematic recording of road accidents, are recommended for the development of effective intervention(s) to curtail and prevent RTI in Nepal.

Contributors

RK conceived the study design, performed analysis and drafted the manuscript. AL assisted with data interpretation and revised the manuscript. Both authors approved the final version.

Competing Interests

None declared for both authors.

Data sharing

No additional data available.

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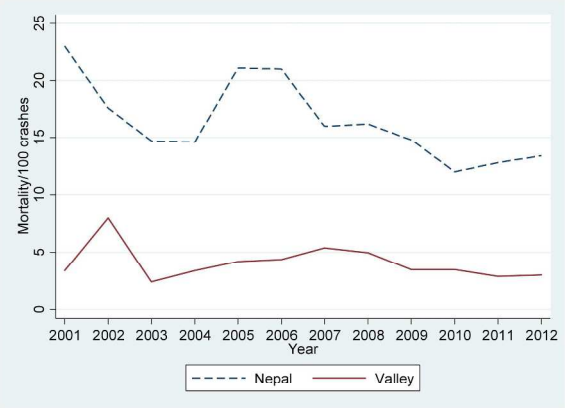
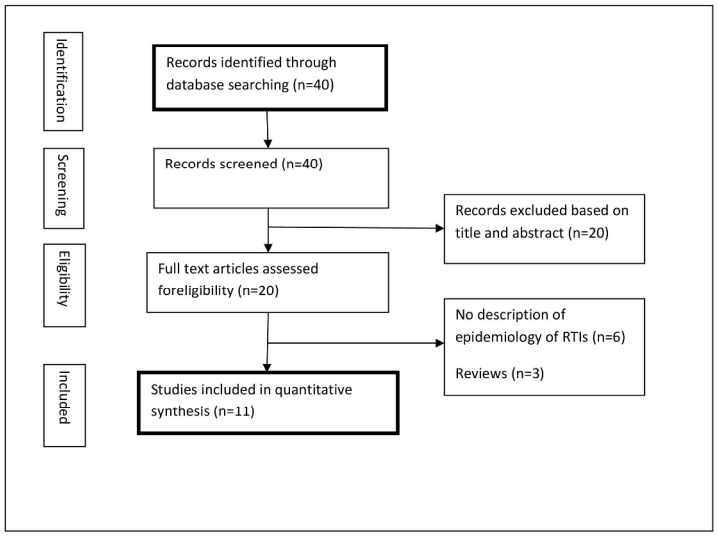
Figure 1. Mortality rate per 100 crashes in Nepal and in Kathmandu valley, 2001-2012.



209x297mm (300 x 300 DPI)

Figure 2. PRISMA flow diagram of studies selected for review.



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PRISMA 2009 Checklist

Section/topic	#	Checklist item	Reported on page #
TITLE			1
Title	1	Identify the report as a systematic review, meta-analysis, or both.	
ABSTRACT			
Structured summary	2	Provide a structured summary including, as applicable: background; objectives; data sources; study eligibility criteria, participants, and interventions; study appraisal and synthesis methods; results; limitations; conclusions and implications of key findings; systematic review registration number.	2
INTRODUCTION			
Rationale	3	Describe the rationale for the review in the context of what is already known.	4
Objectives	4	Provide an explicit statement of questions being addressed with reference to participants, interventions, comparisons, outcomes, and study design (PICOS).	5
METHODS			
Protocol and registration	5	Indicate if a review protocol exists, if and where it can be accessed (e.g., Web address), and, if available, provide registration information including registration number.	NA
Eligibility criteria	6	Specify study characteristics (e.g., PICOS, length of follow-up) and report characteristics (e.g., years considered, language, publication status) used as criteria for eligibility, giving rationale.	5
Information sources	7	Describe all information sources (e.g., databases with dates of coverage, contact with study authors to identify additional studies) in the search and date last searched.	5
Search	8	Present full electronic search strategy for at least one database, including any limits used, such that it could be repeated.	5
Study selection	9	State the process for selecting studies (i.e., screening, eligibility, included in systematic review, and, if applicable, included in the meta-analysis).	5
Data collection process	10	Describe method of data extraction from reports (e.g., piloted forms, independently, in duplicate) and any processes for obtaining and confirming data from investigators.	5
Data items	11	List and define all variables for which data were sought (e.g., PICOS, funding sources) and any assumptions and simplifications made.	5
Risk of bias in individual studies	12	Describe methods used for assessing risk of bias of individual studies (including specification of whether this was done at the study or outcome level), and how this information is to be used in any data synthesis.	5
Summary measures	13	State the principal summary measures (e.g., risk ratio, difference in means).	5
Synthesis of results	14	Describe the methods of handling data and combining results of studies, if done, including measures of consistency (e.g., I^2) for each meta-analysis.	NA

PRISMA 2009 Checklist

Section/topic	#	Checklist item	Reported on page #
Risk of bias across studies	15	Specify any assessment of risk of bias that may affect the cumulative evidence (e.g., publication bias, selective reporting within studies).	5
Additional analyses	16	Describe methods of additional analyses (e.g., sensitivity or subgroup analyses, meta-regression), if done, indicating which were pre-specified.	NA
RESULTS			
Study selection	17	Give numbers of studies screened, assessed for eligibility, and included in the review, with reasons for exclusions at each stage, ideally with a flow diagram.	8
Study characteristics	18	For each study, present characteristics for which data were extracted (e.g., study size, PICOS, follow-up period) and provide the citations.	9
Risk of bias within studies	19	Present data on risk of bias of each study and, if available, any outcome level assessment (see item 12).	9
Results of individual studies	20	For all outcomes considered (benefits or harms), present, for each study: (a) simple summary data for each intervention group (b) effect estimates and confidence intervals, ideally with a forest plot.	9
Synthesis of results	21	Present the main results of the review. If meta-analyses are done, include for each, confidence intervals and measures of consistency	8
Risk of bias across studies	22	Present results of any assessment of risk of bias across studies (see Item 15).	9
Additional analysis	23	Give results of additional analyses, if done (e.g., sensitivity or subgroup analyses, meta-regression [see Item 16]).	NA
DISCUSSION			
Summary of evidence	24	Summarize the main findings including the strength of evidence for each main outcome; consider their relevance to key groups (e.g., healthcare providers, users, and policy makers).	12
Limitations	25	Discuss limitations at study and outcome level (e.g., risk of bias), and at review-level (e.g., incomplete retrieval of identified research, reporting bias).	12
Conclusions	26	Provide a general interpretation of the results in the context of other evidence, and implications for future research.	13
FUNDING			
Funding	27	Describe sources of funding for the systematic review and other support (e.g., supply of data); role of funders for the systematic review.	NA

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Epidemiology of Road Traffic Injuries in Nepal, 2001-2013: Systematic Review and Secondary Data Analysis

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Epidemiology of Road Traffic Injuries in Nepal, 2001-2013: Systematic Review and Secondary Data Analysis

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ABSTRACT

Objective: To investigate the epidemiology of road traffic injury (RTI) in Nepal for the period 2001-2013.

Methods: Two approaches, secondary data analysis and systematic literature review, were adopted. RTI data were retrieved from traffic police records and analysed for the incidence of RTI. Electronic databases were searched for published articles that described the epidemiology of RTI in Nepal.

Results: A total of 95,902 crashes, 100,499 injuries and 14,512 deaths were recorded by the traffic police over the 12-year period 2001-2013. The mortality rate increased from 4/100,000 population in 2001-2002 to 7/100,000 population in 2011-2012. There were relatively more reported crashes yet fewer deaths in Kathmandu valley than the rest of the country. Of the 20 articles related to RTI, only 11 articles met the eligibility criteria, but were mainly descriptive case series or cross-sectional hospital-based studies. The majority of RTI were reported to occur among motorcyclists and pedestrians, in males, and concerning the age group 20-40 years. The common sites of injury were lower and upper extremities. Only three articles mentioned possible causes of accidents that include pedestrian road behaviour, alcohol consumption and improper bus driving.

Conclusions: Nepal suffers a heavy burden of RTI, with higher fatalities in highways out of Kathmandu valley caused by bus crashes in hilly districts. The majority of published studies on RTI are descriptive and hospital-based, indicating the need of more thorough investigation of causes of RTI and systematic recording of crashes for the development of effective interventions.

Article Summary

- This study utilised secondary data analysis and systematic literature review to investigate the specific problems and available information with regard to RTI in Nepal, including the urban-rural divide in mortality, the nature of fatal crashes, the shortcomings of police records and the need to detail such investigations.
- The secondary data were retrieved from national traffic police records to analyse incidence patterns in Kathmandu valley and elsewhere.
- The systematic review searched electronic databases to identify and synthesise concepts underlying RTI.
- The study strength included the incorporation of national data and published studies over a 12-year period, highlighting trends on incidence and documenting status of RTI.
- The main limitation for the secondary data was the lack of details on RTI, especially the cause of crashes. None of the reviewed studies were aetiological with testimonies of drivers or other persons involved in the crashes.

INTRODUCTION

Globally, road traffic injury (RTI) is the eighth leading cause of death[1] and is projected to rise to the top five by 2030.[2] Approximately 90% of the estimated 1.2 million deaths from RTI occur in low and middle income countries.[3] In particular, countries in the Western Pacific Region and the South-East Asia Region of the World Health Organisation account for more than half of all RTI-related mortalities in the world. The mortality rate in the South-East Asia Region is 18.5 per 100,000 population and one-third of those deaths involve motorized 2-3 wheelers. About 30% of countries in this region have some policy to promote walking and cycling.[3]

In Nepal, the population has increased by 15% from 23.2 million in 2001 to 26.6 million in 2011,[4] while the registration of vehicles jumped from317,284 in the fiscal year 2000-2001 to 1,348,995 in 2011-2012,giving a rise of 325% in the same decade.[5] There are almost two million vehicles registered throughout Nepal by July 2015. Approximately 80% of these vehicles are two wheelers (motorcycles), followed by light vehicles such as cars, jeeps and pickup vans.[5]

Similarly, there has been a dramatic increase in the national road network which is classified into two broad categories: strategic road network and local road network.[6] The strategic road network comprises national highways and their feeder roads, which are constructed and maintained by the Ministry of Physical Infrastructure and Transport, with more rapid increases in earthen road length (171 km in 2000 to 4173 km in 2012) than blacktop road length (2974 km in 2000 to 5573 km in 2012).[7] The local road network is managed by the district authorities. These local roads were constructed to access rural villages in the hilly districts. It is estimated that the total length of the local road network in 2013 was 50,943, of which 34,766 (68%) was earthen or gravelled.[6]

RTI is a common cause of injury and trauma in Nepal.[8-10]According to a hospital-based study, among the 1848 patients with a history of trauma in eastern Nepal admitted within one year, 38%were due to RTI.[11]Moreover, autopsy conducted in hospitals revealed that road accident was a major cause of death.[12, 13]There are multiple causes of road traffic crashes, mainly related to driving and drivers' behaviours, mechanical condition of the vehicle(s) involved, and the road environment.[14, 15] Before developing policy and appropriate interventions to curtail and prevent RTI, it is important to understand its epidemiology.

Therefore, the purpose of this study is to investigate the incidence patterns of RTI in Nepal during the period 2001 to 2013.

METHODS

This study of RTI in Nepal adopted two approaches: (i) secondary data analysis and (ii) systematic literature review. In Nepal, road traffic accidents are recorded by the traffic police in each district, and complied for the whole country in the police headquarter in the capital Kathmandu. Such raw data were retrieved for the period 2001 to 2013 for the secondary data analysis. The analysis consists of comparing RTI data between Kathmandu Valley and the rest of the country, and producing mortality rates per population, per vehicles and per crashes by census year. In Nepal, RTI refers to an injury or death event of a road user as a result of a traffic-related crash that involves at least one motor vehicle with two wheels.

For systematic review, electronic databases PubMed, EMBASE, CINAHL, PsycINFO and Google Scholar were searched for relevant articles describing epidemiology of RTI in Nepal. Key words used to identify the underlying concepts were: (1) Injury (injur*/disab*/hospital/wound/morbid*/mortalit*/death/fatal); (2) Road (road/traffic/accident/crash/collision); (3) Population (Nepal/Kathmandu). The literature search was initially conducted by combining the first two concepts in the title and abstract field using Boolean terms and word truncation. Later, the population referring to Nepal was added to the search. All articles extracted were then exported to EndNote for identification of relevant articles. The PRISMA checklist was adopted as the standard for the systematic review. Selected articles were those: (i) published between 1980 and 2014; (ii) related to Nepal; (iii) published in peer reviewed journals; (iv) described any epidemiological aspect of RTI based on primary data. Review articles were excluded. The full texts of the relevant articles were retrieved and results were finally presented in a tabular format.

RESULTS

Incidence of RTI

Table 1 shows RTI statistics by place and time. There are 95,902 crashes, 100,499 injuries and 14,512 deaths in total over the 12-year period 2001-2013, with the average deaths per year being 1209 (SD 449). The road traffic related mortality appeared to rapidly increase

from 2007 onwards. Table 2 compares mortality rates per population, vehicles, and crashes between the two population census years in Nepal. The mortality rate increased from 4 per 100,000 in 2001-2002 to7 per 100,000 in 2011-2012. However, the corresponding deaths per vehicle and deaths per crash decreased over the same period, as shown in Table 2.

Table 1. Road traffic related deaths and injuries in Nepal, 2001-2013.

	Kathmandu Valley			Out of Kathmandu Valley			Total		
Fiscal Year	Crashes (n)	Deaths (n)	Injuries (n)	Crashes (n)	Deaths (n)	Injuries (n)	Crashes (n)	Deaths (n)	Injuries (n)
2001-2002	2180	75	1520	1643	804	3076	3823	879	4596
2002-2003	2225	180	2052	1639	502	3175	3864	682	5227
2003-2004	3652	86	2365	1778	716	3219	5430	802	5584
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2005-2006	1989	83	2132	1905	742	3389	3894	825	5521
2006-2007	2097	93	2670	2449	860	5244	4546	953	7914
2007-2008	2211	120	2774	4610	1011	5134	6821	1131	7908
2008-	2765	137	3168	5588	1219	6898	8353	1356	10066

2009									
2009-2010	4104	146	3864	7643	1588	7649	11747	1734	11513
2010-2011	4914	171	4185	9099	1518	8336	14013	1689	12521
2011-2012	5096	148	3713	9201	1689	8116	14297	1837	11829
2012-2013	4770	147	3677	8812	1669	8309	13582	1816	11,986
Total	39712	1513	34443	56190	12999	66056	95902	14512	100499

The RTI statistics in Table 1 further indicate relatively higher reported crashes yet lesser deaths in Kathmandu valley than the rest of the country. Consequently, the mortality rate per crash in Kathmandu valley was relatively low when compared to elsewhere in Nepal. Figure 1 compares mortality rate per crashes by place. The mortality rate per crash was fluctuating throughout the 12-year period 2001-2012, with a decreasing trend evident from 2007 onwards.

Table 2. Burden of road traffic injuries in Nepal.

Year	Population	Registered vehicles	Crashes	Deaths	Deaths /population	Deaths /vehicle	Deaths /crash
2001-2002	23,151,423	317,284	3,823	879	4/100,000	277/100,000	22.9/100
2011-2012	26,620,809	1,348,995	14,297	1837	7/100,000	136/100,000	12.84/100

Studies on RTI in Nepal

A search of the three concepts (injury, road, population) in the title and abstract field yielded 40 articles. These potential articles were then screened for relevancy. Twenty articles were found not related to RTI and excluded. Of the remaining 20 articles assessed for eligibility, three were reviews and six studies did not describe epidemiology of RTI; see Figure 2. Only 11 articles examined some epidemiological aspect and were subsequently included for our detail review.[13, 15-24] Table 3 summarises these 11articles, of which eight were hospital-based studies with data derived from hospital cases. All articles were descriptive in nature: eight case series and three cross-sectional studies.

The majority of articles described characteristics of the injured persons, types of vehicle involved and injury sites. Only three articles mentioned possible causes of accidents that include pedestrian road behaviour, alcohol consumption and improper bus driving.[15, 21,23] The common finding from these studies was that the majority of RTI occurred among motorcyclist and pedestrians, in males, and within the age group 20-40 years. The common sites of injury were lower and upper extremities.

Table 3. Studies related to epidemiology of road traffic injuries in Nepal.

Reference	Design	Setting	Sample size	Data collection	Aspects studied	Main findings
16	Case series	Hospital-based	217	Medical records	Pattern of injuries; Characteristics of injured persons	Majority of injuries in motorcyclistsfollowed by pedestrian; injured persons were mainly males in the age group 16-30; most commonly affected were head and face followed by lower limbs.
17	Case series	Hospital-based	757	Medical records	Pattern of injuries; Characteristics of injured persons	Pedestrians followed by motorcyclists commonly injured; lower limbs were mostly affected; mostly in the age group 21-40.
18	Case series	Hospital-based	615	Medical records	Pattern of injuries;Timing of accidents; Characteristics of injured persons	Most injured were pedestrians in the age group 15-45 with lower extremities affected.
19	Prospective case series	Hospital-based	870	Proforma-based interviews; medical records	Pattern of injuries; Characteristics of injured persons; Safety measures	Most affected were males in the age group 20-29 and were pedestrians and passengers in the vehicles; 16.9% drivers consumed alcohol; seat belt not worn by car, jeep and van drivers.
20	case series	Hospital-based	75	Medico-legal autopsy; interview	Pattern of injuries	Fracture was the most common injury followed by laceration.
15	Cross-sectional	Community-based	365 deaths; 1751	Police record and interviews	Characteristics and causes of bus accidents	Bus-only accidents were the most common followed by bus-pedestrian and bus-vehicle collisions; 75% of bus fatalities and injuries occurred during daylight

			injured persons			hours; probable causes includes drivers' habits, vehicle condition and road condition.
21	Case series	Hospital-based	360	Proforma-based interviews	Characteristics of injured persons; Causes of accidents	Most commonly affected were passengers and pedestrians in the age group 15-30; personal problems, alcohol consumption and old vehicles were identified.
23	Cross-sectional	School-based	1557	Self-administered questionnaire	Causes of pedestrian injury	Road behaviours such as "looking both ways along the road before crossing" or playing in the road or sidewalks are not significantly associated with pedestrian injury except for compliance with green signals.
22	Cross-sectional	School-based	1557	Self-administered questionnaire	Types of vehicles; Activities of pedestrian	Injuries caused by motorcycles while crossing the road and walking in urban areas and in semi-urban areas.
13	Case series	Hospital-based	4383 autopsies	Medico-legal autopsy record	Characteristics of injured persons	About 18% of fatalities due to road traffic accidents; most common were pedestrians followed by occupants of public transport.
24	Case series	Hospital-based	80	Medico-legal autopsy record	Characteristics of injured persons; Intoxication status	82% of fatalities due to road traffic accidents commonly involving pedestrians and motorcyclists; 34.8% were intoxicated among road traffic deaths.

DISCUSSION

Nepal suffers a heavy burden of RTI. The number of road traffic fatalities per year is far more than those caused by natural disasters (for example, 614 deaths in 2009-2010)[25] or by malaria (for example, 200 deaths in the 2006 epidemic).[26] In fact, RTI ranks 11thamong the leading causes of DALYs and 12th among the leading causes of premature death in Nepal.[27] The mortality rate per population due to RTI almost doubled from 2001 to 2013, suggesting that RTI is a silent epidemic in Nepal. The mortality rate of 7 per 100,000 population derived from police data in this study for 2011-2012 is lower than the WHO estimate of 17 per 100,000 population for the year 2013, which suggests that not all road deaths are captured by police data.

The rapid increase in deaths, especially from 2007 onwards, may be attributed to the overall increase in vehicles as well as road tracks, mostly earthen roads in hilly districts, which incur delay in accessing hospital emergency services in the event of a crash. On the other hand, the apparent reduction in mortality per vehicle or per crash merely reflects the dramatic increases in vehicle registration and associated number of non-fatal crashes.

In Nepal, the death tolls due to road traffic crashes mainly occur at highways and district roads out of Kathmandu valley or other major cities. The majority of such crashes concern bus passengers in hilly districts. The most common form of crashes involves bus-only, where the bus goes off road in hilly terraces.[15] Because of hilly and rocky terrain, the chance of occupant survival is low. Therefore, it is important to ensure maintenance of district village roads for the safe operation of local buses.

The nature of bus-only crashes also indicates driving-related issues as probable causes. Such issues include high speed, overtaking, overload, overwork and use of alcohol. Indeed, traffic crash data suggested driving-related issues are far more relevant than mechanical fault or pedestrian negligence.[6] Alcohol drinking and motorcycle riding were strongly associated with the risk of experiencing an RTI in Vietnam.[28] Travel in open-back utility vehicles, overcrowding, and alcohol consumption were the main factors for RTI in Pacific island countries.[29]Surveillance by traffic police should be increased to enforce compliance of traffic laws and regulations. Since most of the accidents are related to drivers and driving behaviours, these aspects should be the key focus for any future intervention.

Apart from the traffic-police data, the other sources of RTI data are derived from hospital medical records. Previous hospital-based studies found that persons in the age group 20-40, males, pedestrians and motorcyclists contribute the majority of RTI, consistent with findings from China,[30] India,[31] and Vietnam.[28] This is somewhat expected considering the popularity of motorcycles among the age group 20-40. Drivers of vehicles are predominantly males in Nepal. Traffic education should be strengthened through public campaigning and safety promotion in schools targeting young novice motorcyclists.

Several limitations should be considered. Although none of the studies included in our review are aetiological, few have examined possible causes of crashes. The traffic-police recorded data provide information on RTI in Nepal, but further analysis of the raw data is not feasible due to the restricted data access. Minor injuries or crashes without any dispute or property damage may not have been reported. However, fatal crashes are likely to be reported and captured by traffic police for legal actions. Currently, updated epidemiological data on road traffic crashes are lacking in Nepal. A thorough investigation on causes of RTI with detailed account of drivers and persons involved would provide useful insights for the prevention of RTI in Nepal.

CONCLUSION

Nepal suffers a heavy burden of RTI, with fatalities occurring mainly in highways caused by bus crashes in hilly districts out of Kathmandu valley. Traffic-police data and hospital medical records provide the sources for RTI information. The majority of published studies on RTI in Nepal are descriptive and hospital-based, suggesting that persons in the age group 20-40, males, pedestrians and motorcyclists are commonly injured. A thorough investigation of causes of crashes, especially bus-only crashes in highways, and systematic recording of road accidents, are recommended for the development of effective intervention(s) to curtail and prevent RTI in Nepal.

Contributors

RK conceived the study design, performed analysis and drafted the manuscript. AL assisted with data interpretation and revised the manuscript. Both authors approved the final version.

Competing Interests

None declared for both authors.

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Data Sharing Statement

RTI data in Nepal are accessible in the traffic police website (http://traffic.nepalpolice.gov.np/) and in a document prepared by department of roads (http://www.dor.gov.np/documents/Status_Paper%20_2013.pdf).

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Figure 1. Mortality rate per 100 crashes in Nepal and in Kathmandu valley, 2001-2012.

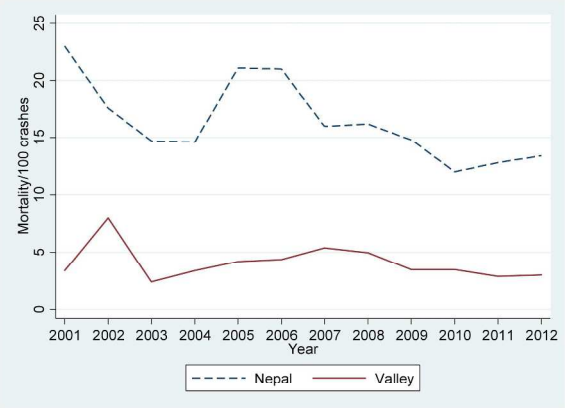

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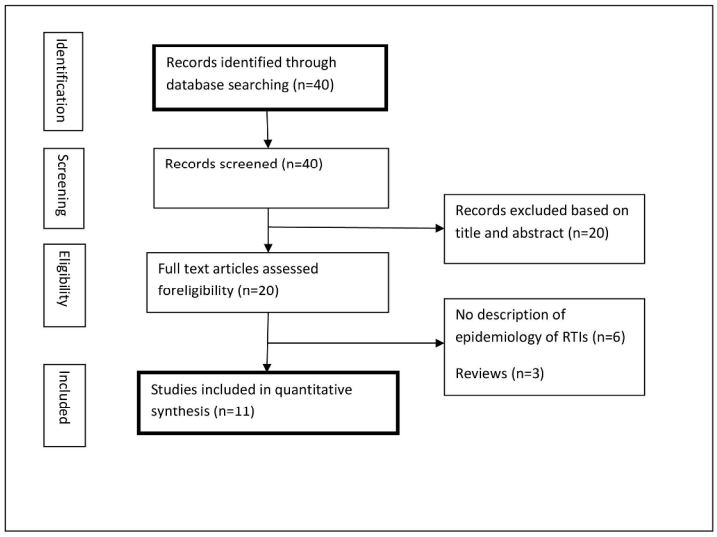
Figure 2. PRISMA flow diagram of studies selected for review.



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PRISMA 2009 Checklist

Section/topic	#	Checklist item	Reported on page #
TITLE			1
Title	1	Identify the report as a systematic review, meta-analysis, or both.	
ABSTRACT			
Structured summary	2	Provide a structured summary including, as applicable: background; objectives; data sources; study eligibility criteria, participants, and interventions; study appraisal and synthesis methods; results; limitations; conclusions and implications of key findings; systematic review registration number.	2
INTRODUCTION			
Rationale	3	Describe the rationale for the review in the context of what is already known.	4
Objectives	4	Provide an explicit statement of questions being addressed with reference to participants, interventions, comparisons, outcomes, and study design (PICOS).	5
METHODS			
Protocol and registration	5	Indicate if a review protocol exists, if and where it can be accessed (e.g., Web address), and, if available, provide registration information including registration number.	NA
Eligibility criteria	6	Specify study characteristics (e.g., PICOS, length of follow-up) and report characteristics (e.g., years considered, language, publication status) used as criteria for eligibility, giving rationale.	5
Information sources	7	Describe all information sources (e.g., databases with dates of coverage, contact with study authors to identify additional studies) in the search and date last searched.	5
Search	8	Present full electronic search strategy for at least one database, including any limits used, such that it could be repeated.	5
Study selection	9	State the process for selecting studies (i.e., screening, eligibility, included in systematic review, and, if applicable, included in the meta-analysis).	5
Data collection process	10	Describe method of data extraction from reports (e.g., piloted forms, independently, in duplicate) and any processes for obtaining and confirming data from investigators.	5
Data items	11	List and define all variables for which data were sought (e.g., PICOS, funding sources) and any assumptions and simplifications made.	5
Risk of bias in individual studies	12	Describe methods used for assessing risk of bias of individual studies (including specification of whether this was done at the study or outcome level), and how this information is to be used in any data synthesis.	5
Summary measures	13	State the principal summary measures (e.g., risk ratio, difference in means).	5
Synthesis of results	14	Describe the methods of handling data and combining results of studies, if done, including measures of consistency (e.g., I^2) for each meta-analysis.	NA

PRISMA 2009 Checklist

Section/topic	#	Checklist item	Reported on page #
Risk of bias across studies	15	Specify any assessment of risk of bias that may affect the cumulative evidence (e.g., publication bias, selective reporting within studies).	5
Additional analyses	16	Describe methods of additional analyses (e.g., sensitivity or subgroup analyses, meta-regression), if done, indicating which were pre-specified.	NA
RESULTS			
Study selection	17	Give numbers of studies screened, assessed for eligibility, and included in the review, with reasons for exclusions at each stage, ideally with a flow diagram.	8
Study characteristics	18	For each study, present characteristics for which data were extracted (e.g., study size, PICOS, follow-up period) and provide the citations.	9
Risk of bias within studies	19	Present data on risk of bias of each study and, if available, any outcome level assessment (see item 12).	9
Results of individual studies	20	For all outcomes considered (benefits or harms), present, for each study: (a) simple summary data for each intervention group (b) effect estimates and confidence intervals, ideally with a forest plot.	9
Synthesis of results	21	Present the main results of the review. If meta-analyses are done, include for each, confidence intervals and measures of consistency	8
Risk of bias across studies	22	Present results of any assessment of risk of bias across studies (see Item 15).	9
Additional analysis	23	Give results of additional analyses, if done (e.g., sensitivity or subgroup analyses, meta-regression [see Item 16]).	NA
DISCUSSION			
Summary of evidence	24	Summarize the main findings including the strength of evidence for each main outcome; consider their relevance to key groups (e.g., healthcare providers, users, and policy makers).	12
Limitations	25	Discuss limitations at study and outcome level (e.g., risk of bias), and at review-level (e.g., incomplete retrieval of identified research, reporting bias).	12
Conclusions	26	Provide a general interpretation of the results in the context of other evidence, and implications for future research.	13
FUNDING			
Funding	27	Describe sources of funding for the systematic review and other support (e.g., supply of data); role of funders for the systematic review.	NA