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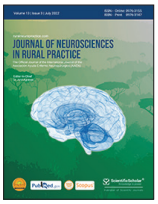

Systematic Review

Prevalence of road traffic injuries in South East and South Asian region – A systematic review

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ABSTRACT

Background: South and South-East Asian countries report a great liability for the world's road traffic injuries (RTIs) and deaths. A vast number of research studies tested various interventions including specific protective devices to prevent accidents, but no review papers have been conducted to find out the prevalence of RTIs in South-East and South Asian countries.

Objective: This review paper was an attempt to find out the prevalence of RTIs and their associated factors in South-East and South Asian countries.

Methods: Following the guidelines of Preferred Reporting Items for Systematic Review and Meta-Analyses (PRISMA), we searched the articles in the electronic databases of PubMed/Medline, Scopus, CINAHL, ProQuest, and Web of Science. Articles were selected if they reported the prevalence of RTI, or road traffic accident (RTA) deaths. In addition, a data quality assessment was done.

Results: Out of the 10,818 article hits from the literature search, ten articles found the eligibility and inclusion criteria. Most of the studies reported that males are involved in the RTIs more than females. The male mortality rate is more than the female mortality in RTI mortality. Young adult males are the major victims when compared with the different age groups of male victims. Two-wheelers are the major contributors to the accident rate. Religious or national festivals are not free from accident-prone times. Climatic seasons and nighttime have a major influence on the RTIs. RTIs are increasing due to the sudden and huge increase in the number of motor vehicles and the development of cities and towns.

Conclusion: Accidents are non-predictable but controllable disasters in society. Overspeeding, bad conditions on road, the vulnerability of the vehicles, and careless driving are the major reported reasons for RTIs. Making and implementing strict laws can help us to control RTAs. The major effect on the reduction of RTI can be assured only with the presence of responsible people. That can be achieved only by creating awareness in society about traffic rules and responsibilities.

Keywords: Trends, Traffic injuries, Road traffic trauma, Road accident, Road traffic accidents, Vehicle accidents, Motor accidents, Asia, Asian countries

INTRODUCTION

Road traffic injuries (RTIs) are an ignored but unavoidable health issue around the globe. It needs an effective avoidance method to promote supportable safety. According to a study conducted in 2010, RTIs are ranked eighth in factors contributing to death.[1] Nearly 1.2 million deaths and more than 20 million people suffer from injuries due to road traffic accidents (RTAs). RTIs are increasing due to the sudden and massive increase in the number of motor vehicles and the development of cities and towns.[2]

RTIs are unavoidable but can be preventable. The situation has been monitored and addressed by the World Health Organization (WHO) on various platforms in the form of various guidelines and policies. Few countries started following the recommendations of the WHO. Unfortunately, most countries have not shown interest to follow or implement the WHO guidelines or policies in terms of road safety.[3] In the decade, 2011–2020, the United Nations were forced to declare the decade of action for road safety due to the severity of the issue globally.[4]

Most of the studies depicted RTIs as the major issue in society in developed or Western countries. Data from developing nations were lacking. The researchers took an interest in systematically analyzing the prevalence of RTAs,

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Received: 26 September 2022 **Accepted:** 31 January 2023 **EPub Ahead of Print:** 03 March 2023 **Published:** 03 May 2023 **DOI:** 10.25259/JNRP_25_2022

the basic causes, and the effects of RTI on victims in the countries located in South-East and South Asia countries and estimate the prevalence of RTIs in this region. By recognizing the impact, our study can contribute to the "preparedness stages" for the prevention of RTIs and the implementation of suitable policies to possibly lessen the impact of RTIs among the victims.

The present systematic review on the prevalence of RTIs is very important to create awareness and to avoid continuing unfavorable outcomes by implementing new technological methods in the transportation system of the countries. The huge number of RTI cases happening in the country is normally neglected by the people without giving them any consideration. Evidence about the frequency of RTI in South-East and South Asian countries is important to develop tactics for timely recognition and correct administration ensuring improved results in the reduction of RTI cases in these countries. Hence, this data would benefit the administrators in adopting innovative methods in the prevention of RTAs and, thus, helps to prevent loss of life produced by RTIs, thereby bringing an encouraging impression on the decline of RTI-related mortality and morbidity.

After considering all the situations, the present systematic review was conducted with the objective of determining the prevalence of RTIs and their impact on road traffic regulations in South-East and South Asian countries.

METHODS

Eligibility criteria

The eligibility for the studies for the systematic review was set based on study design, year of publication, and language and geographical area of the study conducted. Cross-sectional, descriptive, and cohort studies only were selected for the review. Studies published from January 1, 2011, to December 31, 2020, published in the English language and the outcomes measured in terms of the prevalence of RTAs in South and South-East Asian countries were selected for the study.

Two reviewers (V and J) reviewed and identified the studies independently for eligibility of the studies. The discrepancy that arose between the two reviewers was solved through a discussion with the third reviewer(S) of the team. Articles were excluded if only abstracts were available and a full text was not available and if it is literature or systematic review, meta-analyses, or commentaries.

Search strategy

The literature search was done in the electronic databases of PubMed/Medline, CINAHL, ProQuest, Scopus, and Web of Science. Articles were selected if they reported the prevalence of RTAs, RTI, or RTA deaths. In addition to this, we searched manually the reference lists of eligible articles. PICO was formulated and identified as follows.

PICO

Participants/population

- All RTI victims
- All hospital admitted victims
- All moralities related to RTI.

Intervention(s), exposure(s)

- RTI of all types (Pedestrian, passenger).

Comparator(s)/control

The comparison will be within the participants, with no other comparison group.

Main outcome(s)

The primary outcome will be

- Prevalence of RTAs
- Risk factors for RTA injury
- Mortality rate among RTA injury victims.

Search

The review search comprised the following terms

- Client, adults, subjects, patients, and participants
- Prevalence, trends, frequency, and incidence
- Cross-sectional, descriptive, and epidemiology
- RTAs, accident traffic, RTIs, and traffic accidents
- South East Asia, South Asia, Afghanistan, Bangladesh, Bhutan, India, Pakistan, Nepal, Sri Lanka, Maldives, Malaysia, Singapore, and Vietnam.

These terms were combined using the Boolean operators "OR" and "AND."

Source reviewing

The literature search aimed to find published research papers. The search was limited to research papers published in the English language. For articles published in other languages, English translations were searched if available. A three-phase search approach was applied for this systematic review. In the initial phase, the search was done with MEDLINE and CINAHL which were followed by an analysis of the text words contained in the title and abstract, and of the index terms used to describe the article. All identified keywords and index terms were used to search in the second phase. In the third phase of the literature search, all the reference lists of the identified articles were searched for additional studies.

Quality of studies

STROBE indicators were preferred to perform the data quality assessment since our systematic review included only observational studies.

Study selection

We got a total hit of 10,818 articles from different databases. Reviewers independently reviewed hits and 43 studies were retrieved for the titles and abstracts. The retrieved articles were uploaded to the covidence. Title screening and abstract screening were done as per the protocol. The eligibility of the study was determined by the independent review of the articles by two reviewers. A third reviewer's suggestion was considered when any disagreement between the two reviewers arise.

Data extraction

Two reviewers independently extracted the data using the covidence platform. Any disagreement that arose between the reviewers was settled by consulting the third reviewer for advice. The studies' broad features, such as the year of data collection, the study's location, the number of victims, the number of injured and dead, and the type of vehicle involved in the accident were gathered. In addition, details on the author, the publication year, the data source, and the study's goals were gathered.

Data analysis

We noticed during the paper extraction that meta-analysis is not practicable due to excessive sample characteristic variability. Therefore, using the research's findings, we created a meta-summary.[5] From each paper, the sample and study results were carefully examined.

RESULTS

Study selection and description of results

Through a database search, 10,818 articles were initially identified which yielded 43 articles that were retracted and ten articles lasted for final extraction by meeting the inclusion/exclusion criteria "[Figure 1]."

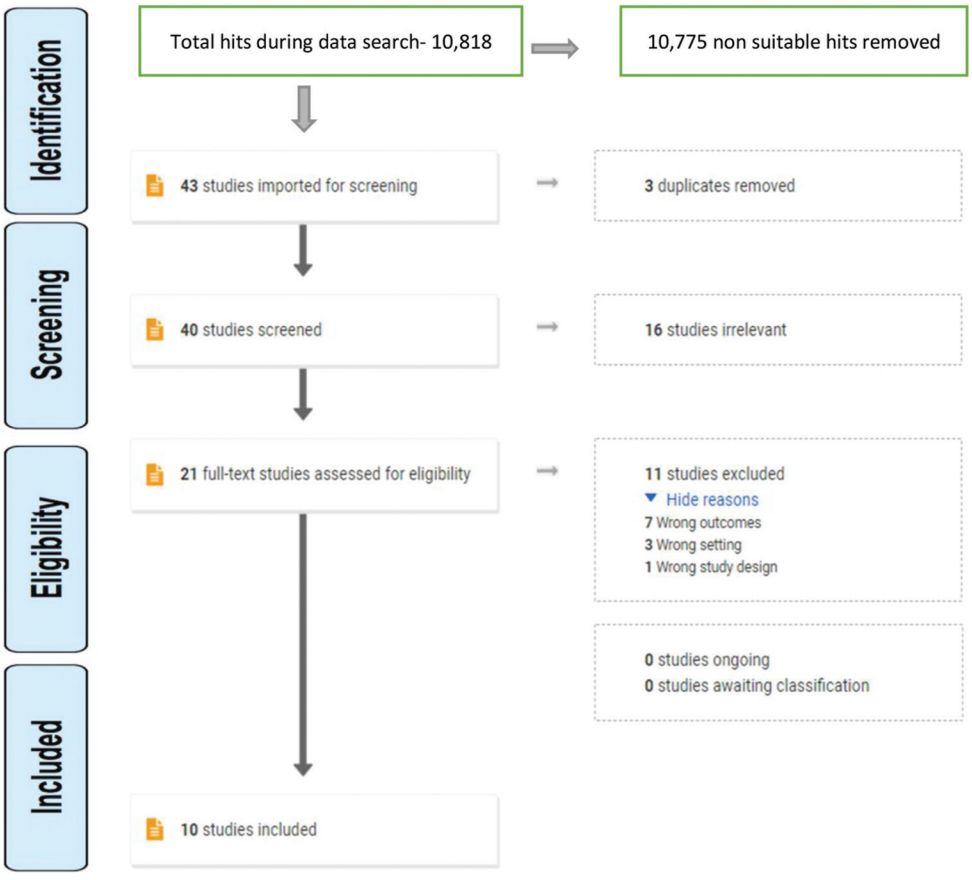

Figure 1: PRISMA flow diagram. PRISMA flow diagram indicates the number of studies selected and retrieved based on the inclusion and exclusion criteria. PRISMA: Preferred Reporting Items for Systematic Review and Meta-Analyses.

Among these 10,818 initial hit articles, 3014 from PubMed, 157 from SCOPUS, 1599 from Web of Science, 5885 from ProQuest, and 163 from CINAHL were there. From these articles, 43 articles were retrieved for the final title and abstract screening. These documents were uploaded in the covidence app for easy extraction.

Finally, ten studies were included for the full-text extraction which met the inclusion criteria. We got these studies from eight countries. Three studies were from Pakistan and one each from India, Sri Lanka, Laos, Vietnam, Malaysia, Maldives, and Thailand.

The characteristics of each article and the population involved are explained further in [Supplementary Table 1] and a summary of the study is included in [Supplementary Table 2].

Most of the studies selected vehicle drivers or victims of accidents as participants. The majority of the studies collected primary data from the records such as the national accident register, hospital records, and police records.[6,7] Some studies were collected directly from the victims of the accident or their relatives. One study collected data from the immediate care giver.[4] The majority of the studies reported that heavy vehicles such as buses, lorries, and trucks are making major accidents but some reported that motorcycles and cars are making accidents. The drivers who met with the accidents majorly were the drivers of commercial vehicles or motorcycles.[8] All the studies involved both males and females as the population of the study, except for two studies that considered only the male population for the study. Most of the studies reported that males are involved in the RTIs more than females. All studies concluded that the male mortality rate is higher than the female mortality in RTI mortality. Major reporting of the studies was that young adult males are the major victims of RTIs when compared with the different age groups of male victims.

Two-wheelers are the major contributors to the RTA rate irrespective of the country.[9] Commercial vehicles and cars are much less contributing to the accident rates as compared with other motor vehicles. Climatic seasons and nighttime have a major influence on the RTAs. During the rainy season, the number of accident cases is more as compared with other seasons. Accident cases are more happening during the day time but the mortality due to RTIs happens more at night.[6]

One study was conducted to rule out the prevalence variation of accidents in the festival season and during the non-festival season.[4] In that study, the result showed that there is no difference in accident prevalence during festival season and non-festival season. The output was the same. The number of accident cases reported during the Ramadan month was almost the same as that of other times. So that study concluded that the festival season also does not make any difference in the accident rates.

Most of the studies reported that RTIs mainly affect the head and nervous system[9,10] [Supplementary Table 3]. Mortality cases were reported with the people who got an injury to the head at the highest rate.[8,11] Motorcyclists especially those who were not used helmets were reported with the highest rate of head injury among the RTIs[9,10,12,13,14] [Supplementary Table 4].

DISCUSSION

This is the first comprehensive analysis of RTI prevalence in South and South-East Asian nations. This study involved the examination of ten manuscripts from eight South and South-East Asian nations.

These studies reported that the male gender was involved in RTIs more than the female gender. This may be due to the involvement of more male people in driving when compared to the female gender. Mortality due to RTIs also happens to males when compared to females. Further analysis of age-wise mortality, it was clear that young males were involved in more accidents and lose their life in the RTIs. Some studies lead the doubt to the risk-taking driving behavior of young male drivers may be the reason for this skewing in the mortality pattern of RTIs. This shows the need for creating awareness among young drivers about road security and the responsibility to follow road traffic rules.

One study was conducted to rule out the prevalence variation of accidents in the festival season with the non-festival season. In that study, the result showed that there is no difference in the accident rates on the roads during the festival season and during the non-festival season. The study was conducted during Ramadhan month when a majority of the people in that country not using the motor vehicle. However, the accident rate shows no major difference from the accident rates that occurred in the other months in that country. From that observation, we can assume that the prevalence data are not associated with the traffic loads during religious or cultural or national festivals of the society or country. Accidents were happening as human errors on the roads.

The majority of the studies collected primary data from the records such as national accident registers, hospital records, and police records.[6,7] Some studies were collected directly from the victims of the accident or their relatives. One study collected data from the immediate care givers.[4] However, one study concentrated on the missing RTI cases from the national registry or hospital records. That study reported that 33% of the RTIs were not reported in the national accident register or hospitals. These study findings point toward the lack of a standardized recording system of accident victims in the South and South East Asian countries. All these countries have different registry patterns of RTAs. However, none of the countries follow the standardized registry of RTI victims.

Most of the RTAs also not registered in these countries until these cases were not registered in a hospital or with the police. This observation leads to the fact that all countries should have a standardized reporting and recording system of RTAs/RTIs which should be recorded at the accident spot. It should be under a central monitoring system which helps to retrieve the data whenever necessary.

Most of the studies were funded by different non-governmental organizations (NGOs) or private agencies to rule out the reason and prevalence of RTIs. Government agencies, which have to play a major role in preventing these accidents had not shown much interest in these kinds of studies. Bad road conditions and ineffective road traffic rules have a major role in RTAs. These two factors were under the control of various departments of the government. It is a basic need that government must organize some monitoring mechanism to check the efficiency of the traffic rules and the condition of roads at regular intervals. Such activities would help to save thousands of lives which are spared on the roads.

Most of the studies reported that RTIs mainly affect the head and nervous system. Motorcyclists especially those who were not used helmets were reported with the highest rate of head injury among the RTIs. These were the major reason for the youths to be the victims of RTIs. It shows the importance of wearing protective devices while driving or travelling in motor vehicles. All countries have their own road traffic rules which state the protective devices and their usage. Most of the passengers or riders were reluctant to follow those instructions intentionally or unintentionally. If all the people start to follow the road traffic rules, the mortality rates can be decreased. Tightening the legislation cannot be a permanent solution to solve the issue. Creating awareness among the public about the importance of following road traffic rules is a major task for the government. A mixed approach method by tightening the rules with creating awareness among the public can make an impact for long-term effects.

Meta-summary

Each study in question was a cross-sectional descriptive study. The trial lasted between 2 months and 5 years. In conducting the studies, no time series designs were employed. Six studies were supported by NGOs or commercial organizations. Four studies had independent funding. Data were gathered through registrations or records kept by national or police agencies, hospitals, victims' families, or victims' records. Both men and women were included in the population of each study. However, for two trials, the study exclusively included male participants. Seven of the ten studies found that heavy vehicles cause the most fatalities and significant accidents, while two also found that motorcycle riders cause accidents, and one study found that inexperienced car drivers also cause accidents.

Limitations

This systematic review had some limitations which must be considered while evaluating the results. In our inclusion criteria, we fixed the cross-sectional, descriptive, and cohort studies only. The geographical area is limited to the South and South-East Asian countries. These two criteria limited our scope to find more literature searches on the prevalence of RTIs.

Strengths of the study and future directions of the study

India's health-care system and economy are severely impacted by the effects of traffic incidents. This review evaluates the prevalence of RTIs in South East Asia and South Asia, which have comparable road and transportation systems. The factors that affect the likelihood of RTAs in these nations indicate improving the road infrastructure, creating distinct lanes for various vehicle types, promoting good driving and walking habits, and ingraining a culture of road safety from an early age. Additional studies on each of the aforementioned topics will enrich the national database, further assisting in the reduction of RTI rates.

Implications for policy and practice

The problem will need to be understood at its true scale, which will need a diversified strategy and efforts toward systematic data collection. This should include implementing programs for awareness and education aimed at both drivers and pedestrians, strong enforcement of the legislation to control and regulate traffic on the road, effective trauma management systems to lessen the severity of the victim's injuries, encouraging the public to use safety equipment like helmets, effective infrastructure to create safer roads, and intensive research on developing the available approaches.

Other information

Protocol registration

PRISMA guidelines were used to report the review study. This systematic review is registered in the database of prospectively registered systematic reviews in health and social care (PROSPERO) with the PROSPERO registered id:- CRD42021230112. Also obtained the Institutional Research Committee permission (IRC).

CONCLUSION

This systematic review reviewed ten articles which met the inclusion criteria put by the researchers. The studies were able to provide the prevalence and supporting data regarding the RTIs in the South and South-East Asian countries.

The study concluded that the world tries to prevent the RTIs with various measures on the other side the RTI reporting

cases are increasing day by day. The WHO has recommended road safety appraisals as a strategy for the reduction of RTIs in connection with the decade of action for road safety. However, some studies found that road improvements lead to increased RTI as which increases the speed of the vehicle and led to accidents. Hence, strict traffic rules along with the speed control interventions of motor vehicles and public awareness about the traffic rules and personal responsibilities may help to reduce the RTIs.

Acknowledgment

We like to acknowledge to all directly or indirectly support the study.

Declaration of patient consent

Patient's consent not required as there are no patients in this study.

Financial support and sponsorship

The Indian Council of Medical Research (ICMR) provided funding for the study: - HSR/Ad-HOC/4/2018-19, RFC No. (P-9), dated 2/07/2018.

Conflicts of interest

There are no conflicts of interest.

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How to cite this article: Vinish V, Chakrabarty J, Vijayan S, Nayak BS, Shashidhara YN, Kulkarni M, *et al*. Prevalence of road traffic injuries in South East and South Asian region – A systematic review. J Neurosci Rural Pract 2023;14:214-23.

SUPPLEMENTARY TABLES

Supplementary Table 1: The characteristics of each article and the types of vehicles involved.

Title	Lead author contact details	Country	Type	Aim of study	Start date	End date	Study funding sources	conflicts	Populatin gender
RTI mortality and its mechanisms in India: Nationally representative mortality survey of 1.1 million homes.	Marvin Hsiao, Ajai Malhotra, J. S. Thakur, Jay K. Sheth, Avery B. Nathens, Neeraj Dhingra, Prabhat Jha	India	Cross sectional study	To quantify and describe the mechanism of RTI deaths in India.	2001	2003	John E Fogarty International Center of the National Institutes of Health.	None	Both
RTCs in Ramadan: An observational study.	M. N. Tahir, G. Macassa, A.H. Akbar, R. Naseer, A. Zia and S. Khan	Pakistan	Cross sectional study	Prevalence of RTCs in Punjab, Pakistan.	Jan-11	Aug-11	Nil.	No	Both
Road rage and RTAs among commercial vehicle drivers in Lahore, Pakistan.	M. A. Shaikh, I. A. Shaikh and Z. Siddiqui	Pakistan	Cross sectional study	To understand more about road rage experiences and behaviours and the RTA profile among different types of commercial vehicle drivers in the city of Lahore in Pakistan.	Feb-09	May-09	Nil.	None	Male
Determinants of RTI Among Adult Motorcyclists in Male, Maldives.	Mariyam Waseela and Orapin Laosee	Maldives	Descriptive study	The incidence of nonfatal RTIs in Male, the capital city of the Maldives, and identifies risk factors associated.	Dec-12	Jan-13	Nil.	Nil	Both
Geoclinical analyses for areas at high risk for motorcycle-related RTI in a district in Malaysia.	Nik Hisamuddin NA Rahman and Nyi Nyi Naing	Other: Malaysia	Cross sectional study	Collect data on the epidemiology, the pattern of injury among motorcyclists and to relate with spatial data in a local district.			University Sains Malaysia, who had granted RU Grant (grant no.: 304. PPSP. 6316147).	Nil	Both
RTIs in northern Laos: Trends and risk factors of an underreported public health problem.	Gaunther Slesak, Saythong Inthalath, Annelies Wilder-Smith and Hubert Barennes	Other: Laos	Cross sectional study	To investigate trends, risk factors and better estimates of RTI.	Dec-07	Jan-11	NGO SFE.	None	Both

(*Contd...*)

Supplementary Table 1: (*Continued*).

Title	Lead author contact details	Country	Type	Aim of study	Start date	End date	Study funding sources	conflicts	Populatin gender
Prevalence and factors associated with RTC among taxi drivers in Hanoi, Vietnam.	Quang Ngoc La, Andy H. Lee, Alynn B. Meuleners, Dat Van Duong	Vietnam	Cross sectional study	Estimate the prevalence of RTC among taxi drivers in Hanoi for the period 2006–2009, and to identify factors affecting these RTC.	2006	2009	Nil.	No	Male
Patient and injury characteristics associated with road traffic mortality in general hospitals in southern Thailand.	Sunee Kraonual, Apiradee Lim, Attachai Ueranantasun, Sampurna Kakchapati	Other: Thailand	Descriptive study	To determine the association between patient/injury characteristics and road traffic mortality.	2008	2013	Graduate School, Prince of Songkla University, Thailand, and the Centre of Excellence in Mathematics, the Commission on Higher Education, Thailand.	No	Both
Under reporting of RTIs in the district of Kandy, Sri Lanka.	Nithershini Periyasamy, Catherine A. Lynch, Samath D. Dharmaratne, D. B. Nugegoda, A. Truls	Sri Lanka	Cross sectional study	To conduct a community survey to estimate the degree to which RTIs are under reported and to compare the characteristics of RTI reported to the police to those not reported.	1-1-2007	31-12-2007	HEDMaTC at the faculty of Medicine, University of Peradeniya.	Nil	Both
Vulnerable road users are at greater risk during Ramadan - results from road traffic surveillance data.	Amber Mehmood, Anoosh Moin, Qamar Khan, Mohammad Umer Mir, Rashid Jooma	Pakistan	Descriptive study	To find the frequency of RTCs according to time of incident, road user group and survival.	2006	2011	JohnsHopkins-Pakistan International Collaborative Traumaand Injury Research Training Programme.	Nil	Both

RTI: Road traffic injury, RTA: Road traffic accident, RTC: Road traffic crash, RU: Research University, SFE: Service Fraternel, HEDMaTC: Health emergency and disaster management and treatment center, NGO: Non-governmental organization

Supplementary Table 2: Summary of the studies.

Title	Inclusion criteria	Country	Method of recruitment of participants	Type of vehicle involved	Total number of victims	Number of injured people	Injured people %	Number of mortality	Mortality %
Road traffic injury mortality and its mechanisms in India: Nationally representative mortality survey of 1.1 million homes.	Studies reported with Death or injury by RTI.	India	National data	All type of vehicles	4456	2157	48.4	2299	51.6
RTCs in Ramadan: An observational study.	RTC data collected at the Lahore headquarters of Rescue 1122	Pakistan	Care givers report	All type of vehicles	14788	13021	88.05	1767	11.95
Road rage and RTAs among commercial vehicle drivers in Lahore, Pakistan.	Bus, auto-rickshaw and wagon drivers in Lahore	Pakistan	Voluntary	Truck, Bus	901	106	11.8	––	––
Determinants of Road Traffic Injury Among Adult Motorcyclists in Male, Maldives	Motorcyclists aged between 18 and 44 years, and agreed to participate were recruited	Maldives	Voluntary	Motorbike	117	117	100	––	––
Geoclinical analyses for areas at high risk for motorcycle-related road traffic injury in a district in Malaysia	All patients who attended ED with RTIs Patient who died in ED secondary to RTIs.	Other: Malaysia	Clinic patients	Motorbike	439	436	99.5	3	0.5
Road traffic injuries in northern Laos: trends and risk factors of an underreported public health problem	Patients presenting with injuries from RTAs	Other: Laos	Hospital based records	All type of vehicles	1074	1057	98.4	17	1.6
Prevalence and factors associated with RTC among taxi drivers in Hanoi, Vietnam	A person in control of a taxi working at a taxi company, with a level B2 or above driving licence	Vietnam	Voluntary	Car	1214	276	22.7	––	––
Patient and injury characteristics associated with road traffic mortality in general hospitals in southern Thailand	Road traffic injuries recorded by the general hospitals in 5 southern provinces of Thailand	Other: Thailand	Clinic patients	All type of vehicles	78862	77431	98.2	1431	1.8
Under reporting of road traffic injuries in the district of Kandy, Sri Lanka	People from kandy met with accident	Sri Lanka	Clinic patients	All type of vehicles	149	133	89.3	16	10.7
Vulnerable road users are at greater risk during Ramadan - results from road traffic surveillance data	Nil	Pakistan	Clinic patients	All type of vehicles	1,63,022	157269	96.47	5753	3.53

RTI: Road traffic injury, RTC: Road traffic crash, RTA: Road traffic accident

Supplementary Table 3: RTI risk activity of the studies.

S No.	RTI risk activity	No. of studies reported
1.	Not wearing helmet	3
2.	Hits	9
3.	Skids	2
4.	Not wearing seatbelt	4
5.	Bad condition of roads	5
6.	Wrong lines	2
7.	Bad climate	

RTI: Road traffic injury

Supplementary Table 4: Type of injuries in the studies.

S. No.	Type of injury	No. of studies reported
1.	Head or neck injury	4
2.	Fracture to extremities	2
3.	Blunt with penetrating	2
4.	Chest or abdominal injury	2
5.	Pelvic cavity injuries	2
6.	Others	3