Review Article

Prevalence pattern of road traffic accidents in developing countries—a systematic review

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Abstract

One of the main causes of death and disability is road traffic injuries, with an unequal number of incidences in developing countries. Prevalence of road traffic accident (RTA) is a growing public health concern in developing countries. Our systematic review looked for existing evidence on the prevalence of RTA, thereby aimed at reducing the incidence of RTA in developing communities. Electronic databases such as CENTRAL, DARE, CDSR, Cochrane Methodology Reviews, MEDLINE, PubMed, and other resources were searched. In addition, hard copies and unpublished works were also searched. PubMed keyword strategy was tailored to the other databases. Findings of the review correlate the relationship of age and sex with RTAs in developing countries. According to the results, it was found that adolescents and young adults, especially male population, are at high risk of traffic injury and death, with the prevalence rate ranging from 11.1% to 42.6% for age group of 20–30 years and from 4.6% to 97.2% for male subjects. Hence, there arises an urgent need for further research on the potential correlates for RTA in developing countries as information in this field will help in implementation of measures to prevent fatalities caused by RTAs, thereby bring a positive impact in the reduction of RTA-related mortality and morbidity.

KEY WORDS: Road traffic accidents, age, sex

Introduction

Situation Globally

Road traffic accidents (RTAs) are an emerging global epidemic. One of the main causes of death and disability is road traffic injuries, with an unequal number of incidences in developing countries.[1] According to the current estimates of the global burden in 2002, road traffic injuries were ranked as the 11th leading cause of death in the world. In many industrialized countries, although there is a decrease in RTA rates and its related deaths, there is a rapid increase in many underdeveloped countries. The aggregate rates of road traffic fatality per 100,000 population were lowest in high-income countries such as the European region (11.0), whereas the highest rates were reported in the low-income and middle-income countries such as eastern Mediterranean (26.4) and African regions (28.3).[1]

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Situation in Developing Countries

One of the main causes of death and disability is road traffic injuries, with an unequal number of incidences in developing countries.[1]. In 2000, RTA were the ninth leading cause of disability-adjusted life years lost and are projected to become third by 2020.[2] Every year, more than 20 million people are injured or disabled and 1.17 million are killed because of RTAs.[2] In developing countries, more than 85% of the deaths and nearly90% of the disabilities are caused by RTAs globally.[3] In India, of the mortality of 2,123.60 from all causes, 1,463 are caused by RTA. The World Health Organization (WHO) report on Global Status Report on Road Safety, which is the first of its type, states that, with more than 130,000 deaths annually, India has overtaken China and now has the worst RTA rate worldwide.[4] Similarly, 1.6% are because of RTA of 42.8% in Nepal, 19% of 91.5% in Nigeria, 18.6% of 50.9% in Iran, and 24% of 34.7% in Thailand. It is important to note that about 9.5% of the total 1.2 million deadly crashes in the world are accounted by

India. In 2009, one death in every 4.14 min and one injury in every 1.13 min occurred in India because of road accident. If this trend prevails, then about 150,000 deaths and 3 million hospitalizations yearly by 2010, which can rise further to 20, 000 deaths and more than 3.5 million hospitalizations yearly by 2015, will be recorded in India.[4]

In addition, RTAs also exert a considerable economic burden on developing countries, estimated to cost to about $24.5 billion across Asia with India alone crossing about USD $13.5–50 billion (i.e., 3% of GDP).[5] In order to determine the prevalence of this increasing burden of early death and disability, which developing countries are encountering because of RTAs, the available epidemiological and anthropological literature has been reviewed.

Objective

To collate and review the evidence on prevalence patterns of RTAs in developing countries with respect to age and sex.

Materials and Methods

Types of Studies

Cross-sectional, cohort studies, randomized- and non-randomized-controlled trials, reviews, and original articles investigating the prevalence pattern of RTAs in developing countries were included in the study.

Types of Participants/Intervention

The prevalence pattern of RTAs in developing countries was observed in both the genders, aged 14–65 years, or any ethnic group. The prevalence pattern of RTAs in developing countries in both the genders and 14–65 years of age were assessed in this review. Observational community- and hospital-based studies from developing countries targeting participants within age group 14–65 years were included for the review. Article in all languages were considered for inclusion. Exclusion criteria included study not relevant to research question and published before 2000.

Search Methods for Identification of the Studies

We searched around 20 databases for interventions studies related to prevalence pattern of RTAs in developing countries.

We searched all databases in November 2014 from their start date: the Cochrane Library databases (CENTRAL, DARE, CDSR, and Cochrane Methodology Reviews) (Issue 4, 2007); MEDLINE (OVID) (January 1966 to December 2012); PUBMED (January 1966 to December 2012). Other resources included Database of Health Technology Assessment Database, NHS Economic Evaluation Database, National Research Register for Social Care, Clinical Trials.gov, research registers (i.e., National Institute for Health Research Portfolio Database, UK Research Register for Social Care for social care topics), National Institute for Health, Center for International Rehabilitation Research Information and Exchange, and Google and Google Scholar and gray literature for unpublished work. We searched the reference lists of included studies and contacted experts in the field to identify further studies and for seeking more information on the topic. PubMed keyword strategy was tailored to the other databases. Hand searches were conducted for conference proceedings, medical journals, and books. There were no language restrictions.

Data Collection and Extraction

Abstracts of search results were reviewed for identification of potentially relevant studies and for exclusion of studies not meeting selection criteria. The full text copies of all articles identified as potentially relevant were retrieved. Two authors independently assessed each of the retrieved articles for inclusion, extracted the data, and cross-checked the data extraction forms using the Cochrane Effective Practice and Organization of Care data collection checklist, and in case of any discrepancies, we referred to the original article. The decision was referred to a third review author in case of disagreement between the two authors, and the issue was resolved by consensus. We contacted study authors to obtain missing data. The characteristics of included and excluded studies are shown in Table 1

Data Analysis

As included studies were very heterogeneous in terms of interventions, settings, and measured outcomes, a systematic review was considered as a more appropriate approach to the data.

For each study information on study design, focus of the study, participants of the study, burden of RTA, characteristics of injury such as interaction injury, severity, type, and mechanism, risk factors for RTA, and strategies to prevent RTA was extracted. The Eppi Reviewer 4 software was used for data analysis.

If the studies identified were similar in terms of settings, patients, interventions, outcome assessment, and study methods, we planned to carry out a meta-analysis. However, this was not possible owing to noticeable clinical heterogeneity. We, therefore, carried out narrative synthesis of the results from the included studies. Furthermore, we, therefore, advise caution in the interpretation of results as, where there is a high heterogeneity, the applicability of the overall effect estimate is likely to vary in varied settings.

After including and excluding studies based on the quality appraisal, data analysis of the studies was undertaken. The initial step for this process involves a simple descriptive evaluation of each study, commonly presented in tabular format [Table 1; Figures 2 and 3].

Assessment of Study Quality

We assessed study quality with a modified version of the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) checklist (available at http://www.strobe-statement.org/fileadmin/Strobe/uploads/checklists/STROBE_checklist_v4_cross-sectional.pdf),[6,7] which as

Table 1: Data extraction form (mapping report)

Study title	Study design	Study location	No. of participants	Recruitment	Age	Sex
Singh et al.[8]	CS	India	1,238	Victims who reported to MMIMSR emergency and various OPD clinics during the study period	79.47% of the victims were in the age group of 15–50 years	Male, 88.77%; female, 6.70%
Jha et al.[10]	CS	India	726	RTA victims reporting to JIPMER casualty during the study period	0–9 years: 6%; 10–19 years: 11.5%; 20–29 years: 31.3%; 30–39 years: 22.3%; 40–49 years: 15.6%; 50–59 years: 9.1%; 60–69 years: 3%; >70 years: 1.2%	Male (M), 83%; female (F), 17%; 0–9 years: M, 4.6%; F, 13%; 10–19 years: M, 12.9%; F, 4%; 20–29 years: M, 32.7%; F, 24.5%; 30–39 years: M, 22.6%; F, 21.1%; 40–49 years: M, 15.4%; F, 16.3%; 50–59 years: M, 8.1%; F, 13.8%; 60–69 years: M, 2.5%; F, 5.7%; >70 years: M, 1.2%; F, 1.6%
Sharma et al.[9]	Retrospective record-based study	India	423	Case records of the medical records section of Shree Krishna Hospital, Pramukhswami Medical College	0–10 years: 6.4%; 11–20 years: 12.1%; 21–30 years: 28.8%; 31–40 years: 20.6%; 41–50 years: 16.1%; 51–60 years: 10.2%; >60 years: 5.9%	Male, 77.3% (maximum no in 21–30 years, 31.8%); female, 22.7% (highest in 31–40 years, 21.9%)
Fitzharris et al.[11]	CS	India	378	Consecutive RTI cases reporting to two large public hospitals and three branches of a large private hospital in Hyderabad during the study period were recruited	Median age for riders was significantly older than that of the pillions ($z = 3.9$, $p \leq 0.05$); 1–9 years: 0.8%; 10–14 years: 2.4%; <20 years: 11.1% (riders) and 26.2% (pillions); >40 years: 29% (riders) and 18% (pillions) ($\chi 2(2) = 15.7$, $p \leq 0.05$).	Male, riders: 97.2%; pillions: 69.8%
Sehat et al.[15]	CS	Iran	22,128	64,200 people aged ≥18 years were identified from 2008 Urban Health Equity Assessment and Response Tool (Urban HEART) survey of which 22,128 households were interviewed by three-stage stratified design	Mean (SD): 34.4 (0.45); 18–25 years: 39.7%; 26–45 years: 39.9%; >45 years: 20.34%; 18–25 years: pedestrian (P), 29.4%; bicycler (B), 63.9%; motorcycle (M), 48.2%; car (C), 37.2%; 26–45 years: P, 35.4%; B, 23.4%; M, 39.0%; C, 41.9%; >45 years: P, 35.2%; B, 12.74%; M, 12.8%; C, 20.9%	Male, 66.7% (22.6 per 1,000); emale: 33.3%; M:F, 2:1; male: P, 53.8%; B, 75.2%; M, 73.9%; C, 66%; female: P, 46.2%; B, 24.8%; M, 26.1%; C, 34%

(*continued*.....)

Dandona et al.[12]	CS	India	34,696 people	4,019 pedestrians and 4,183 MTV drivers provided RTC history for 17,454 and 17,242 people	<15 years: 3.8%; 16–20 years: 14.2%; 21–30 years: 42.6%; 31–40 years: 21.7%; <15 years: M:M, 1.4%; M:O, 2.2%; P:M, 1:7%; P:O, 7.3%; 16–20 years: M:P, 15.2%; M:M, 14.6%; M:O, 12.1%; P:M, 19.6%; P:O, 22.9%; 21–30 years: M:P, 45.5%; M:M, 47.0%; M:0, 45.5%; P:M, 24.8%; P:O, 26.0%; 31–40 years: M:P, 21.2%; M:M, 22.8%; M:O, 23.3%; P:M, 15.0%; P:O, 14.6%; 41–50 years: M:P, 9.1%; M:M, 12.1%; M:O, 12.8%; P:M, 15.0%; P:O, 17.7%; >50 years: M, 4.6%; F, 13%; M:P, 9.1%; M:M, 2%; M:O, 4.1%; P:M, 8.5%; P:O, 11.5% (M, motorized two-wheeled vehicle; P, pedestrian; O, others]. Mortality rate: 50%, 21–40 years; 50%, >40 years	Male: M, 4.6%; P, 13%; female: M, 4.6%; P, 13%; Male: M, 4.6%; P, 13%; M:P, 81.8; M:M, 83.4%; M:O, 82.8%; P:M, 58.8%; P:O, 66.7%. Female: M, 4.6%; P, 13%; M:P, 18.2%; M:M, 16.6%; M:O, 17.2%; P:M, 41.2%; P:O, 33.3%. Mortality rate: M, 4.6%; F, 13%; 83.3%, male subjects.
Saadat and Karbakhsh[16]	CS	Iran	3,000	Telephone survey was arranged over a random sample of Iranian drivers	41.8 (±11.53); $p = 0.881$	Male: M, 4.6%; F, 13%; $p = 0.011$
Saadat and Soori[14]	CS	Iran	2,488	Households were randomly selected for a face-to-face interview	mean age of car drivers, 43.9 ± 15.7; RTI incidence per 1000 population: age of drivers: M, 4.6%;F, 13%; motor cycle (MC) owners (MC-O), 12.94%;	Male car owners, 4.6%; female car owners, 2.6%

(*continued*.....)

					nonowners (MC-NO), 10.86%; car (C): C-O, 13.29%; C-NO, 13.18%; $p < 0.001$ for age difference of C-O and MC-O vs. MC-NO; C-O vs. C-NO; $p < 0.05$ for age difference of C-NO vs. MC-NO	
Patil et al.[13]	CS	India	350	All road traffic injury cases admitted to Krishna Hospital and Medical Research Center during the study period were studied	Average age, 32.5 years; below 14 years, 10.5; 20–29 years, 29 (highest); 60 years and above, 6%	Male, 82.3%; female, 17.7%; Male:female, 4.6:1

CS, cross-sectional study.

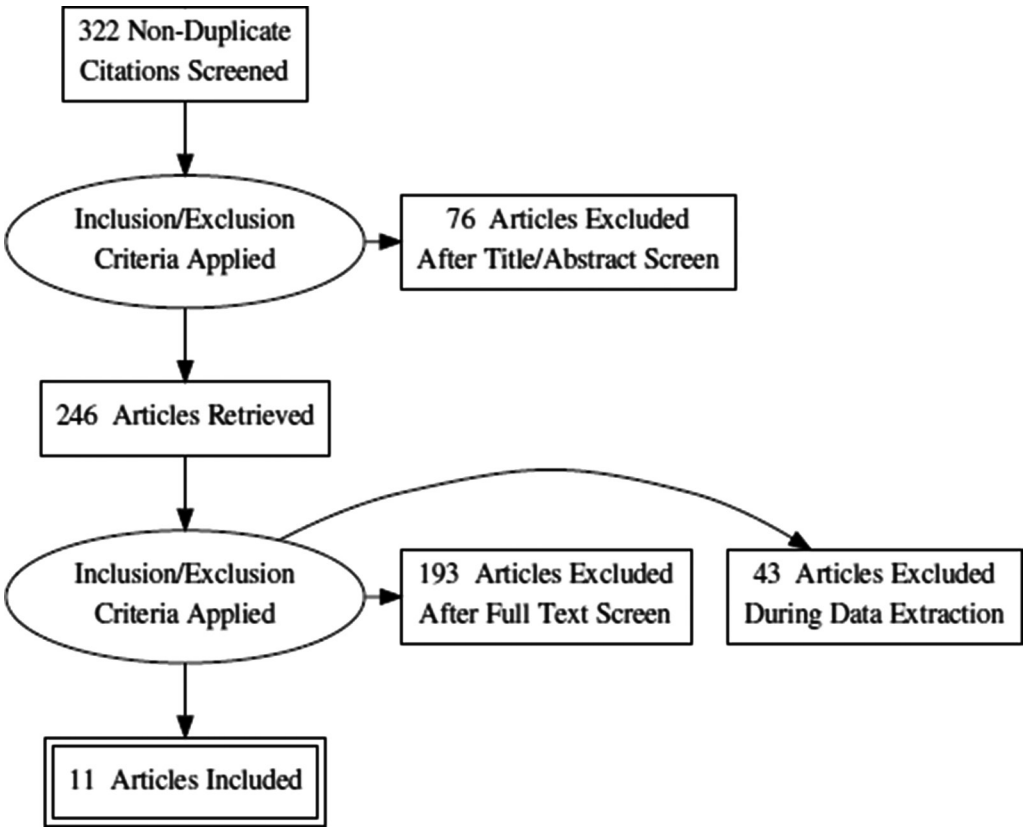

Figure 1: Prisma flow chart.

modified to include items that are to be considered in cross-sectional studies reporting. One point was given for each STROBE item. The article addressed by the reviewer independently determined a global quality score for each article. Articles with quality score of at least 12 of possible 23 were retained in the review [Table 2].

Results

Our search identified 372 references from different databases. After removing duplicates, 322 references remained, which were screened, and 95 references were excluded. Full texts of 246 references were retrieved and screened for

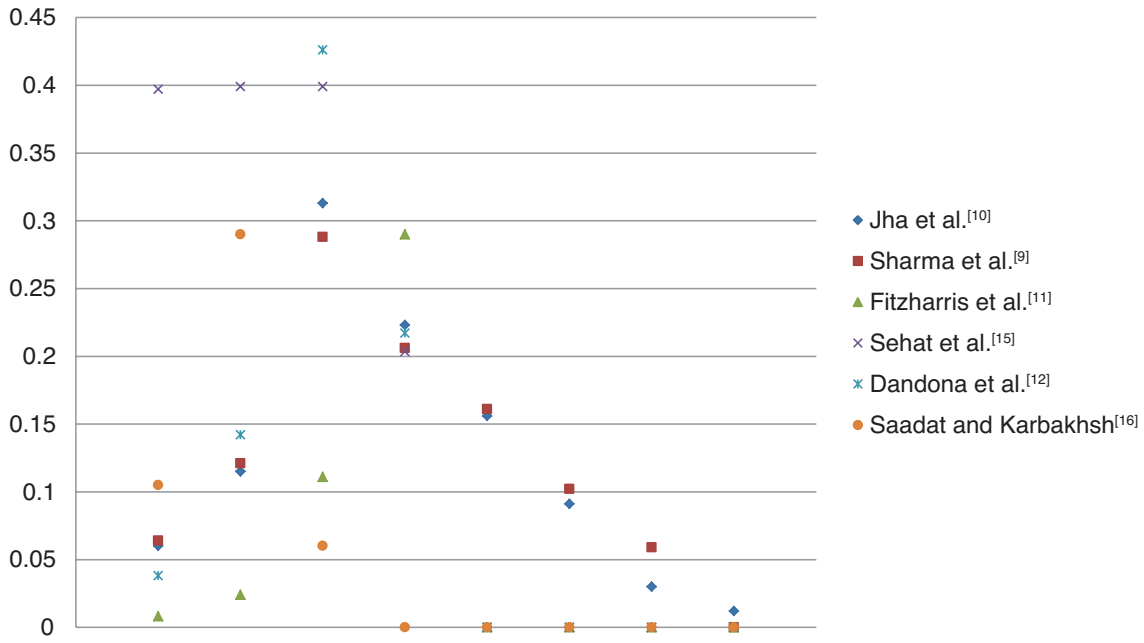

Figure 2: Prevalence of RTA according to age groups.

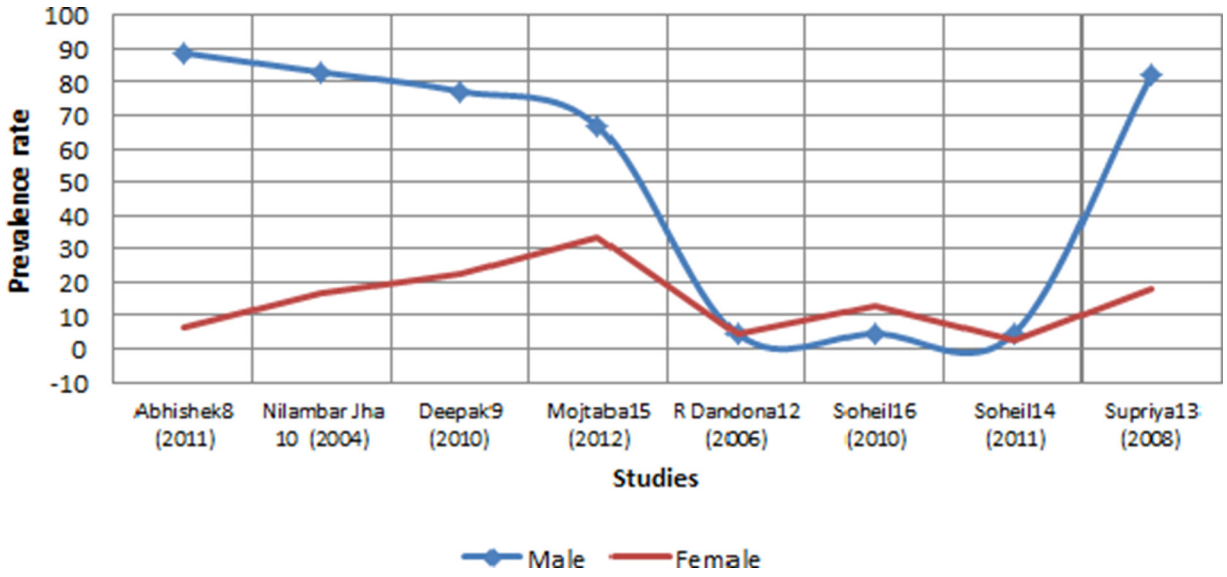

Figure 3: Prevalence of RTA according to sex.

eligibility, and after excluding 236 references, 10 were included in this review [Figure 1].

Description of the Included Studies

The studies were heterogeneous in terms of recruitment methods, sample size, data collection, and operational definition of multimorbidity or comorbidity. The number of participants in each study varied tremendously from 378 to 34,696.

Of the nine studies included, all were cross sectional [Table 2]. Over 66.66% of the studies were conducted in India[8–13] and three in Iran.[14–16] Of the nine studies, five were hospital record-based studies,[7–9,11,13] while four studies were population-based studies.[8,10,15,16] The majority of the studies

Table 2: Quality assessment of the studies retained in the review, based on a modified (shorter) version of STROBE

Item	Singh et al.[8]	Jha et al.[10]	Sharma et al.[9]	Fitzharris et al.[11]	Sehat et al.[15]	Dandona et al.[12]	Saadat and Karbakhsh[16]	Saadat and Soori[14]	Patil et al.[13]
1[a]	+	+	+	+	+	+	+	+	–
1[b]	+	+	+	+	+	+	+	+	+
2	+	+	+	+	+	+	+	+	+
3	+	+	+	+	+	+	+	+	+
4	+	+	+	+	+	+	+	+	–
5	+	+	+	+	+	+	+	+	+
6	+	–	–	+	+	+	+	+	+
7	+	–	+	–	+	+	+	–	+
8	+	–	–	+	+	+	+	+	+
9	–	–	–	–	–	–	–	+	–
10	–	–	–	–	–	–	+	+	–
11	–	–	+	+	+	+	+	+	–
12	–	–	–	+	+	+	+	+	–
13[a]	+	+	+	–	+	–	+	+	+
14[a]	+	+	+	+	+	+	+	+	+
14[b]	+	–	–	–	+	+	+	+	–
15	+	+	+	+	+	+	+	+	+
16[b]	–	–	–	+	+	+	+	+	–
17	–	+	+	+	+	+	+	+	+
18	+	+	+	+	+	+	+	+	+
19	–	–	–	+	+	+	+	+	–
20	–	+	+	+	+	+	+	+	+
21	–	–	–	–	–	–	–	–	–
22	–	–	–	–	+	–	–	–	–

Notes: + indicates that the study met criteria for that item, whereas – indicates that the study did not meet the criteria for that item. For description of STROBE items, go to: http://www.strobe–statement.org/fileadmin/Strobe/uploads/checklists/STROBE_checklist_v4_cross–sectional.pdf.

[a]Of a maximum possible score of 23.

STROBE, Strengthening the Reporting of Observational Studies in Epidemiology.

targeted motorized vehicle drivers,[8–14,16] pedestrian,[8–12,14,16] cyclists,[9,10,12,13] and passengers.[9]

Descriptions of Outcomes

Prevalence pattern of road traffic accidents in developing countries

Table 1 and Figures 2 and 3 mapping reports give the details of the nine studies focusing on prevalence of RTAs in developing countries.

Age

During the review process, several studies showed a higher cutoff age or aimed at children. In order to be conclusive (as there were not many relevant studies found in these category), we have included studies that targeted adults from these communities, as the majority within each study was younger than 65 years. In addition, some of the studies reported included younger teenagers. Therefore, we can only say that (a) lowest age reported in a study was 14 years; (b) the highest age was not reported (in several studies); and (c) the mean age for each study was 25 years or below. All the studies included participants aged between 14 and 65 years. Participants younger than 14 years and older than 65 years were excluded from the analysis.

Majority (79.47%) of the victims were in the age group of 15–50 years. References [8] and [10] reported that below and above the age of 20 and 49 years, respectively, there is a decrease in accident cases. The highest (28.6%) percentage of the cases was seen in the age group of 20–29 years. Among the included studies, almost all the studies measured the higher prevalence of RTAs among the young and middle-aged population of the countries. Similar observations were also made in other studies that showed the highest number of victims (29.4%) was between the age groups of 20–29 years,[12] 21–40 years,[9] and 18–25 years.[15] In addition, lower proportion of RTAs were reported in those aged 60 years and older.[10]

According to these studies, the incidence of RTA estimates revealed a wide difference in the results; however, one constant observation was that, as the age increased, the incidence increased. The largest difference in the prevalence was observed at the age group 20–30 years, with the prevalence ranging from 11.1% in a study[11] reporting to 42.6% in another study.[12] Among studies that included patients of all ages, there appears an association between age and prevalence: prevalence was roughly 15% or lower before the age of 20 years, then increased dramatically, and finally plateaued around the age of 40 years and then decreasing above 40 years of age.

Sex

Almost all the studies involved both male and female participants. However, we could not include any studies targeting lesbian, gay, bisexual, and transsexual. All studies measured the higher prevalence of RTAs among the male population of the countries. Four studies showed the greater prevalence of male subjects in RTAs[8,10,12,13] and reported the male to female ratio in RTA as follows: 2 years: 1:15; 3.2 years: 1:10; and 4.6 years: 1:13. No significant association was detected between gender and traffic crash and between age and gender of pedestrians who collided with a car compared with pedestrians who collided with a motorcycle.[16]

The sex prevalence of RTA estimates reported by these studies shows a wide variation in the results, the only constant being the greater prevalence in male subjects when compared with female subjects. The largest difference in prevalence of RTA was reported for male subjects, which ranged from 4.6%[14,16] to 97.2%,[11] while that for females ranging from 2.6% in a study[14] reporting to 33.3% in another study.[15]

Study quality was assessed in all the studies included. Quality scores in the final sample of articles ranged from 15 to 23 of the total 23 [Table 2]; therefore, all the articles were retained.

Discussion

This study shows that the various variables (gender and age) and their relationship with RTAs in developing countries. Our systematic review shows that the prevalence estimates of RTAs vary widely among studies. The largest difference was observed at the age of 20–30 years and male population. These degree of variations are not really to reflect actual differences between the populations but more likely to be because of biases in the methods. In addition to their differing geographic settings, the studies differed in recruitment method and sample size, data collection, and operational definition of RTAs, including the number of conditions and the conditions selected. All of these factors may affect the prevalence estimates.

One of the studies was conducted in hospitals using existing patient databases,[7] which bear the benefit of counting a large number of varied patients. Their prevalence estimates are possibly a good estimation of the real prevalence at the health-care level in their specific locations, providing that a random sample of practices are included; however, their estimate reliability may be influenced by aspects including completeness of records and codification of data.

In contrast, studies in which patients were recruited during visit with the physician after RTA can overrepresent frequent attenders, who have more complex medical problems and would increase the actual prevalence of RTA witnessed in the practice. This may be the reason for high RTA prevalence in studies using this recruitment method.[6,9,11,12] Moreover, this kind of recruitment is expected to present smaller sample sizes, decreasing the precision of estimates.

Differing methods can also relatively explain the dissimilarities that we detected in the prevalence estimates. This influence can be inferred from the results of one study in the general population involving household personals and drivers among whom conditions were assessed using a variety of sources.[10,13–15] Prevalence estimate based on self-reports from general population and drivers was higher than that obtained when data were collected from hospitals. The collective contribution of data from the medical practitioners (using their knowledge of patients), patient self-reports, and medical records can result in more valid estimates than those estimated using only one source of data.

Studies done in both hospital and the general population/drivers showed influence of age on prevalence of RTA, with low estimates before the age of 14 years and then a steep increase in prevalence in the age group of 20–40 years. Tendency of this age group to show scarce attention to traffic rules and regulations and nonuse of safety devices such as helmets, seatbelts, restraints, and so on, can be a possible explanation for the same. This reveals that the most active and productive age group of population are affected in RTAs, which poses a serious economic loss to the community. References [6] and [13] reported that, below and above the age of 20 and 49 years, respectively, there is a decrease in the accident cases. The reason for this may be that the children are taken care of by elders and are less likely to use vehicles.

Four studies showed that the greater prediction of male subjects in RTAs may be because of higher exposure of male subjects on streets and higher risk-taking behaviour[6,10,12,13] and female subjects lead a less active life and mostly remain indoors.[13] Less than one of six cars belonged to women. This may reflect the income inequality between the genders. In Iran, fathers being the responsible for the family income and majority of the job opportunities being occupied by men may reflect the fact that, as a substitute to the bad quality of public transport, motorcycles are used as the mode of transport of their wives and children by the motorcyclists: "a higher ratio was seen in bike and motorcycle accidents and a lower ratio in pedestrian accident."[17]

The reports analyzing the prevalence estimates by age group, because there is no standard for age groups, the researchers must ensure to provide sufficient information to enable proper assessment of their cohorts with respect to age, particularly when open-ended age-groups are accessed

(e.g., aged ≥ 65 years). Either data pertaining to the age structure or the mean and SD values would enable graphical representation and comparison. The availability of the results obtained for each gender and for both the genders combined would also enable comparison.

Taking into consideration of the various aspects of prevalence studies on RTA highlighted in this systematic review, we suggest some methodological issues to be considered in the conduct of such studies. Pertaining to the sampling method at the health-care level, mainly, two approaches for sampling prevail. One approach is to excerpt data from the existing databases, which generally gives evidence on the whole practice or a large number of patients and reveals the general situation existing in the setting. Data may be extracted for randomly selected patients or for all patients. The second approach is to include patients seen during clinical sessions during a definite time period. However, this may result in oversampling of complex patients with many diseases or recurrent attendees; however, it gives perception into the medical practitioners' daily work. In studies involving the general population, random samples, in particular geographic locations, are appropriate. Checking patients' medical history in medical charts or computerized databases is the commonly used method for data collection in prevalence studies at the practice level, which bears the advantage of being based on written evidence but assumes that the records are complete, which may not always be the case. An alternate method is to obtain combined data from physicians, patient self-reports, and medical records, which should equip more reliable estimates than a single source and is desired when feasible. Studies conducted in the general population predominantly use questionnaires that are based on self-reporting, which may have the shortcoming of allocating equal weight to major and minor health conditions. Hence, this may be acceptable when the research question specifically addresses perceived burden or in case of very large samples are to be studied and lack of other available data. Hence, a multisource method where information can be retrieved from more than a single source (self-report, medical history from medical practitioners, and clinical assessment) is preferable to a single-source method.

Strengths and Limitations

Despite the greater burden of RTAs in the developing country, there is a deficiency in the availability of systematic data on the degree of the problem and its multidimensional nature. Only less data are available on the patterns, distribution, and outcomes of RTAs throughout the country. Absence of organized data collection methods, at both the national and state levels, results in restrictions in designing appropriate intervention strategies to handle the problem in the country. The research question restricted our inclusion to observational studies, which, in turn, restricted our scope for analysis.

Implications for Policy and Practice

Future steps involve a multifaceted approach and efforts toward systematic data collection to understand the real degree of the problem. This should comprise creating awareness and educational programs targeting both the vehicle users and the road users, strict law implementation methods to control and regulate traffic on the road, efficient trauma management systems to decrease the severity of the injuries experienced by the victims, boosting the use of safety utilities such as helmets by the public, effective infrastructure to make safer roads, extensive research on developing the available methodologies such as helmets by adapting them to local conditions, improving designing of more stable and crash-resistant vehicles, and formation of a national-level common platform to collate research data for better understanding of RTAs and to aid in evidence-based policy construction to combat this problem in our country.

Conclusions

Our systematic review looked for existing evidence as to the prevalence of RTA, thereby aimed at improving the incidence RTA among the young people and male population from developing communities. In conclusion, we observed marked differences across studies in the estimated prevalence of RTAs that appeared to be largely because of variations in the study methodology. Use of a more uniform methodology should permit more accurate estimation of the prevalence of RTAs in developing countries such as India and facilitate comparisons across settings and population. Where evaluations were published, these were often lacking in rigor. Most of the literature and reviews found show that a wide variety of approaches used are mainly limited to the risky behavior among the younger age groups. Looking at dimension for determining the prevalence, we suggest that, for any approach, more information need to be gathered from various communities. Research in this area is very much needed and of great priority, particularly aimed at RTA in specific age groups in developing countries as a lack of information in this field will not bring any positive impact in the reduction of RTA among the population of young age groups. These data will help to shape the legislative and preventive activities. A recent systematic review also suggested that effective legislation and actions should be theoretically based and culturally appropriate with strong methodological design and acceptable to communities. Interventions that teach skills rather than knowledge acquisition are more effective and should be given in multiple areas and need to be tailored for both genders, using peers to maintain the effectiveness of interventions. It, therefore, stands to reason that measures targeting both the male and female population and risk-taking behavior problems including traffic violation, substance abuse, and so on, will be more effective that those targeting male population alone. Following the same line of reasoning, measures promoting safe driving behavior such as mobile usage, eating, inadequate attention, fatigue, negligence; maintenance of vehicle condition; adequate protection including abs, helmets, safety, and others; promoting licensed vehicle and coping skills when integrated with efficient and effective legislation of traffic regulation;

and maintenance and implementation by legislation (whose absence has been the influencing factor for increased number of RTA among youths) are bound to have a more pronounced positive effect. This was corroborated by our findings. On the basis of these findings, it is also recommended that strict licensure procedure should be followed and minimum level of education regarding road safety required for applicants of road license, especially the youths who are at risk for such RTAs.

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