

Reducing road traffic accident in low and middle income countries: A rapid evidence synthesis.

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Abstract

Background: The number of roads traffic death remains unacceptably high. A Global estimate shows that about 1.35 million people die and millions are seriously injured by a road traffic accident. A road traffic accident is the 8th leading cause of death among people of all ages and it is the leading cause of death for children and young adults of 5-29 years of age. Such disastrous problems are worsening with the increasing number of vehicles.

Objective: To summarize the best available evidence on interventions that can reduce road traffic accidents.

Method: A rapid evidence synthesis approach adapted from the SURE Rapid Response Service was applied to search, appraise and summarize the best available evidence on effective intervention in reducing road traffic injury. To answer the question under review we searched for relevant studies from databases including PubMed, the Cochrane Library, Transport, Health system evidence, Epistemonikos, and Support summary. The following key terms were used for searching: Road traffic accident, RTA, Injury, Reduction, Prevention, Minimization, "Low and middle-income country", LMIC. We found 18 articles through a search of different databases mentioned above. After screening for the titles and abstracts of the articles, four of them which satisfy the inclusion criteria were included in the final review. Then we appraised and graded the methodological quality of systematic reviews that are deemed to be highly relevant using AMSTAR

Finding: The identified interventions to reduce road traffic accidents were Legislation and enforcement, Public Awareness/Education, Speed Control/ rumble strips, Road Improvement, Mandatory motorcycle helmet, graduated driver license (GDL), Street lighting.

Legislation and enforcement: Legislation focusing on mandatory motorcycle helmet usage, banning cellular phone usage when driving, seat belt laws, decreasing the legal blood alcohol content (BAC) level from 0.06 g/L to 0.02 g/L bring the best result where enforcement is there.

Public Awareness/Education: focusing on seat belt use, child restraint use, educational training in health centres and schools/universities, and public awareness with media through the distribution of videos, posters/souvenirs, and pamphlets are effective in the short run.

Speed Control: through traffic calming bumps, or speed bumps, rumbled strips are effective in reducing accidents and fatality.

Mandatory motorcycle helmet: Is associated with reduction in mortality.

Graduated driver's license (GDL): reduce road traffic injury by 19%.

Street lighting: is a low-cost intervention which may reduce road traffic accidents.

Keywords: Reducing, RTA, Road traffic accident, Evidence synthesis, Evidence summary, Rapid review.

Background

The number of roads traffic death remains unacceptably high. Global estimate shows that about 1.35 million people die from preventable accident and 50 million are injured by road traffic accident every year. Road traffic accident is the 8th leading cause of death among people of all ages while it is the leading

cause of death for age group of 5-29 years. This disastrous problem is worsening with the increasing number of vehicles. It is estimated that road traffic accident will be a cause for 13 million deaths and 500 million injuries in the coming ten years globally (WHO, 2018, WHO, 2021). The rate, scale and other impact of the problem is even worse in low and middle-income countries which makes road safety development

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a priority in these countries. Even though there is limited number of registered vehicles in developing countries, more than 90 percent of the world's road death happens in these countries. The rate of death in low-income countries is more than 3 times higher compare to the high-income countries. The rate of road traffic death is highest in Africa (26.6/100,000 people) followed by South-East Asia (20.7/100,000 people). It was also estimated that, road traffic accident incurs a total cost of one to three percent of the total Gross National Product (GNP) [1-3].

Reports indicated that, worsening trend of road traffic injury (RTI) was observed in two (Africa and Asia) of the six WHO regions. Financial losses in LMICs due to RTIs are also estimated to be US\$100 billion/year. RTI victims are not able to participate in economic activities where RTI consequently put households into poverty, for crash survivors and their families strive to cope with the event and long term effect of the event limit the activity of the victim. On the other hand RTI affects the young age group which are usually the most productive part of the society [1, 4].

In response to the problem, the United Nations Decade of Action for Road Safety 2011-2020 sets an ambitious goal. The goal was to reduce the estimated level of traffic fatalities in low and middle-income countries by half in the year 2020. This was expected to prevent about 5 million lives, avert 50 million serious injuries and provide an economic benefit of more than US\$3 trillion [3, 5]. The a Second Decade of Action for Road Safety 2021-2030 stressed the same plan as the previous plan of reducing death and injuries resulting from road traffic accidents by 50% in this decade [2].

Middle and high-income countries made more progress in reducing the number of road traffic deaths than low-income countries. Between the years 2013 and 2016, no decrement in the total number of road traffic death was observed in any low-income country [1]. The problem remained unchanged globally in the past 20 years in both relative and absolute terms too [2].

The Objective of the Review

The objective of this review is to summarize the best available evidence on intervention that can reduce road traffic injury specifically in low and middle income countries (LMIC).

Methods

A rapid evidence synthesis approach adapted from the Sustainable Use of Research Evidence (SURE) Rapid Response Service was applied to search, appraise and summarize the best available evidence on effective intervention in reducing road traffic injury. To answer the question under review we searched for relevant studies from databases including PubMed, the Cochrane Library, Transport, Health system evidence, Epistemonikos and Support summary. The following key terms were used for searching: Road traffic accident, RTA, Injury, Reduction, Prevention, Minimization, "Low and middle income country", LMIC.

We found 18 articles through search of different data bases mentioned above. After screening for the titles and abstracts

of the articles, four of them which satisfy the inclusion criteria were included in the final review [6-9].

Inclusion and exclusion criteria

All systematic reviews conducted on road traffic accidents in low and middle-income countries were included for this review. The included studies were filtered for the English language. The last search was made on Dec 08, 2021, with no date restriction. Non-transparent reviews (e.g. news, letters, editorials, reports, communications, comments, and correspondence) were not included.

Review Findings

We searched for relevant studies on different databases to answer the objectives under review. Based on our search, we identified systematic review, meta-summary, meta-analysis and review. Then we appraised and graded the methodological quality of systematic reviews that are deemed to be highly relevant using AMSTAR 2.

Evidence on Interventions to Reduce Road Traffic Accident (RTA)

We found four eligible evidence that discuss reducing road traffic accident (RTA) specifically from low and middle income country. All the identified studies were systematic reviews. The identified interventions to reduce road traffic accident were Legislation and enforcement, Public Awareness/Education, Speed Control/ rumble strips, Road Improvement, Mandatory motorcycle helmet, graduated driver license (GDL), and Street lighting [6-9]. The summary of the findings related to interventions to reduce road traffic accident (RTA) is found in Table 1.

Legislation and enforcement

Legislation interventions reduced road traffic crashes, injuries and deaths with the best results in the setting of good enforcement initiatives. Legislation focusing on mandatory motorcycle helmet usage, banning cellular phone usage when driving, seat belt laws, decreasing the legal blood alcohol content (BAC) level from 0.06 g/L to 0.02 g/L [8].

Public awareness/education

A significant reduction in fatalities appeared immediately following enactment public awareness campaigns with non-significant decreases over time. Public awareness focusing on seat belt use, child restraint use, educational training in health centres and schools/universities, and public awareness with media through distribution of videos, posters/souvenirs, and pamphlets are highlighted [8].

Speed control

Public awareness and speed control interventions alone appeared to have no significant effects on reducing road traffic injuries or fatalities. But when these are combined with other approach, they were shown to be more effective at significantly reducing road traffic fatalities and injuries over time. Means of speed control includes traffic calming bumps, or speed bumps, rumbled strip [8].

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Table 1: Summary of findings of interventions to reduce road traffic accident (RTA), Dec. 2021.

Studies	Findings	Type of document	Quality of the evidence
Road Traffic Injury Prevention Initiatives: A Systematic Review and Meta summary of Effectiveness in Low and Middle Income Countries (Staton C., et al, 2016)	<ul style="list-style-type: none"> ➤ Legislation interventions reduced road traffic crashes, injuries and deaths with the best results in the setting of good enforcement initiatives. ➤ Legislation as well as education and public awareness campaigns, a significant reduction in fatalities appeared immediately following enactment with non-significant decreases over time. ➤ Public awareness and speed control interventions alone appeared to have no significant effects on reducing road traffic injuries or fatalities. But when these are combined with other approach, they were shown to be more effective at significantly reducing road traffic fatalities and injuries over time. ➤ Road improvement interventions should consider how the impact of improved roads will affect speeds and traffic flow. In LMICs where enforcement and resources are limited, rumble strips could be effective at reducing road traffic crashes and fatalities through speed control. 	A Systematic Review and Meta-summary	Low Quality
Differences in outcomes of mandatory motorcycle helmet legislation by country income level (Lepard JR. et al, 2020)	<p>Mandatory motorcycle helmet laws reduce mortality</p> <p>Enactment of helmet legislation for motorcycle users is associated with 29% reduction of fatalities</p>	A systematic review and meta-analysis	Low quality
Interventions to Prevent Unintentional Injuries Among Adolescents: (Salam RA. Et al, 2016)	Possession of a graduated driver license (GDL) for new young drivers significantly reduced road accidents by 19%	A Systematic Review and Meta-Analysis	Low quality
Street lighting for preventing road traffic injuries (Beyer and Ker, 2009)	Street lighting may prevent road traffic crashes, injuries and fatalities.	(A systematic Review)	Medium Quality

Road improvement

Because speed control is crucial to crash and injury prevention, road improvement interventions should consider how the impact of improved roads will affect speeds and traffic flow. In LMICs where enforcement and resources are limited, rumble strips could be effective at reducing road traffic crashes and fatalities through speed control [8].

Street lighting

Street lighting is a low-cost intervention which may reduce road traffic accident. Street lighting improves a driver's visual capabilities and ability to detect roadway hazards. It is also argued that street lighting may have an adverse effect on road safety where drivers may 'feel' safer because lighting gives them improved visibility which could result in increasing speed and reducing concentration. This is important to low and middle-income countries where the installation of suitable lighting systems is less common than in high-income countries [6].

Graduate Driver License (GDL)

Graduate driver license (GDL) reduce road traffic injury by 19%. GDL included two licensing levels of restrictions on teens' driving before they are eligible to drive without restrictions. The first level is a learner license that allows teens to gain driving experience under the supervision of a fully licensed driver (i.e., a parent or parent-designated adult). The second level is an intermediate license that allows teens who have gained experience driving with a learner license to drive independently but with restrictions that limit their exposure to the highest risk driving conditions (i.e., at night and with young passengers) [7].

Mandatory motorcycle helmet use

Enactment of helmet legislation for motorcycle users is associated with 29% reduction of fatalities [9].

Discussion

Legislation interventions is associated with reduction of road traffic crashes, injuries and deaths which result in greater effect in a situation of good enforcement. It was found that more than one fourth of road traffic accidents were due to violation of traffic rules [10].

Legislation in relation to the legal blood alcohol content (BAC) level was one of the effective intervention in reducing road traffic accident. Literature also stresses the importance of strict law enforcement with inhaled alcohol tests. There should be a 'zero tolerance' for the alcohol blood level tests for drivers [11].

Public education was found to have an effect on reducing road traffic injury in the short run when support with legislation. But its effect diminishes as the time goes. A systematic review on randomized controlled trials also stresses the effect of traffic education. The review reported that safety education for pedestrian is associated with changing the road crossing behaviour [12]. Educational programs on older driver was reported to improve driving awareness and driving behaviour, but it is not associated with reduction of crashes [13]. Health education for children of less than 17 years is associated with reduction of traffic injuries by more than one third (36% reduction) [14]. WHO, safety strategy on road traffic also give emphasis to creating awareness to the public through campaign [15]. On the other hands, some reviews reported contradictory report that driver education can increase knowledge of the driver, but it may not reduce accident as the program seldom end up in bringing change of behaviour [16].

Road improvement was another interventions that could reduce road traffic injury and death. Although road improvement is associated with increase in traffic mass, the number of accident and injury was found to be reduced based on review

reports [17]. On the other hands, limiting the speed was found to be an effective intervention in reducing road traffic accident. It was also reported that closer to half (43 %) of road traffic accidents were due to high speed and fatal and non-fatal injuries were associated with speeding [10, 11].

Graduated driver license (GDL) for new young drivers was another intervention that was found to be effective in reducing road traffic accident. This was supported by the study that report medical emergency road traffic accident are more common among unexperienced drivers where experienced drivers are equipped with driving competency and able to cope with stress and time pressures. But, overconfidence among experienced drivers on the other hands can lead to crash [11, 18].

Mandatory motorcycle helmet laws reduce mortality due to motorcycle users. Review reports also support this finding. If there are universal helmet law, there is good compliance of helmet which in turn is associated with lower rate of fatality and injuries [11, 19]. Studies also reported that helmet use is associated with a lower rate of intracranial hemorrhage, traumatic brain injury (TBI), head injury and decreased rate of major head injury [20].

Street lighting was another intervention that has an impact on reducing road traffic fatalities, injury and crash. Literature also supports the importance of this intervention in reducing road traffic crash fatality and death [11].

Contribution of authors

All authors equally contribute to the development of the brief.

Conflict of interest

There is no conflict of interest to declare.

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