

Rising Epidemic of Road Traffic Injuries in Ethiopia: A Systematic Review of Available Literature

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ABSTRACT

Introduction: Road traffic injury is a silent epidemic causing death in low and middle-income countries, including Ethiopia. In this systematic review, we seek to analyze road traffic injury characteristics in Ethiopia from available literatures.

Methods: An electronic search for road traffic injuries was conducted on peer-reviewed literature and websites from 1965 to 2022. A systematic narrative summary was done on the literature involving study design, study setting, topic focus, results, and other study variables. Identified themes were analyzed.

Result: A total of 451 literature search results were found in the specified period, with 33 of the studies meeting the inclusion criteria. The majority of studies (28/33) were hospital-based. In all reports, a higher proportion of injury was found in economically active age groups, with an age range of 10-50, with the highest proportion of 87.9%. Most of the studies reported a higher proportion (2/3rd) of injuries among male patients. One study (31) gave occupational details of the patients. The majority of the road traffic victims were daily laborers 41.3%. The proportion of pedestrians affected in Addis Ababa was more than in the outskirts, ranging from 62.6-93 % (11, 22, 23), while in the regional hospitals' report, the range was from 33.4-35.4. In regards to the causes of the accidents, indicated that 84% were due to driver error. After 2004, the incidence of car crashes rapidly increased. In central Ethiopia, the number of crashes, fatal accidents, and non-fatal road traffic collisions had increased by more than double in a six-year period.

Conclusion: This literature review has revealed the increasing burden of road traffic accidents in Ethiopia. People of low socioeconomic status, young age, male sex, and productive communities are disproportionately affected. Urgent action, focusing on human factors, should be taken to prevent road traffic injuries in Ethiopia.

Keywords Road traffic injury, increasing pattern, Ethiopia

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1. Introduction

A silent epidemic of death is occurring in low and middle-income countries due to road traffic injuries. Communicable diseases like Ebola are not silently tolerated like RTI's where the people, governments, and media react, but that is not the case with RTI, despite killing more people. RTI is one of the leading causes of death and life-long disability globally.^(1, 2) According to the World Health Organization (WHO) (2004), globally, more than 1.23 million people die due to RTI every year, while the number of injured is as high as 50 million.⁽³⁾ Recent estimates in 2013 revealed that annual deaths due to RTI have risen to 1.4 million.⁽⁴⁾ After 1996, the annual number of deaths from RTI worldwide was estimated to rise by 10%. The rise was mostly assumed to be in low and middle-income countries. If the trend in RTI continues without intervention, it is estimated that road traffic deaths and injuries could rise by 65% by 2020 and be the third leading cause of mortality from its current place of eighth.^(3, 5, 6)

In 2013, over 85% of all deaths and 90% of disability-adjusted life years (DALYs) were lost due to road traffic injuries in low- and middle-income countries, which have only 47% of the world's registered vehicles.^(2, 4) Furthermore, globally, road traffic injuries are reported as the leading cause of death among young people aged 15–29 years and are among the top three causes of mortality among people aged 15–44 years.⁽¹⁾

In Africa, the number of road traffic injuries and deaths has been increasing over the last three decades.^(7, 8) It appears that the volume of vehicles and road users is growing due to rapid urbanization and motorization. According to the 2015 Global Status Report on Road Safety, the WHO African Region had the highest rate of fatalities from road traffic injuries worldwide, at 26.6 per 100,000 population for the year 2013.⁽¹⁾

Ethiopia, having less than one million vehicles, is often mentioned for its high rate of fatalities due

to traffic accidents. The WHO's 2009 global status report on road safety described the fatality rate per 10,000 vehicles in the country as 114, which was higher than the sub-Saharan average of 60.⁽⁷⁾ This number is declining, according to the Road Transport Authority report, which reports 62 per 10,000 vehicles in 2015/2016. But, the actual number of deaths is increasing.⁽⁹⁾

It is imperative that all stakeholders, including policymakers, work together to reduce the burden of this preventable problem at various levels. Empirical evidence is needed to formulate appropriate interventions. Therefore, in this paper, the existing literature in the country is systematically reviewed to describe the epidemiology, trends, and associated mortality related to RTI.

2. Methods and Materials

Data Sources: To identify all studies that investigated road traffic accidents, a search of the electronic database containing keywords such as "road traffic," "injury," "accident," and "trauma" was conducted. To identify peer-reviewed English language literature from 1965 to 2015, the search engines PubMed, Google Scholar, and Embase were used. In addition, the reference lists from relevant studies were examined to identify older papers in particular.

Inclusion and exclusion criteria: This review included literature on road traffic accidents and trauma in general from Ethiopia. There were no restrictions on study setting, demography, the number of study participants, or study design. After reading the full text and abstracts by two reviewers, trauma studies that did not include road traffic injuries, abstracts without full text, editorials, and letters were excluded.

Data Extraction: After reviewing the selected studies, data extraction was done on a standard data extraction form for the selected variables, which included the study design, topic focus, methodol-

ogy, study setting, and their main results (socio-demographics, victim affected, type of vehicle, magnitude, and trend of road traffic injuries).

Analysis: The identified studies were a prospective and retrospective review of data that were different in study focus, study design, and outcome characteristics, which were not suitable for Meta-analysis. A systematic summary and grouping of all identified studies with their main results was performed, and a thematic analysis was performed. Accordingly, themes involving socio-demographic patterns, temporal characteristics, and the magnitude of RTI compared to other injuries, victims affected, types of vehicles and circumstances of injury, errors leading to accidents, and trends of RTI were identified. Qualitative and descriptive quantitative analysis was done for identified themes.

3. Result

Identified Studies

A total of twenty-eight studies have been identified that meet the inclusion criteria spanning five decades. Most of the older studies involved general injuries, but in the past two decades, more studies have focused on road traffic injuries. The majority of studies (23/28) were hospital-based, 12 prospective and 11 retrospective. Among 28 articles that met inclusion criteria, 17 investigated the magnitude and pattern of injuries within hospitalized patients, including RTI. Four studies looked specifically into RTI in Emergency Departments, with one describing features of imaging in RTI patients. There were 4 studies investigating patterns of RTI in different parts of the country utilizing police reports. Two studies conducted mortality audits following trauma, and only one study was on community-based injuries.

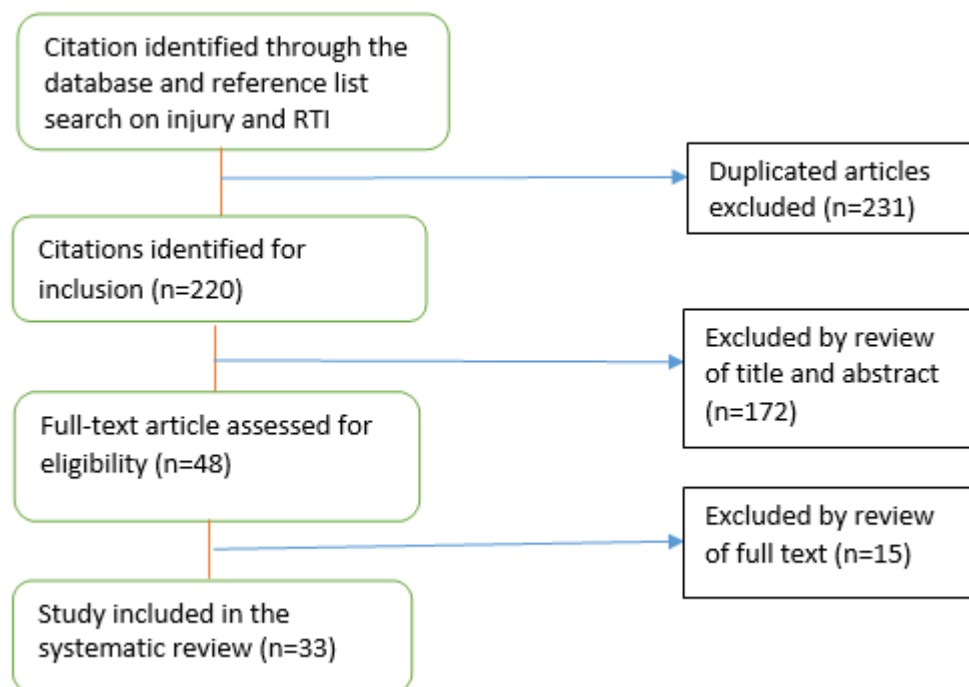


Fig 1: Selection process for the systematic review

Socio-demographic pattern

Age: Two of the 28 studies reported on injuries in children up to 15 years of age,^(24,25) twenty-four

studies examined injuries in all age groups [10,11,12,13,14,16,17,18,19,21,22,23,35,36,37,3,26,27,30,32,33,(1,2),3,4,5] a

mong which two were autopsy studies.^(17,18) Eight studies^(15, 20, 28, 29, 31, and 34) reported only an adult population. Of the 26 studies where all age groups were included, a higher proportion of injury was found in economically active age groups. The highest proportion described by Feleke et al., 87.9%, was in the age range of 10-50, among which the 10-30 age group accounted for 59.5%.⁽³²⁾

Among RTI studies, Fekade Assefa has shown the mean age of drivers involved in accidents to have been 32.9, while the majority of accidents occurred in the age group of 19-30 (51.7%) and 31-50(40.3%). The highest number of crashes (fatal, injury, and property damage) involved drivers in the 18–30-year-old age group (45%) and in the 31-50-year-old age group (35%). In an analysis of 12,140 clashes and 14,540 fatalities by Getu Tulu et al., the commonest driver age was 18-30=49.46%, followed by 31-50=45.7 %, >51=6.29% and age-<18=2.81%.^(37, 2)

Sex: Most of the studies reported a higher proportion (Mostly 2/3rd) of injuries among males. The highest proportion of males (86.4%) was described by Bekelcho et al in a hospital series, while among the RTI police series, Fisseha et al. reported the highest proportion of 80%.⁽²⁾

Occupation and residence: Among studies that focused on RTI, two ^(3, 4, 5, 32) gave details of occupations, demonstrating that the majority of road traffic victims were daily laborers (41.3%), followed by students (12.2 %). Another study described that 70% of RTI victims were from urban areas.⁽³⁾

Temporal Characteristics

Among 11 studies focused on RTI, only five investigated temporal characteristics within the year. Studies^(2, 3, 35) showed the majority of the accidents

occurred from June to September in the rainy season, but the other two^(34, 38) reported uniform distribution throughout the year, with a small peak in January

The magnitude of RTI compared to other injuries

Twenty-six studies analyzed all injuries and showed the relative magnitude of RTI. The contribution of RTI varies from 2.5-62.5%, with a weighted pool of 33.16%, while 21/24(87.5%) studies showed RTI was predominant. In these ranges, the lowest proportion was in a community-based injury survey in Jima zone ⁽¹⁴⁾, and the highest proportion of 62.5% was from the Wolaita Sodo hospital study.⁽³²⁾ See Table 1 below.

Victims affected by the RTI

Among all injury series, 10 studies showed the types of victims involved in the accident. It was observed the proportion of pedestrians compared to passengers was different in Addis Ababa and regional hospitals. The proportion of pedestrians affected in Addis Ababa was greater, ranging from 62.6-93 %^(11, 22, 23, 5 2), while in the regional hospitals' report, the range was from 33.4-35.4%.^(10, 12) Conversely, in the report of regional hospitals, passengers were primarily affected, with a range of 45.8% to 59.3 %.^(3, 10, 12) In one report,⁽³⁵⁾ a higher proportion of drivers (20.5%) were affected.

Two of four traffic police report analyses described the victims involved in RTI. Table 2 shows that data pooled and analyzed from the whole country, central Ethiopia, and Amhara region showed pedestrian mortality of 59.9%, 53.5%, and 35.5%, respectively. Similar to Addis Ababa, in the Amhara region, a detailed analysis of RTI in cities Gonder, Bahrdar, and Dessie showed the pattern was more pedestrian predominant.⁽³⁵⁾

Table 1: Percentage distribution of victims affected and RTI magnitude in Ethiopia, 2017

Principal investigator	Total No Of Injury	RTI	Situation of Injured Pedestrian	Passenger	Driver/Assistant
Berhanu N.	1277	416(32.6)	139(33.4)	211(50.7)	NA
Mulat T.	3822	1578(41.3)	1457(93)	NA	NA
Mensur O.	1982	289(14.6)	104(35.4)	172(59.3)	NA
Kifle W.	1102	334(30.3)	NA	NA	NA
Kifle W.	3909	98(2.5)	NA	NA	NA
Zuriyash M.	328	161(49.1)	NA	NA	NA
Alemu MH.	120	56(46.7)	NA	NA	NA
Tufa G.	90	34(37.9)	NA	NA	NA
F.Tsegaye	2107	784(37.2)	NA	NA	NA
Munayazewal D.	1487	639(43.0)	NA	NA	NA
Daniel A	422	202(49.7)	NA	NA	NA
Elias A.	507	211(41.6)	NA	NA	NA
Ahmed E.	7151	2793(39.1)	2458(88)	335(12)	NA
Lambisso W.	3687	1733(47.0)	1462(80)	NA	NA
Fisseha T.	343	93(27.1)	NA	NA	NA
Gedlu E.	313	45(14.4)	NA	NA	NA
Isabel	47	17(36.5)	NA	NA	NA
Hagos	385	127(32.9)	NA	NA	NA
Finot D	84	31(37)	NA	NA	NA
B.Tadesse	321	123(38.3)	NA	NA	NA
Fasika	600	85(14.1)	NA	NA	NA
Seid M.	690	250(36.2)	NA	NA	NA
Feleke HM	416	240(62.5)	81(34)	110(45.8)	49(20.5)
Debrework	230	78(33.9)	NA	NA	NA
Bekelcho et al.	8458	8458(100)	6039 (71.4)	1632 (19.3)	787(9.3)
S. Getachew	779	779(100)	514	NA	NA
Ashenafi H.	327	327(100)	73(25.5%)	117(40.9)	96(33.6)
Duko et al.	350	143 (40.9%)	NA	NA	NA
Amare Demisse	381	381(100)	NA	NA	NA

Types of vehicles and circumstances of injury

A report from Amhara Police records⁽³⁵⁾ showed fire trucks (51%) to be the predominant cause of RTI, followed by long-distance buses (34.5%). A study at Tikur Anbessa Specialized Hospital (31) also showed similar findings where trucks, minibusses, and long-distance buses contributed 30.8%, 30.7%, and 10.9%, respectively. A recent study from Wolaita Hospital showed a predominance of motorcycles (31%) and Bajaj (14.2%), while traditional vehicles accounted for the following: Isuzu truck (21.2%), Minibus (10.8%), long-distance bus (9.6%). A study conducted in Addis Ababa city revealed that a substantial number of

cases, amounting to 2608 incidents (30.8%), were attributed to public transport.⁽²⁾ In contrast, a study conducted at Hawassa University demonstrated a higher incidence of crashes associated with motorcycles.⁽⁴⁾

An Article from TASH⁽³¹⁾ described the circumstances of the injury. The most common circumstances were crossing the road (36.1%), sidewalk strikes (22.6%), and falls from vehicles (18.7%), followed by collisions and rolling in 17.4%. Analysis of police reports from the Amhara region⁽³⁵⁾ also described vehicle-pedestrian collisions contributing to 54.5% of all accidents.

Errors leading to accidents

Two articles from the police data pool have analyzed common errors associated with RTIs. The first one ⁽³⁵⁾ indicated that 84% was following drivers' error, which further detailed into 32.1% was due to failure to give priority to pedestrians, 31.5% due to abnormal speed, 10.7% was due to driving on the wrong side, and 4.1% due to not keeping an appropriate distance. The other article by Fekadu Assefa et al. ⁽³⁶⁾ described driving at midnight, driving above speed limits, failing to give priority to other vehicles and pedestrians, and vehicular technical problems as determinants of fatality. A study conducted in Addis Ababa elucidated that the predominant causes of incidents were the movement of pedestrians crossing, accounting for 4469 occurrences (52.8%), followed by issues related to the division of roads and roundabouts, with 3555 incidents (42.0%). Additionally, the study identified the types of road as contributing significantly to the occurrences, with 5917 cases (70.0%) associated with this factor.⁽²⁾

Trends of RTI

Analysis of police reports from 1996-2011 in the Amhara region showed that the pattern of vehicle crashes was relatively low, with a steep increase between 1996 and 2004. Beyond 2004, the crash pattern continued increasing.⁽³⁸⁾ Similarly, another study in the central part of Ethiopia⁽³⁶⁾ showed that the number of crashes were 257 in 2008/2009, which was more than doubled or increased to 636 or 147.4% rise after 6 years in 2011/2012. During this period, the number of fatal accidents doubled from 42 to 96 (128.5% rise), and non-fatal RTCs increased from 215 to 540.

The Ethiopian road safety summary for the last six years also showed that the trend is worsening. The total amount of deaths registered nationally in 2010/11 was 2541, and in 2015/16, 4312, which is a 69.7% rise. Table 2 shows detailed trend analysis and traffic data reports

Table 2: Traffic Police data analyzed from Ethiopia and two other regions in the country

Author and Period of RTI Data	Getu Tulu 2005 -2011.	Fisseha 2007-2011.	Fekade Assefa etal 2007 - 2012.	Tariku Bekelcho 2017-2020
Region	Whole Country	Amhara Region	Central Ethiopia (Dukem to Adama)	Addis Ababa
Magnitude				
Fatal injury	14,545(22%)	2761(41.51%)	515(29.5%)	1274(14.7%)
Non-Fatal Injury	51,570(78%)	3890(58.48%)	1230(70.5%)	7,184(85.3%)
Total	66,115(100%)	6651(100%)	1745(100%)	8458(100%)
Injury /Drivers age	(Fatal Injuries)		(All Injuries)	(All Injuries)
<18	342(2.8%)	NA	25(1.1%)	126 (1.5%)
18-30	6005(49.46%)		1175(51.7%)	3893 (46.0%)
31-50	3853(31.73%)		916(40.3%)	3868 (45.7%)
>51	764(6.29)		158(69%)	571 (6.8%)
Fatal Injury/type of victims				
Pedestrian	7770(53.54%)	966(35%)	307(59.9%)	8458(100%)
Passengers	5702(39.21%)	1560(56.5%)	145 (28.2%)	6039 (71.4%)
Drivers	1070(7.35%)	235(8.5%)	63(12.2%)	1,632(19.3%)
	14542 (1000	2761(100)	515(100)	1,087(9.3%)
Reasons for accident				
Driver error	NA	83.8%	NA	NA
Vehicle problem		7.6%		
Pedestrian error		7.65		
Environment		1%		

NA=not applicable

4. Discussion

This study has systematically analyzed existing data on RTI in Ethiopia from hospital-based studies, community surveys, and police reports. Most studies described RTI as the most prevalent cause of injury of all trauma. This feature was also described in another systematic survey.⁽³⁷⁾ This phenomenon is not exclusive to Ethiopia but also in other developing countries, where RTI is a primary contributor to morbidity, mortality, and disability.⁽⁶⁾

In this study, the most vulnerable groups were the young and productive. The largest proportion in one study were between the ages of 10 and 30, contributing 57.8%, and between the ages of 10 and 50, accounting for 87.9%. Global reports describe similar phenomena, and the youngest population affected was mostly from low—and middle-income countries.⁽⁶⁾ Hence, it is becoming a huge burden to society that RTIs are affecting the most productive age group.

Previously, it was expressed that the highest burden of injuries and fatalities was borne disproportionately by poor people in developing countries, such as pedestrians, passengers of buses and minibusses, and cyclists.⁽⁵⁰⁾ This systematic analysis also showed pedestrians and passengers were the main victims of RTI in Ethiopia. It was also shown that the majority of victims in bigger cities were pedestrians, while in the regions or regional hospitals, passengers were involved more frequently. Previously, in most studies in Ethiopia, the proportion of drivers involved in RTI was very low, but recently, one study showed that the involvement of drivers or assistant drivers was unusually high (20.5%). This might be due to a wider usage of motorcycles and tricycles (Bajaj) in rural areas. In fact, the above study showed that the contribution of motorcycles (31%) and Bajaj (14.2%) to RTIs is significantly increasing in the regions. This was not described in previous studies to this magnitude.⁽³⁷⁾

Besides, we assume that pedestrians and passengers are from economically disadvantaged groups. Many studies did not give a detailed analysis of the socioeconomic status of the victims. Nonetheless, one study⁽³⁷⁾ showed that Daily laborers and students were involved in 41.3 % and 12.2% of RTIs, respectively. Studies have shown that drivers' age is strongly associated with magnitude and fatality of motor cycle accidents.⁽⁵⁰⁾ In our analysis, most RTIs were associated with driver errors such as inappropriate speed and not giving priority to pedestrians. Furthermore, a large proportion of injuries occurred in the younger age group, though one has to know how much the real proportion of youngsters are on the road compared to the other age group. There are many features that are consistent in most studies, but there are also peculiar features that depend on the study time and place.

The study describes human, vehicle, and environment related factors. Most of the data is from hospital registries, though there were a few police data reports involved. This analysis has shown that beyond 2004, crash incidents continued to increase. The number of crashes, fatal accidents, and non-fatal road traffic crashes increased by more than double in a six-year period. This demonstrates that urgent action should be taken to prevent death, disability, economic loss, and social problems that arise from the devastating effect of road traffic injury, with an emphasis on the human factors contributing to the rise in RTIs.

Abbreviation

RTC: Road Traffic Collision

RTI: Road Traffic Injury

WHO: World Health Organization

Author Contributions

AA-MS: - conception and design of the study, analysis and interpretation of data, drafting the manuscript.

MK-LB: - acquisition of data, critical revision of the manuscript for important intellectual content,

analysis and interpretation of data, final approval of the version to be published

WW: - critical revision of the manuscript, supervision of the research.

All authors have read and approved the final manuscript. Each author has participated sufficiently in the work to take public responsibility for the content. The order of authorship reflects the relative contribution of each author

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Competing interests

The authors declare no conflicts of interest. All authors have disclosed any financial or personal relationships with organizations or individuals that could influence their work inappropriately.

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