

Trends of Road Traffic Injury in Ethiopia, 2015 to 2017: National eHMI data analysis.

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Abstract

Background: Road traffic injury (RTI) is one of the leading causes of mortality and morbidity globally. It accounts for more than 1.35 million deaths per year. Low and middle-income countries are affected severely, thus, Ethiopia is among the most affected countries. This paper aims to analyze three years of Electronic Health Management Information System (eHMIS) surveillance data of Road traffic injuries in Ethiopia.

Methods: eHMIS Road traffic injury data were reviewed for three years period (2015 to 2017) and Analysis was done by Microsoft Excel and SPSS.

Result: The trend of injury in Ethiopia increased from 69882 to 100,628 from 2015 to 2017, which was more than a 30 % increase in three years, and inpatient death increased from 125 to 265. Males were affected more than females. Means of monthly reported injuries were computed for each year and one-way ANOVA was employed to test the difference of means of injuries, and all three means were significantly different with $P < 0.05$ at 95% CI. Linear regression was used to evaluate the trend per a year; the slope of the trend was estimated to be $B = 22033$, with 95% CI (17536 -26529), $P < 0.05$, which indicated a significant increase of the trend.

Conclusion: This analysis revealed that in Ethiopia the burden of Road Traffic Injury (RTI) was increasing. Being male has a greater risk of RTI. High-level political commitment and actions are needed to halt the problem.

Keywords: Road Traffic injury, Ethiopia, eHMIS, the trend of road accident injury.

Background

Road traffic injury is one of the leading causes of morbidity and mortality worldwide. According to the World Health Organization (WHO) report of 2018, It accounted for 1.35 million death annually (1). As the number of the vehicle increases the incident also increases. It results from a combination of factors related to the components of the system comprising roads, the environment, vehicles, and road users, and the way they interact [2].

Road traffic crashes are a global burden and increasing public health concern. Road safety performance has traditionally been measured by the reduction of fatalities but road traffic crashes also cause very large numbers of nonfatal injuries, leading to huge economic and human costs to society [3]. The burden of the problem is higher in Low and Middle-income Countries. Despite the lower proportion of vehicles available it accounts for about 80% of total global mortality and morbidity. The burden of road traffic crashes is increasing in recent years especially in sub-

Saharan countries. It could be secondary to a newer tradition of vehicle usage, poor infrastructure design, substance driving, lack of strict safety rules and regulations, lack of sufficient knowledge of rule and regulation, and unboundedness to it [2,3,4].

The main risk factors for road traffic injuries can be classified as Factors influencing exposure to risk, risk factors influencing crash involvement, risk factors influencing crash severity, risk factors influencing the post-crash outcome of injuries [5]. According to the World Health Organization's (WHO) 2018 global status report on road safety, the road crash fatality rate in Ethiopia is increasing per 100,000 population; 2 in 2008, 3 in 2012, and more than 4 deaths per 100,000 population in 2016. Road traffic injury-related death is also estimated to be 27,328 (21494-33159) [6]. Road traffic-related injuries and deaths per 100,000 motor vehicles were estimated to be 21,681 (95% CI: 18,090–25,938) and 4,922 (95% CI: 3325–7183), respectively (7).

Road traffic injury is a great public health problem is progressively increasing year to year. It requires capturing appropriate data and analyze appropriately to identify risks and to point to possible solutions. This assessment is aimed to analyze three years (2015 to 2017 E.C) eHMIS surveillance data of Road traffic injuries in Ethiopia as general to see patterns and trends of the accident.

Methods

Study Area: Analysis of road traffic injury data was done for Ethiopia as a whole.

Study Period: Data of RTA from January 2015 - December 2017 was collected, analyzed, and interpreted from January 20 to March 30/2018.

Study Design: A record review of three years eHMIS data was conducted.

Source population: Total population of Ethiopia who exposed to an injury during study years.

Study Population: all Ethiopian population from 2014 to 2017.

Data Collection Procedure: Secondary data of RTI for consecutive three years from eHMIS database was accessed and the record was reviewed retrospectively for three years (2015 – 2017) at the Federal Ministry of Health of Ethiopia. The national database was used for accessing total cases captured by eHMIS throughout the whole of Ethiopia during the three years.

Operational Definitions:

- eHMIS - Electronic Health Information System (eHMIS) is a health facility-based electronic reporting system filled by trained nurses every month. Theoretically, eHMIS is supposed to capture all RTI cases that come to health facilities and report centrally to the Federal Ministry of Health (FMOH) database. It is electronic documentation that will follow the principle of lossless collection of information at the source. Captures the clinical term or cause of death with the exact wording reported by the health provider.
- Injury – according to ICD, injury means physical or physiological bodily harm occurred secondary to interaction

of the body with energy; usually has an immediate reaction to a well-defined event [8].

- Road Traffic injury – is an injury resulting from a traffic collision, occurs when a vehicle collides with another vehicle, pedestrian, animal, road debris, or other stationary obstruction, such as a tree, pole, or building. According to ICD -10, it is classified into multiple identifications based on the victim's mode of transport and the victim's counterpart. The victim's mode of transport is categorized as to whether he/she is pedestrian, pedal cyclist, a motorbike rider, the occupant of the three-wheel vehicle, car occupant, occupant of the car, pickup or van, occupant of the heavy transport vehicle, and bus occupant. Similarly, mode of transport of counterpart also classified as a pedestrian, pedal cyclist, motorbike rider, occupant of the three-wheels vehicle, car occupant, occupant of the car, pickup or van, transport vehicle or bus, railway train or railway vehicle, other nonmotor vehicles, a fixed or stationary object, no collision and unspecified[9].

Data Analysis Procedure: The data were retrieved from the national eHMIS database, entered to, and analyzed by Microsoft Excel 2010 and SPSS.

Result

The problem of Road traffic injury captured by eHMIS was increasing year to year in Ethiopia. In 2015 it was 69882 reported injuries, in 2016 it was 77982 and in 2017 it reached 100,628. When we compare the number of injuries in 2017 to 2015 it was increased by 30.1%, increased 11.6 % in the first year, and 12.6 % in the second year. The number of injuries reached its peak during the rainy season of the years (June to August) consecutively (Figure 1). The trend of the injury was evaluated by linear regression, and it was found to be increasing with the slope of 22033 per year; $B = 22033$, with 95% CI (17536 -26529), $P < 0.05$. Similarly, we test the trend by months, and it was also found to be increasing by the slope of 146.47 per month; $B = 146.47$, with 95% CI 108 - 184) and $P < 0.05$ (see Figure 1).

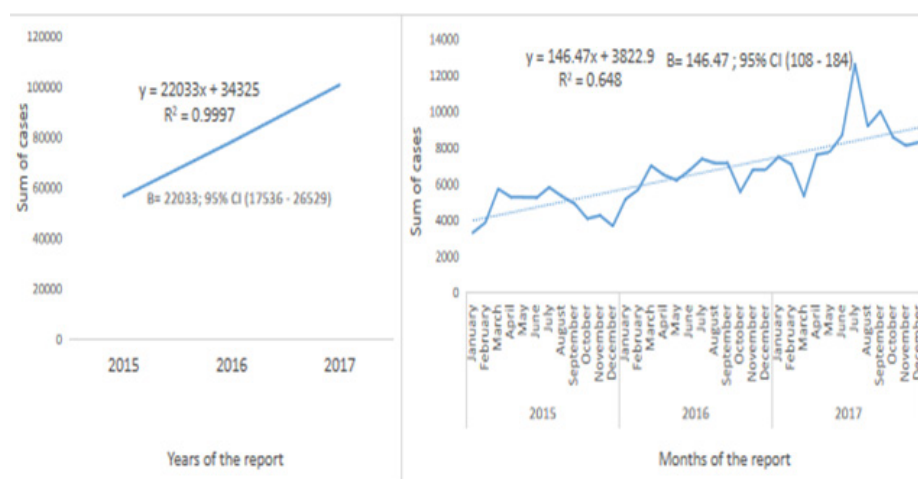


Figure 1: Trends of road traffic injury from 2007-2009 EFY (2014 to 2017). Constructed by principal investigator using SPSS and Microsoft excel. It indicates that the increase of the injury from year to year as well as month to month was statically significant.

Table 1: Number of cases by year and sex, 2015 to 2017 .

| Year | Female | Percent | Male | Percent | Total |
|-------|--------|---------|--------|---------|--------|
| 2015 | 25396 | 10.2 | 44486 | 17.9 | 69882 |
| 2016 | 26794 | 10.8 | 51188 | 20.7 | 77982 |
| 2017 | 34174 | 13.7 | 66454 | 26.7 | 100628 |
| Total | 86364 | 34.7 | 162128 | 65.3 | 248492 |

From a total of 248492 cases, 158134 (63.64%) were males that could probably be due to the risk of exposure and lack of carefulness on-road use. Females were affected less than males, thus contributing only to 36.36 percent of all affected populations (Table 2).

Table 2: frequency of cases by sex in Ethiopia from 2015 - 2017.

| Gender | Frequency | Percent | 95% CI proportion |
|-------------|-----------|---------|--------------------|
| F | 90358 | 36.36 | 36.4 (36.2 - 36.6) |
| M | 158134 | 63.64 | 63.6 (63.4 - 63.8) |
| Grand Total | 248492 | 100 | |

As shown in Table 3, from 248501 total cases, 200210 (80.6%) were adult age groups. It was more than four times the number of pediatrics age groups, which both contributed to 48291 (19.4%) of total cases.

Table 3: Frequencies of cases by age in Ethiopia from 2015 – 2017.

| Age | Frequency | Percent | 95% CI proportion |
|-------------|-----------|---------|--------------------|
| <5 | 9011 | 3.6 | 36 (35 - 37) |
| 5-14 | 39280 | 15.8 | 15.8 (15.7 - 15.9) |
| >14 | 200210 | 80.6 | 80.6 (80.5 - 80.7) |
| Grand Total | 248501 | 100 | |

The mean of monthly reported data was computed for each of the three years and with 95% CI it was found to be 4713 ± 538 in 2015, 6498 ± 451 , and 8385 ± 1121 in 2016 and 2017 respectively. One way ANOVA was employed to test the difference of means and there was a significant difference between group means; with $F(2,33) = 28.0$, $p < 0.05$. After finding significant differences, Post hoc comparison using the Tukey HSD test was employed to identify where the differences existed among the years. The differences of the mean of reported injuries between 2015 and 2016, 2016 and 2017, and 2017 and 2015 were computed and found to be (1785 ± 1205) , (1887 ± 1204) , and (3672 ± 1204) respectively; all were statically significant with $P < 0.05$ at 95% CI. Therefore, it was found that the mean difference existed among all of the years.

Incidence of road traffic injury by region

The highest number of cases was reported from Oromia regional

state (82,822) which was 33.33 % of all cases and the lowest number of cases was reported from the Gambella region which was 992 or 0.48% of all injuries over the three years. Oromiya and SNNPR combined contributed to more than half (57%) of reported cases over the three years (Figure 3). We took half-year population numbers to calculate the incidence of injury per 100,000 population in each region and city administration. The crude incidences of road traffic injury in Harari and Dire Dawa city administrations were led during each year. The incidence of cases per 100,000 population was increasing at the national level and SNNP during the three years. Likewise in Gambella regional state, the incidence was increasing alarmingly. On the other hand, the incidence in Dire Dawa slightly decreased and Oromiya remained almost stable. During each year, the Harari region was leading by the incidence of injury and followed by Dire Dawa city administration (Table 4).

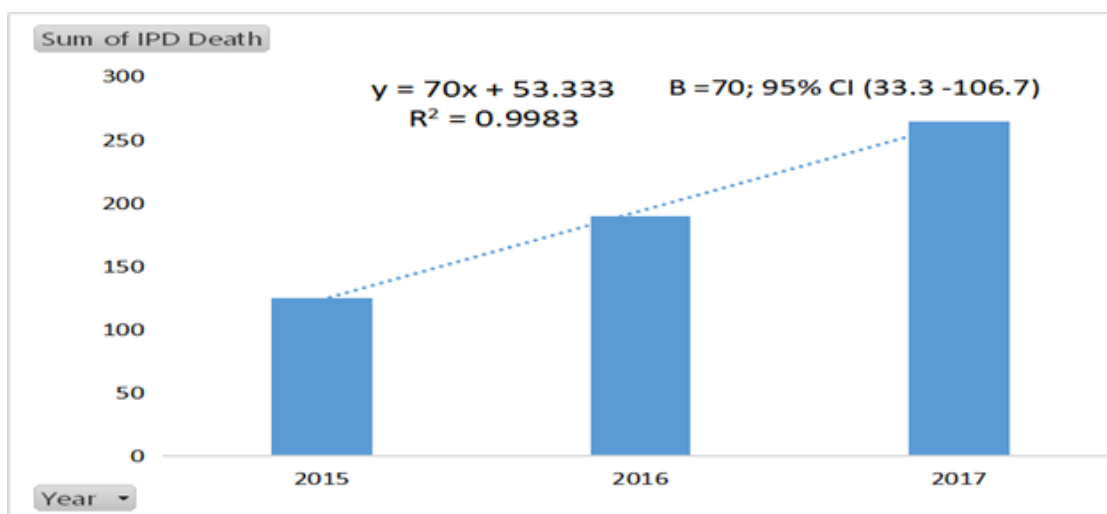


Figure 2: Inpatient death captured by HMIS over three years period. Constructed by principal investigator using SPSS and Microsoft excel. No matter how the number captured was small, it indicated that the trend of IPD death was significantly increasing.

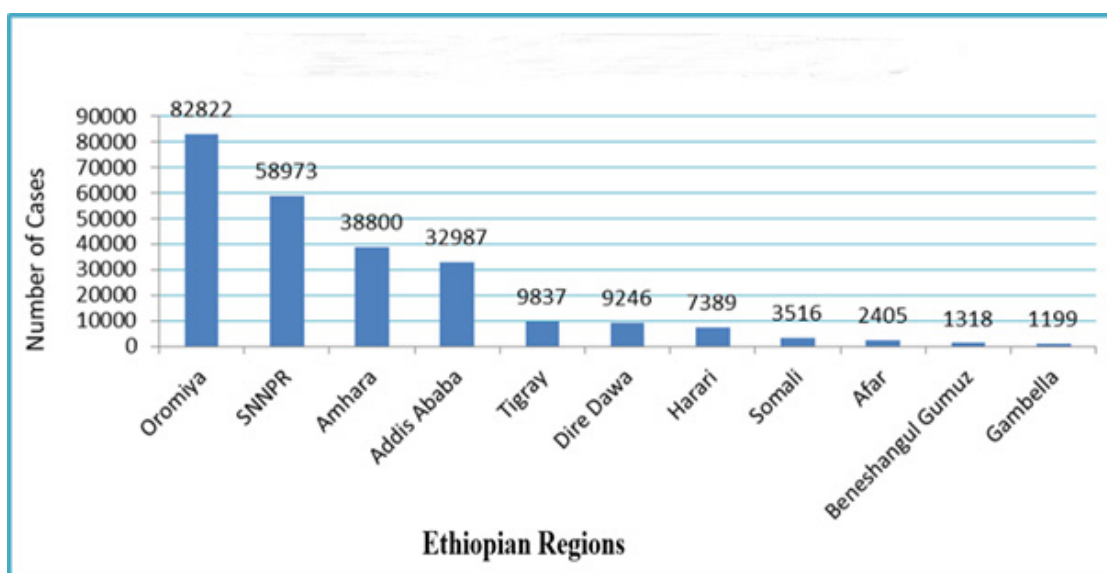


Figure 3: Total sum of cases over the three years presented by regions of Ethiopia.

Table 4: Comparisons of crude incidences per 100,000 population over three years, 2015 to 2017 EFY.

| Incidence of cases per 100,000 population over three years | | | | | | |
|--|-----------|------|-----------|------|-----------|------|
| Region | 2015 | | 2016 | | 2017 | |
| | Incidence | CI | Incidence | CI | Incidence | CI |
| Addis Ababa | 222 | 11 | 385 | 11.2 | 373 | 11 |
| Afar | 40 | 3 | 29.9 | 3.1 | 96 | 4.2 |
| Amhara | 62 | 5 | 75.38 | 5.1 | 86 | 5.2 |
| Beneshangul Gumuz | 60 | 5.4 | 44 | 5 | 57 | 5.2 |
| Dire Dawa | 2017 | 15.1 | 1801 | 15.3 | 1694 | 17 |
| Gambella | 35 | 4 | 42.91 | 4.2 | 341 | 11.5 |
| Harari | 2108 | 12.2 | 2563 | 13 | 2272 | 20 |
| Oromiya | 102 | 5.6 | 87 | 5.3 | 92 | 5.6 |
| SNNP | 86.46 | 7.2 | 94.56 | 7.4 | 174 | 8.6 |
| Somali | 3 | 0.5 | 23 | 1 | 46 | 1.4 |
| Tigray | 66 | 2.4 | 98 | 2.7 | 94 | 2.7 |
| National | 92 | 1.1 | 101 | 1.3 | 128 | 1.4 |

Death captured by eHMIS throughout the three years

The number of death reported over the three years was representing only the death occurred at an inpatient department (IPD) of health facilities. It is the figure of death that happened after admission to hospital wards. According to the data captured by eHMIS reports, it was significantly increasing during the three years. Inpatient death captured by eHMIS during 2007 EFY was 125, less than half of the death captured during 2009 EFY which was 265 (Figure 2). It increased by more than 100% in just two years. Despite this number was much lower than the real death that occurred during these years, it can be taken as a reflection of the growing mortality due to RTI.

Discussion

In Ethiopia, the trend of road traffic injury was increasing over the three years of the eHMIS report. This could be due to an increased population of vehicles, increased network of roads passing through areas that are not familiar to vehicles, increased activities of trade in rural areas, and the absence or weak rule to control substance driving[10]. This is similar to most low and middle-income (LAMIC) countries especially, in the sub-Saharan region. Similar to this, the study done in Ghana show that road traffic injury is persistently increasing since 2000 [11].

The increment of cases could be due to multiple factors like increment of the vehicle number, the increment of population, bad behaviors of road users including drivers and pedestrians, substance driving, and increased road network density passing through rural that are not familiar with the vehicles [5,12,13]; these risk factors can be concluded as epidemiological triads of Host, Agent, and Environment.

Being male and adult age groups have a higher risk of being exposed to RTI than women and younger age groups in Ethiopia. From a total of 248501 cases, 200210 (80.6%) were adult age group and 158134 (63.64%) were males. It was indicated in this study that Adult males were highly affected in Ethiopia. In a study conducted in Kenya, it was shown that 73% of all fatalities were among young males who are an economic asset to society [12]. Similar studies conducted in Addis Ababa Ethiopia show that from the total of fatal crashes that happened in Addis Ababa about 91.1% were male perpetrators with the Adult Age group [14]. This could be due to increased outdoor activity of adults and risk-taking behavior and substance use in males [15].

The incidence per 100000 populations is much higher in the Harari region and Dire Dawa city. They have more than 2000 and 1500 incidences respectively, while other regions are below 300 incidences. Much higher than the estimated incidence of African countries which is 65.2 per 100000 [1,13]. There might be some association between chewing chat and exhaustively working which can result in increased incidence. It is shown that the Use of Amphetamines is about 5 times the risk of someone who hasn't [1]. Therefore it requires further study to see the association between chewing chat and exposure to an accident.

In eHMIS analysis, the death report is incomplete because it only includes death that happened during Inpatient treatment. It does not include a report from Emergency OPD, Death occurred at the scene, and which reported by police. Both hospitals and police do not report all injuries and deaths. The study conducted in Ethiopia in 2005, shows that neither police nor hospital report independently provides accurate coverage of road traffic injury death [16].

Limitations:

- Age classification in eHMIS is only into three: under five, five to fourteen, and above fourteen.
- eHMIS was designed with few variables (age, sex, and place), thus, makes it difficult to analyze important variables like type of injury, severity, safety protocols, and substance use.
- Since eHMIS is filled manually at the health facility level errors like omission and duplication of data could be happened.

Conclusion and Recommendation:

A road traffic injury is one of the high public health concerns in Ethiopia. Despite governmental and civic societies' efforts, the trend of road traffic injury increased tremendously over the three years of the study period in Ethiopia. Being male and adult had a higher risk of exposure to the accident. Therefore, to halt the trend or growth of cases it might be necessary to act on at Host, Agent, and Environmental levels.

Abbreviations:

CI- Confidence Interval
eHMIS - Electronic Health Management Information System
FMOH - Federal Ministry of Health
E.C – Ethiopian Calendar
E.F.Y – Ethiopian Physical Year
G.C – Gregorian Calendar
LAMIC low and middle-income country
WHO – World Health Organization

Declaration:

We hereby declare that this surveillance data analysis of Road traffic Injury is our original work and has not been submitted to peer review journals elsewhere, and all source materials used for this analysis have been duly acknowledged.

Ethics approval and consent to participate:

Not applicable

Consent for publication:

Not Applicable

Competing interests:

The authors declare that they have no competing interests.

Availability of data and materials:

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request at (Fufa Hunduma, email: fhunduma@gmail.com)

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No funding was accepted during this project.

Authors' contributions

FH: conceived the idea, wrote the proposal, conducted the data collection, data processing, analysis, and data interpretation, wrote

the first draft, and wrote the final paper and manuscript write-up. B L: Supervised the paper write-up, reviewed, and approved the final manuscript. All authors have read and approved the manuscript.

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