Characterization of Road Traffic Accidents on the Road between Harar and Dire Dawa, Eastern Ethiopia: A cross-sectional study

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Abstract

Background: A Road Traffic Accident (RTA) is a rampant public health and development challenge in Ethiopia. However, there are very few studies on the different characteristics of road traffic accidents that have occurred. This study was aimed at characterizing the RTA between Harar and Dire Dawa, Eastern Ethiopia from January-April, 2016.

Methods: We conducted a cross-sectional study on the RTA which occurred from January-April, 2016 on the way from Harar to Dire Dawa. We collected the data from the traffic police accident investigating team, drivers who survived the accident, eyewitnesses, and medico-legal reports of the accidents. We present a descriptive analysis to characterize the road traffic accidents that occurred on the road in the specified period.

Results: From January to April, 2016, 166 RTAs occurred on the road between Harar and Dire Dawa. From these, 69 (41.6%) resulted in severe accidents, 56 (33.7%) in property damage only, and 41 (24.7%) in property damage and minor injury to human beings. Many of the accidents occurred on an undivided two-way road (107(64.5%)), some on a divided two-way road (38(22.9%)), and very few on one-way road (21(12.7%)). Most of the accidents (139(83.7%)) were collisions, involving two or more vehicles. Eighty-three (50%) of the drivers reported they had never used a seatbelt whereas 38.6% and 11.4% of them reported that they had used the belt always and only sometimes, respectively. Most of the accidents occurred in clear weather conditions (134(80.7%)), on non-congested roads (110(66.3%)), and in commercial vehicles (40.4%).

Conclusions: The road traffic accidents between Harar and Dire Dawa damaged property and human life. Most of the accidents were caused by commercial vehicles. The causes of the accidents were easily preventable. Interventions that focus on driver's risky behavior, speed, and road safety improvement are essential to solve many of the problems.

Keywords: *Accident, Road Traffic Accident, Accident Severity, Eastern Ethiopia*

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Introduction

Road Traffic Accident (RTA) is defined as an accident that occurs on a street and results in human and/or animal injury or death and property loss. It results from a collision between vehicles, between vehicles and pedestrians, between vehicles and animals, or between vehicles and fixed objects (Amol, 2008). Data from 180 countries indicates that death from road accidents has plateaued at 1.25 million per year, with the highest fatality rate (94%) and injury in low-income countries (WHO, 2015). Every day, over 3400 people die on roads and about ten million people are injured or disabled per year (Nganwa, 2004). The most vulnerable groups to road accidents are cyclists, children, older people (WHO, 2002 and 2015) and pedestrians and passengers of commercial vehicles (Tsegazeab *et al*., 2007; Osman *et al*., 2004). To reduce the problem, seventeen countries have improved at least one of their laws with regard to good practice on drink–driving, seat-belt use, speed, motorcycle helmets, or child restraints. However, the change is not adequate in accordance with the 2030 agenda for sustainable development launched to avert the global number of injuries and deaths from RTA (WHO, 2015). RTA is ranked the number one cause of morbidity among children between 5 and 14 years, and the number three cause of mortality among those in 15 to 29 age group (Jha *et al*., 2004). The official road accident statistics classify the severity of RTA as fatal, serious, and slight.

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Severe injury is commonly defined as death within 30 days of the accident. To determine the severity of injury or crash, studies on road traffic safety obtain data from police reports (Bryant *et al*., 2004).

Evidence indicates that the underlying reasons for road accident in Ethiopia are drivers not giving priority to pedestrians and lack of knowledge on road traffic safety, pedestrians not taking proper precautions, mixed traffic flow system, poor vehicle technical condition, poor traffic law enforcement, poor road network and safety considerations (Abebe, 2010). Poor road network, absence of knowledge on road traffic safety, mixed traffic flow system, poor legislation and failure of enforcement, poor conditions of vehicles, poor emergency medical services and absence of traffic accident compulsory insurance law have been identified as key determinants of the problem (Amol, 2008). In addition to the immeasurable personal and social costs paid by the victims of road crashes and their relatives, traffic injury has a significant economic impact where the direct and economic cost of injury and disability results from levels of injury severity (Osman *et al*., 2003). It is a major public health problem in developing countries, including Ethiopia.

Despite all these facts, little attention is given to RTA as a public health problem and its causes. Therefore, this study tried to identify the vehicle, road, and weather conditions that characterize RTA, to supplement data already available which could be used for policy making and designing road traffic accident prevention activities.

Method and Procedures

Study Setting

This study was conducted on the road route between Harar and Dire Dawa. The asphalt road is two-way, 6 meters wide, and 57 km long. It is among the busiest routes in Ethiopia. In addition to the numerous minibuses from and to Harar and Dire Dawa, a lot of Isuzu carriage vehicles travel very fast to deliver "khat" on time to Dire Dawa, Awaday, Jigjiga and Togo Chale towns. The Harar-Dire Dawa road has a winding section in the area of Dangago.

Study Design and Population

A cross-sectional study was conducted on RTAs on the road between Harar and Dire Dawa that occurred from January to April 2016. In this study, Harar-Dire Dawa road is defined as the main road from Harar bus station to Dire Dawa bus station. The drivers who died or were severely injured in the accident and had no one to give us information were excluded from the study.

Data Collection and Measurements

Relevant data on car crash, road characteristics, vehicle type, weather, and light conditions were collected by five trained BSc nurses, as well as professional road traffic crash investigators. To obtain quality data, the collectors were trained for two days and assessed for their understanding of interviewing process and content of the questionnaire.

Figure: 1 Map of Ethiopia and Harar-Dire Dawa Road, Eastern Ethiopia. Source; Google Maps and Google: rural kebeles.

They were stationed with road traffic police at five sites on the road Harar to Dire Dawa (Harar, Awaday, Haramaya, Dangago and Dire Dawa). The traffic accidents that occurred on the road were described by road conditions, vehicle conditions, weather and time conditions. The accidents that occurred during the data collection were closely and immediately investigated by the data collectors and additional information was sought from the drivers through interviews. Each road traffic accident that occurred on the way was recorded in partnership with road traffic police and more data were collected through face to face interviews with drivers and observations were made. Data were also collected by reviewing medico-legal reports, by interviewing the drivers who survived the accident, and the care givers/relatives of those drivers who died or were severely injured.

Data on alcohol consumption were obtained through verbal interviews of drivers, as an alcohol breath test was not available for use. Vehicle and road characteristics were determined through observation in collaboration with road traffic police accident investigators. The severity of the RTAs was described as (1) severe injury: involving death at the scene or up to one month following the incident; (2) minor injury and property damage: victims hospitalized at least for 24 hours, with damage to property, and (3) property damage only: resulted in crash without any human injury (ERA, 2012).

The data collection tool/questionnaire was adapted from the road traffic accident event registry format. The study tool contained four parts (driver characteristics, vehicle conditions, weather and time conditions, and road conditions). Pre-test was done on the road from Harar to Babile. Daily check-up was made for the completed questionnaire at the submission time. Each completed questionnaire was checked for completeness and consistency during submission at the end of every data collection day. After data collection, the study variables were identified.

Data Analysis

Data cleaning and checking of completed questionnaires was made to check accuracy, consistency and any identified error was corrected. Data entry template was prepared using Epidata Version 3.0. The data were entered on Epidata Version 3.0 by trained data clerks and were checked for completeness and consistency and finally exported to SPSS Version 16 for analysis. Then, the result of the study was presented using comparative tables, graphs and figures. Univariate analyses such as proportion, percentage, ratio, frequency distribution, and appropriate graphic presentations, besides measure of central tendency, were used for appropriate data description.

Ethical Considerations

The study was ethically approved by the Institutional Health Research Ethics Review Committee (IHRERC) of Haramaya University, College of Health and Medical Sciences (CHMS). Respondents were informed about the purpose, risk and benefits of the study ahead of the data collection. The rights of the participants to withdraw from the study at any stage were kept and the name of subjects was not registered on the questionnaire to maintain confidentiality.

Results

Socio-Demographic and Drivers' Characteristics

From January to April, 2016, within four months, 166 RTAs occurred on the road between Harar and Dire Dawa. Interviews were conducted with 153 drivers who survived the accident and 13 care givers/relatives of those drivers who died or were severely injured. About 43 (25.9%) of the drivers were less than 23 years, with a mean age of 29 years, standard deviation of 8. Almost all (98.2%) of them were male. More than half of the drivers 87 (52.5%) attended less than grade eight education (Table 1).

Table 1; Socio-demographic and behavioral characteristics of drivers incurring RTA on the road Harar-Dire Dawa, Eastern Ethiopia, 2016.

Variables	Frequency	Percentage (mean± SD)
Mean age of drivers		29 ± 8
Age of Drivers		
<23	43	25.9
24-35	98	59.0
36-50	23	13.9
>51	2	1.2
Total	166	100
Sex		
Male	163	98.2
Female	3	1.8
Total	166	100
Educational Status		
Less than grade 8	87	52.5
Secondary school	62	37.3
Diploma and above	17	10.2
Total	166	100
Alcohol		
Yes	8	4.8
No	158	95.2
Khat chewing		
Yes	29	17.5
No	137	82.5
Cigarette smoking		
Yes	18	10.8
No	148	89.2
Hashish use		
Yes	6	3.6
No	160	96.4

Seatbelt Use and Driving Related Conditions

From the interviews with the drivers, 83 (50%) of them said that they never used seat belt and the remaining 64 (38.6%) and 19 (11.4%) used always and sometimes, respectively. Most of the accidents 145 (87.3%) occurred on the roads which were familiar to the drivers whereas the rest occurred on roads unfamiliar to the drivers. Twenty-two (13.3%) of the drivers admitted that they used cell phone while driving and 144 (86.7%) claimed that they didn't use cell phone while driving. More than half 89 (53.6%) of the drivers had less than five years driving experience while 59 (35.5%) and 18 (10.8%) had 5-10 years experiences and more than ten years of driving experience, respectively.

Vehicle Characteristics

As indicated in Figure 3 below, 71 (42.8%) of the vehicles involved in the accidents were two and three wheelers (Bajaj taxi, bicycle and motor cycle) and 36 (21.7%) were minibus and vans, 15 (9%) were medium trucks, 12 (7.2%) were heavy trucks, 12 (7.2%) were pickups, 9 (5.4%) were medium and large buses and 4 (2.4%) were other vehicles. Of the 166 vehicles involved in the accidents, only 13 (7.8%) had technical defects. As shown in Table 2, most of the accidents 139 (83.7%) were collisions with at least two or more vehicles involved and the remaining were non-collisions involving only a single vehicle. One hundred and one (60.8%) of the accidents occurred while the vehicles were going straight ahead. Many of the collisions (107(64.5%)) occurred heads-on and the remaining 29(17.5%) and 2 (1.2%) occurred front-rear and front-side, respectively. Some of the vehicles involved in RTA were commercial vehicles (67(40.4%)) followed by taxi (66(39.8%)). It was observed that 79 (47.6%) of the vehicles were found travelling above 60km/hr and the remaining 87 (52.4%) travelling at a speed less than 60km/hr.

Severity Status of the Accidents

The severity of RTA was assessed in collaboration with road traffic accident investigators and classified into three categories: injury, minor injury with property damage, and property damage only (crash without any human injury). From the total of 166 RTA cases recorded over the four months on the 57km road, 56 (33.7%) were only property damage, 41 (24.7%) were property damage with minor injury and 69 (41.6%) were severe accidents (Figure 2).

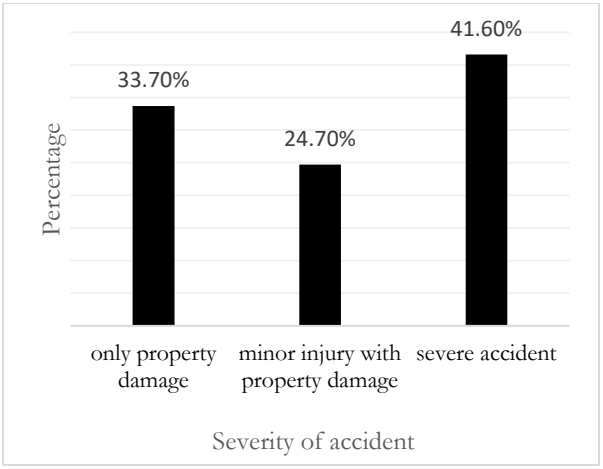

Figure 2: Road traffic accident severity on Harar to Dire Dawa road, Eastern Ethiopia, 2016

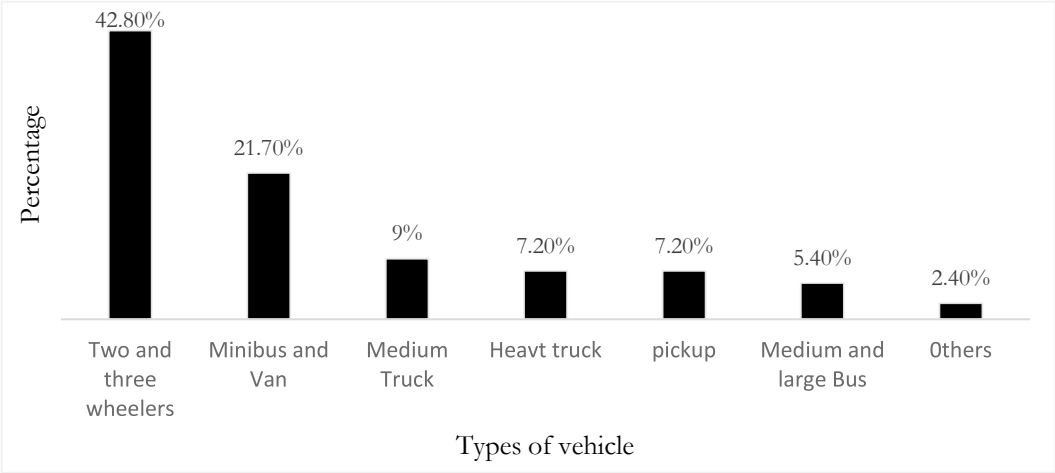

Figure 3: Types of vehicles involved/incurred accident on Harar to Dire Dawa, Eastern Ethiopia, 2016.

Road Characteristics

Many of the accidents (107(64.5%)) occurred on undivided two-way narrow roads whereas 38 (22.9%) and 21 (12.7%) occurred on divided two-way and one-way roads, respectively (Figure 4). As far as road alignment is concerned, 101 (60.8%) of the accidents occurred on straight road and the remaining 65 (39.2%) occurred on curved road. Most (138(83.1%)) of the accidents happened on 'asphalt' road while 22(13.3%) and 6(3.6%) occurred on 'pista' road and 'cobble' road, respectively. A large number (143(86.1%)) of the accidents occurred on damaged road and only 23 (13.9%) occurred on non-damaged road.

Table 2: Vehicle characteristics, incurred in RTA on the Harar-Dire Dawa road, Eastern Ethiopia, 2016.

Category	Frequency	Percentage
Mode of accident		
Collision	139	83.7
Falling of vehicle	12	7.2
Run over	5	3
Over turning	5	3
Being knocked down	3	1.8
Vehicle hitting stationery object	2	1.2
Total	166	100
Vehicle maneuver		
Going straight ahead	101	60.8
Crossing Road	57	34.3
Others	8	4.8
Total	166	100.0
Vehicle Load		
Over loaded	50	30.1
Not over loaded	116	69.9
Total	166	100
Vehicle Category		
Taxi	66	39.8
Van	18	10.8
Commercial	67	40.4
Government owned	15	9.0
Total	166	100
Speed		
Above speed limit	79	47.6
Within speed limit	87	52.4
Total	166	100

Weather and Timing Conditions

Most of the accidents (134(80.7%)) occurred in clear weather conditions whilst 25 (15.1%) and 7 (4.2%) occurred in rainy and foggy weather conditions, respectively. With regard to the light condition, 122 (73.5%) of the incidents took place in broad daylight while only 35 (21.1%) and 9 (5.4%) occurred at night with street light, and night without street light, respectively. Many of the accidents (110(66.3%)) occurred on non-congested roads while (56(33.7%)) occurred on congested roads. As far as time condition is concerned, 87 (52.4%) of the accidents occurred after 1:30pm and the remaining 79(47.6%) occurred before 1:30pm.The highest number of accidents (45(27.1%)) occurred on Saturday and 22 (13.3%) of RTA occurred on Monday, 33 (19.9%)occurred on Tuesday, 18 (10.8%) occurred on Wednesday, 14 (8.4%) occurred on Thursday, 13 (7.8%) on Friday and the rest (21(12.7%)) occurred on Sunday**.**

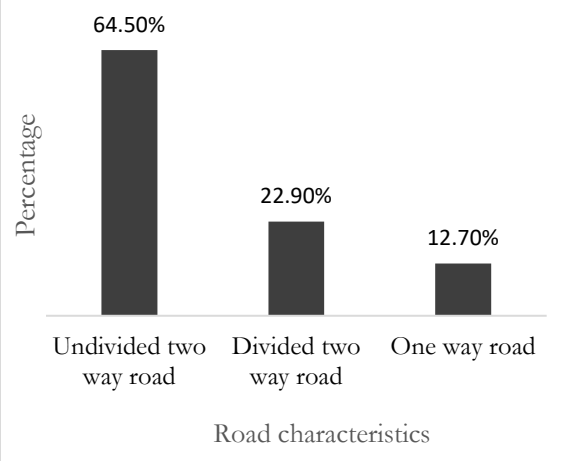

Figure 4: Road characteristics and RTA on Harar to Dire-Dawa road, Eastern Ethiopia, 2016

Discussion

Within four months, 166 RTAs occurred on the way between Harar and Dire Dawa. Of these, 41.6% resulted in severe accidents. Study reports from Tanzania and Ethiopian Road Transport Authority, National Road Safety Coordination Office show similar findings (NRSCO, 2006, Chalya *et al*., 2012). A study conducted on the road from Addis Ababa to Hawassa reported 819 road accidents in one year (Abegaz *et al*., 2014). This variation is due to difference in road design and the study period elapsed. Almost all the drivers who incurred the accidents in our study were male (98.2%), which is similar to what was reported from India, where

82.5% of the RTA victims were male drivers (Khare *et al*., 2012). More than half (59%) of the drivers were in the age range of 24 to 35 years, which is similar to a study reported from India (Maj *et al*., 2014). This could be due to unsafe driving behavior and substance use in this age group.

Half of the drivers who incurred RTA self-reported that they never used seatbelts. Likewise, a study conducted on the road between Hawassa and Addis Ababa reported that severe accidents are associated with non-use of seatbelt (Abegaz et *al.* 2014). Time and day factors are important in the occurrence of RTA. In our study many of the accidents occurred after 1:30 p.m and on weekends, especially on Saturdays. This might have been due to high traffic flow and less driver concentration in the afternoon. In studies done in India, more RTAs occurred between 3 and 7 pm (44.16%) than between 7 and 11 a.m (24.16%) and on weekends from 3 to 7 pm the maximum number of RTA cases were recorded (Nilambar *et al*., 2004; Badrinarayan *et al*., 2010). This is in line with what our study revealed.

Unlike the similar study in India, where a large number of RTAs occurred in rainy and cloudy weather, in our study most of the accidents occurred in clear weather conditions. The inconsistency could be due to difference in study period and weather condition (Badrinarayan *et al*., 2010). With respect to light condition, most of the incidents occurred in day light.

Like study reports in India and Ethiopia, most of the accidents in our study were collisions (Osman *et al*., 2003, Badrinarayan et al., 2010), and took place on damaged road. Another research in Indian found knock-down as the common mode of RTA, followed by falling off vehicles (Nilambar *et al*., 2004). This discrepancy could be explained by difference in road design and land topography. In our study two or three wheeler vehicles caused more RTAs than trucks and buses did. An Indian based study revealed that bicycles, trucks and buses accounted more for RTA (Nilambar *et al*., 2004). This is in support of our finding but the proportion of truck and buses involved in RTA were less in our finding and this is probably due to the difference in vehicle proportion.

Social desirability bias and fear of legal consequences may have affected our research findings. Research methodologies involving self-reported measures depend largely on individuals' memory and recall bias may exist. Self-reported assessment of driver alcohol use may have introduced bias and alcohol testing, which was already in use at the capital, Addis Ababa, was not used. The study may have excluded those RTA cases which declined investigation due to fear of medico legal consequences. The study was conducted on a prospective base and this enabled the study to collect pertinent data in collaboration with road traffic crash investigators.

Conclusions and Recommendations

Road traffic accident is causing huge losses of properties and loss of human life on the road connecting Harar and Dire Dawa. The burden of road traffic accident is high, which is largely as a result of narrow defective roads and mixed traffic flow. Most of the accidents were severe. Commercial vehicles mainly accounted for the road traffic accidents. Most of the reasons for the accidents are really and easily preventable. Interventions that focus on drivers' risky behaviors, speeding and road safety improvements are essential to avert many of the problems.

Acknowledgement

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Authors' Contributions

LN led the proposal development, data collection, data analysis and write up. YD also actively participated in proposal development, data collection, analysis and write up of the paper.

Conflict of Interest

The authors declare that they have no competing interests.

References

Abebe, A. 2010. road traffic accident as major public health concern in Ethiopia. Proceeding 20th annual conference of Ethiopian public health association 20101(12): p. 13. Available from: *www.etpha.org/publications/abstracts-proceedings.html*

Abegaz, T., Berhane, Y., Worku, A., Assrat, A. & Assefa, A. 2014. Effects of excessive speeding and falling asleep while driving on crash injury severity in Ethiopia: A generalized ordered logit model analysis. *Accident Analysis & Prevention,* 71**,** 15-21.

Alice, N.B. 2004. RTA-related deaths in the United States and 35 other high and upper middle income countries. *Int J Epidemiology* 27(5): 214-221

Amol, T. 2008. Road traffic accidents in Ethiopia: magnitude, causes and possible interventions. Advances in Transportation Studies *an international Journal Section* A. 15 (2): 12.

Badrinarayan, M. and Nidhi, D. 2010. Epidemiological Study of Road Traffic Accident Cases from Western Nepal. *Indian J Community Med.* 35(1): 2-5.

Bryant, B., Mayou, R., Wiggs, L., Ehlers, A. and Stores, G. 2004. Psychological consequences of road traffic accidents for children and their mothers. Psychological Medicine 11(34): 335-346.

Chalya, P. L., Mabula, J. B., Dass, R. M., Mbelenge, N., Ngayomela, I. H., Chandika, A. B. & Gilyoma, J. M. 2012. Injury characteristics and outcome of road traffic crash victims at Bugando Medical Centre in Northwestern Tanzania. *Journal of trauma management & outcomes,* 6**,** 1.

ERA(Ethiopian Roads Authority). 2012. Ethiopian Road Asset. E. R. A. (ERA). Addis Abab,Ethiopia.

Jha, N., Srinivasa, D., Roy, G., Jagdish, S., Minocha, R.. 2004. Epidemiological study of road traffic accident cases: A study from South India. Indian journal of community medicine : official publication of Indian Association of Preventive & Social Medicine. 29(1):20-24.

Khare, N., Gupta, S.K., Varshney, A. and Athavale, A. 2012. Epidemiological Study Of Road Traffic Accident Cases Attending Tertiary Care Hospital, In Bhopal Madhya Pradesh. National *Journal Of Community Medicine* 3(3): 456-424.

NRSCO(National Road SafetyCoordination Office) 2006. Overview of the Road Safety Activities in Ethiopia. Ethiopian RoadTransport Authority, National Road Safety Coordination Office. Ethiopia.

Osman, M., Kebede, Y. and Anberbir, S. 2003. Pattern & magnitude of accident & injury in North Gondar Administrative zone.*Ethiop Med J.* 41(3):213-20.

Pathakm, S.M., Jindal, A.K., Verma, A.K, Mahen, A. 2 0 1 4. An epidemiological study of road traffic accident cases admitted in a tertiary care hospital.*Me d i c a l journa l armed for c e s in d i a* 7 0 (32): pp.32-35.

Tsegazeab K, Tesfaye M and Tegodan T. 2007. status of road traffic injury prevention in Ethiopia. *Ethiop Med J* 46(4): 383-390.

WHO(World Health Organization) 2015. Global status report on road safety: Injury Prevention. Available from:http://www.who.int/violence_injury_prevention/road_safety_status/2015/en/

WHO(World Health Organization) 2002. Regional Office for South-East Asia, New Delhi. Strategic plan for injury prevention and control in South-East Asia.