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Research Article

Use of Seatbelts and Observable Factors among Public Transport Drivers in Addis Ababa, Ethiopia

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Wearing of proper seatbelt while driving is scientifically proven to protect from severe and fatal injuries. The aim of this study was to assess the status of proper seatbelt use and observable factors among public transport drivers in Addis Ababa, Ethiopia. The study conducted an inside vehicle observation study among 600 public transport vehicles in Addis Ababa, Ethiopia, from January to February 2017. Sample vehicles were randomly selected from ten arterial and ten collector road networks. This study used an observational checklist for data collection and logistic regression analysis to find the associated variables with improper seatbelt use. The odds ratio with a 95% CI and a p-value of <0.05 were considered for the statistically significant association. The prevalence of proper seatbelt use was 47.5% [95% CI (43.0–51.3)]. Khat chewing [AOR: 2.41, 95% CI (1.04–5.60)], engaged in driving distraction activities [AOR: 2.93, 95% CI (2.08, 4.13)] and being city bus drivers [AOR: 1.66, 95% CI (1.09, 2.52)], were significantly associated with improper seatbelt use. The actual rate of proper seatbelt use among public transport drivers in Addis Ababa was very low compared with the officially known report. Drivers' behavior and being drivers of large-sized vehicles were associated with improper seatbelt use.

1. Introduction

Each year, road traffic crashes result in roughly 1.35 million people's deaths and 20 to 50 million reported nonfatal injuries worldwide [1]. In 2012, road traffic injuries ranked first among the top ten causes of death among people aged 15 to 29 [2] and the eighteenth leading cause of death for people of all ages in 2016 [3]. More severe road traffic accidents, with 93% of fatalities, were recorded from low- and middle-income countries like Ethiopia [1]. Even though these countries own only 54% of the world's vehicles, road traffic deaths occur three times more frequently in these countries than in high-income countries [2, 3]. The situation might become worse in the coming decades because the countries' economic growth has been accompanied by increased motorization [2].

In the African region, road traffic injuries are both a public health challenge and a development issue that leads to a loss of approximately 3% of gross domestic product [2]. The sustainable development goals (SDG 3, target 3.6) include road traffic deaths and injuries with a target of 1.25 million peoples' deaths per year in 2015 of a 50% reduction [1, 2]. Nevertheless, there is an increment in the problem globally [1, 4]. There were no reductions in the number of road traffic deaths in any low-income country, including Ethiopia, between 2013 and 2016, although some reductions were recorded in middle- and high-income countries [3].

Ethiopia has a low number of registered vehicles with high road traffic accidents [2]. In fact, in recent years, the number of registered vehicles has shown a rapid increase of more than two times from 2013 to 2019 [2, 5]; more than half of these vehicles were registered in Addis Ababa city [5]. In

the country, the average annual growth of road traffic accidents, road development, and motorized vehicles was 9.16%, 10.81%, and 13.34%, respectively [6].

Several factors are responsible for the cause of road traffic crashes, including speed driving, drunk and driving, overtaking, reckless driving, fatigue, drugs, sleeping, and cell phone usage [7]. Similarly, various factors determine the severity of the road accident outcome. Improper seatbelt wearing is one of the main factors that increases the risk of fatalities [2, 8, 9]. A seatbelt is designed in a way to distribute the forces of a crash over the strongest parts of the body; the three-point lap and diagonal seatbelt are the most widely used types in different vehicle types. The seatbelt tongue clips into the buckle, a retractor device is included as part of the belt system as this ensures unnecessary slack is taken up automatically [10]. Seat belts limit the movement of drivers in the event of a crash, dispersing the force of the restraint to reduce the likelihood of severe or fatal injuries [2]. Wearing a seatbelt correctly reduces the risk of fatality among drivers by 45–50%, the risk of severe injuries by 45%, and minor injuries by 20% [2, 4, 11]. Reports indicated a higher rate of drivers wearing seatbelts among high-income countries (77–99%) than low- and middle-income countries (7–43%) [2].

However, the officially known report of the rate of seatbelt use in Addis Ababa, Ethiopia is higher than the average of high-income countries; this report initiated the current study. Since 2015, a road traffic monitoring and evaluation program in Addis Ababa has conducted a large survey of seatbelt use by drivers twice a year for five years. Applying a similar roadside observation technique with the traffic officers, on average, 97% of the drivers were observed wearing a seatbelt [12]. Other studies from a selfreported interview in Ethiopia from Gondar and Addis Ababa cities have also reported 70% and 87% seatbelt use among public transport drivers, respectively [13, 14]. Seatbelt use is one of the risk factors stated in Ethiopia's road safety law and enforced by traffic police officers [15, 16]. Execution of the law is enforced by the traffic police officers at the roadside observation. The previous studies collected data from roadside observation and driver's selfreported interviews. But, observation is an important way of collecting information about the true behavior of people because people do not always do what they say and they do [17]. Therefore, this study aimed to determine the rate of proper seatbelt practice among public transport drivers by inside vehicle observation as a data collection technique.

2. Materials and Methods

This study employed a cross-sectional study design through inside vehicle observation among public transport vehicles in Addis Ababa, Ethiopia. Addis Ababa, the capital city of Ethiopia, occupies a total of 540 sq. km of land area surrounded by a mountainous landscape with ten subcities and 558 city road networks (159 Arterial and 399 Collector Street). Minibus taxis, midbuses, and buses are the leading public transport vehicles in the city [18]. Data collection for the study was extended from January to February 2017.

The source populations were public transport vehicle drivers (minibus taxis, midbuses, and buses) on Addis Ababa city roads. Public transport vehicle drivers who operate at selected road locations were the study population. Only public transport vehicles departing from selected public transport vehicle terminals were included in this study.

Since there was no previous study on proper seatbelt use based on inside vehicle observation in Ethiopia, a 50% proportion was assumed. A sample size of 600 drivers was calculated using a single population proportion formula with the assumption of 50% proportion, 5% margin of error, 95% confidence level, and 1.5 design effects.

A stratifying multistage sampling technique was employed. Addis Ababa city is divided into ten subcities, and then classified roads into arterial roads and collector roads under each subcity. Finally, one arterial road and one collector road were selected randomly from each subcity for the observation. Then the total sample was equally distributed to all randomly selected roads. The data collection period was three days a week (two weekdays and one weekend day); the time categories for the observation day were: 7:00 AM–11:00 AM, 11:01 AM–3:00 PM, and 3:01 PM–7:00 PM.

The data collection tool was an observational checklist developed for the road traffic monitoring and evaluation program in Addis Ababa [16–22]. Driver proper seatbelt utilization was the dependent variable in this study. The independent variables were driver-related factors (sex, age group, smoking, and khat chewing), driver distraction, vehicle type, and driving environment-related characteristics (road type, law enforcement, time, and day). A data collection protocol was prepared to guide the research team while observing the inside vehicle driver's activity and filling in the checklist.

Ten research team members were trained and participated in the data collection. A pilot trial was exercised on unselected roadway segments. The vehicles at the departure terminal for observation were selected; the data collector travels as a front-seat passenger, sitting closer to the driver. The observations started when the selected vehicle started the journey and continued until the final destination. The final destination was a place where the vehicle returns from the journey; at this place, the data collector chooses another vehicle for the return observation. The data collectors gave more attention to observing drivers' natural practices and should be unidentifiable by the drivers as observers. If a driver recognized the data collection activity, the observation was to be discontinued, and the data was discarded. Each vehicle and driver were observed for an average of 30 minutes. On average, four vehicles in the morning and six vehicles in the afternoon were observed per day per location. The vehicle plate number was recorded to avoid repeated observations of the same vehicle. Data collection activities were conducted with close supervision by the investigators in the field.

The data were checked for completeness and consistencies, then entered using epidemiological information package (Epi-Info) version 3.5.3 (Centers for Disease Control and Prevention, Atlanta, GA, USA), developed by

the US CDC and then exported to SPSS version 21 (IBM, Armonk, NY, USA) for further cleaning and analysis. The prevalence of proper seatbelt wearing practice among drivers was computed. The association between seatbelt use and observable factors was assessed by bivariate and multivariate analysis. A p-value of <0.2 in the bivariate analysis was used as a cutoff point to select the candidate variables for multivariable analysis. The cutoff point was selected to reduce unstable estimates in the multivariate logistic analyses [19–21]. The odds ratio with a 95% CI and a p-value of <0.05 were considered for the statistically significant association in the final model. Multicolinearity assumptions and model fitness were checked. The multicolinearity result revealed a variance inflation factor of <2 and tolerances of >0.9. This indicates that a specified independent variable was not explained by another independent variable in the model [19]. The Hosmer–Lemeshow goodness model fitting was $X^2 = 8.17$ with a degree of freedom of 8 and a significance equal to 0.48. The test should be insignificant at a p value of 0.05, indicating that the variable entered fits the model [22].

2.1. Operational Definitions

Proper seat belt use: wearing/using a correctly fastened seatbelt, not damaged/distorted, and is tightly fastened so that it passes through the shoulder and chest/across the front of the body during the observation period. Otherwise, it is considered improper seatbelt use (either improper seatbelt use or unbelted/never used seatbelt).

Arterial road: roadways with high traffic volume provide a high degree of mobility and carry a high proportion of travel for long-distance trips. These roadways carry a significant portion of the trips entering and leaving an activity center, and most of them through movements that either go directly through or bypass the area.

Collector road: collects traffic from local roads and connects them to arterial roadways. It penetrates neighborhoods, community collecting, and distributing traffic between neighborhoods and arterial roads. Collector routes are shorter than arterials but longer than local roads. Collectors provide less mobility than arterials at lower speeds and for shorter distances.

Public transport vehicle: vehicle giving public transport services in Addis Ababa and was recorded as a city public transport bus, midbus, and minibus taxi.

Bus, midbus, and minibus taxi: public transport vehicles are able to carry up to 12, 25, and more than 25 occupants, respectively.

Distraction: at least one of the following activities: frequent tuning of radio/music, mobile phone use, talking with passengers, or frequently watching people outside through the side window while driving [23, 24].

2.2. Ethical Consideration. An ethical approval letter for the research was obtained from Addis Ababa University, College of Health Sciences, and the School of Public Health Research Ethics Committee. This study was considered free/exempt from requiring informed consent because of the purpose of the study and no records included drivers' private information.

3. Result

3.1. Driver-Related Characteristics. Almost all (99.7%) of the drivers were male, and 56.8% of the drivers were in the age group of 35–64 years. Few drivers (0.5%) were smoking cigarettes, and 5.7% were chewing khat. About 46% of the drivers were engaged in one or more driver distraction activities, such as tuning the radio/music, using the mobile phone, talking with passengers in the back, or frequently watching people outside through the side window while driving (Table 1).

3.2. Driving Environment and Use of Seatbelt. A total of 600 public transport vehicles (300 from arterial and 300 from collector roads) were observed at 20 road segments. Out of all observed public transport vehicles, 459 (76.5%) were minibus taxis, 80 (13.3%) were midsize buses, and 61 (10.2%) were city buses. None of the observed vehicle drivers were encountered by a traffic police officer for seatbelt enforcement. About 40% and 66.7% of the vehicles were observed in the morning (7:00 AM–11:00 AM) and on weekdays, respectively. The overall prevalence of proper seatbelt utilization among public transport drivers in the current study was 47.5% [95% CI (43.0–51.3)] (Table 2).

3.3. Observable Factors Associated with Nonuse of Proper Seatbelt. Age group, khat chewing, driver distraction, vehicle type, and road type were candidate variables for the multivariate model after being fitted with the bivariate model. Khat chewing [AOR: 2.41, 95% CI (1.04–5.60)], engaged in driving distraction activities [AOR: 2.93, 95% CI (2.08, 4.13)] and being city public transport and midbus drivers [AOR: 1.66, 95% CI (1.09, 2.52)], were significantly associated with none utilization of proper seat belt (Table 3).

4. Discussion

The current study found that the overall prevalence of proper seatbelt use among public transport vehicle drivers was 47.5% [95% CI = 43.3–51.3]. However, this result is significantly lower than the observational study report that monitors the rate of seatbelt use in Addis Ababa by Bloomberg Initiative Road Side Observation from 2015–2020; 96–99% of vehicle drivers wear seatbelt in the five years [12]. Similarly, other selfreported studies among Ethiopian public transport vehicle drivers in Addis Ababa and Gondar cities reported high rates of seatbelt use, with 87% and 70%, respectively [13, 14]. Outside of Ethiopia, other roadside observation studies in Iran (77.9%) [25] and Thailand (77.4%) [26] have also reported a high rate of seatbelt use. These variations of over-reporting might be attributed to the difference in the data collection methods;

Table 1: Driver-related characteristics of public transport drivers in Addis Ababa, Ethiopia, 2017.

Variables	Observed counts ($n = 600$)	Percent (%)
Sex		
Male	598	99.7
Female	2	0.3
Age group		
18–34	202	33.7
35–64	341	56.8
>64	57	9.5
Smoking cigarette		
Yes	3	0.5
No	597	99.5
Khat chewing		
Yes	34	5.7
No	566	94.3
Driver distraction		
Yes	273	45.5
No	327	54.5

Table 2: Distribution of seatbelt use among public transport drivers in Addis Ababa, Ethiopia, 2017.

Variables	Observed counts ($n = 600$)	Percent (%)
Data collection session		
7:00–11:00 AM	240	40.0
11:00 AM–3:00 PM	180	30.0
11:00 AM–3:00 PM	180	30.0
Data collection day		
Weekend day	200	33.3
Weekday	400	66.7
Road type		
Arterial road	300	50.0
Collector road	300	50.0
Seatbelt utilization		
Proper seatbelt used	285	47.5
Improper seatbelt used	214	35.7
Unbelted seatbelt	101	16.8

these studies used either roadside observation or self-reported methods of data collection. The loose, unlocked, and nonfunctional seatbelt may not be visible from the roadside observation. Besides, drivers also tend to over-report good behavior during the selfreported interview [27].

Although proper seatbelts technically save the lives of occupants from severe road crashes, several reports show that the increased rate of seatbelt use is highly linked with the country's level of enforcement programs [10]. Hence, in countries where there are weak public awareness intervention programs about the benefits of seatbelt use and poor vehicle inspection systems, the rate of proper seatbelt reports might be inflated due to data sources from roadside observation or selfreported interviews. Despite the fact that Ethiopia has road traffic control regulations to enforce drivers to wear a seatbelt while driving [28], traffic police officers do not control the proper seatbelt wearing practice due to roadside observation practice [5, 29]. In addition, functional seatbelt inspection is not a critical issue in the annual vehicle inspection program. Therefore, the reported rate of seatbelt use only from roadside observation or drivers' interviews may mislead national road safety programs related to seatbelt use.

This study reported that being city public transport mid and bus drivers, Khat chewing and engaging in driving distraction activities were significantly associated with the lack of use of proper seatbelts.

Midbus and bus drivers had a lower rate of proper seatbelt practice than minibus taxi drivers. This finding is consistent with a study from Gondar, Ethiopia [14]. This might be due to traffic officers' being unable to easily observe large-sized vehicle drivers for the control of seatbelt practice compared to small-sized vehicle drivers. Thus, these drivers may have lower compliance with proper seatbelt use unless they understand and value the benefit of wearing seatbelts. Therefore, a wellorganized public awareness program and a strong annual vehicle inspection system should be compulsory for the sustainable use of proper seatbelt by vehicle occupants [10].

Furthermore, the current study revealed that drivers who were chewing 'Khat' while driving and those engaged in driving distraction practice are less likely to wear a proper seatbelt. Khat is a plant leaf considered as a stimulant drug that adult men chew in Ethiopia. Khat has the potential to influence behavior. This might lead drivers to be reluctant to comply with road traffic rules [30–32]. The previous study reported a higher frequency of fines among Khat chewing drivers due to traffic rule violations, including non-seatbelt use, than non-khat-chewing drivers [19]. In addition, a behavioral study using the Theory of Planned Behavior framework found a significant association between selfdistracted behavior and a higher level of unsafe driving behavior [7]. This study also found that drivers who engaged in driving distraction practices had a threefold higher chance of not properly wearing a seatbelt than those who did not. The reason might be the lack of a comprehensive regulatory framework in Ethiopia to control driver distraction behavior [5], and distracted drivers have frequently committed mistakes and violated road traffic rules [33–35].

The data collection technique through observation of the driver's behavior inside the vehicle is the strength of this study. The data collectors acted as unidentified passengers; this reduced the social desirability bias of drivers in the questionnaire interview and enabled them to observe the proper seatbelt practice of the driver better than roadside observation. However, this study also had several limitations: it was limited to public transport drivers, and data were collected during daytime hours; hence the findings might not be generalized to reflect the overall vehicle driver's behavior. In addition, the method was limited to collecting some important variables regarding the knowledge and attitude of drivers towards proper seatbelt use and vehicle-related characteristics. Moreover, we could not collect other unobserved sociodemographic characteristics of drivers; however, this information does not affect the rate of proper seatbelt use.

Table 3: Association between nonuse of proper seatbelt and observable factors among public transport vehicle drivers in Addis Ababa, Ethiopia, February 2017

Variables	Proper seatbelt utilization count		Corollary (95% CI)	AOR (95% CI)
	No	Yes		
All ($n = 600$)	315	285	—	—
Age group				
18–34	102	100	1.50 (0.83, 2.74)	1.52 (0.80, 2.90)
35–64	190	151	1.86 (1.05, 3.29)*	1.66 (0.91, 3.04)
>64	23	34	1.00	1.00
Khat chewing				
Yes	26	8	3.12 (1.39, 7.00)*	2.41 (1.04, 5.60)*
No	289	277	1.00	1.00
Driver distraction activity				
Yes	183	90	3.00 (2.15, 4.20)*	2.93 (2.08, 4.13)*
No	132	195	1.00	1.00
Vehicle type observed				
Midbus and bus	81	60	1.30 (0.89, 1.90)	1.66 (1.09, 2.52)*
Minibus taxi	234	225	1.00	1.00
Road type				
Arterial road	147	153	1.00	0.75 (0.54, 1.06)
Collector road	168	132	1.32 (0.96, 1.83)	1.00

* p-value <0.05, COR: crude odds ratio, AOR: adjusted odds ratio, and CI: confidence interval.

5. Conclusion

The actual rate of proper seatbelt use among public transport drivers in Addis Ababa was very low compared to the officially known report by the transport office and the previous self-reported studies. Driver's khat chewing behavior, engagement in self-distraction activities, and being a bus driver were factors associated with improper seatbelt use. Therefore, the city's traffic management agency and traffic enforcement office should further investigate the rate of proper seatbelt use practices among drivers for the purpose of designing appropriate implementation programs.

Data Availability

All the data supporting the results of our study are available from the author and will be provided on request (hailumary464@gmail.com)

Conflicts of Interest

The authors declare that there are no conflicts of interest.

Authors' Contributions

Conceptualization was performed by S.T., Y.T., and T.A.; methodology was prepared by S.T., Y.T., and H.M.; validation was carried out by S.T. and H.M.; formal analysis and investigation were performed by S.T. and H.M.; the original draft was prepared by S.T.; reviewing and editing were done by Y.T., T.A., and H.M.; and visualization was conducted by all authors. All authors have read and agreed to the published version of the manuscript.

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