Determinants of Mobile Phone Use and Seat Belt Non-compliance Among Vehicle Drivers in Nigeria: An Observational Study

Yingigba Chioma Akinyemi

Abstract The use of mobile phone and non-use of seat belt by drivers while driving is associated with the risk of crashes, injuries, and fatalities. Annual road traffic fatalities in Nigeria were over 5000 during the period 2000–2017. This study examined the rate and factors influencing mobile phone use and non-compliance to use of seat belt in Ibadan metropolis, Nigeria. A total of 6056 drivers were observed at 10 intersections. Overall, 611 (10.1%) drivers were found using a mobile phone while 1903 (31.4%) did not wear seat belt. Results of multiple logistic regression indicated that male drivers were more likely than females to use phones and not wear seat belt. Young drivers were more likely to use phones while driving than older drivers. Commercial vehicle drivers had higher odds of not wearing seat belt compared to other vehicles. No association was found between phone use and seat belt non-compliance. Educational campaigns and improved enforcement strategies need to be implemented.

Keywords Mobile phone · Seat belt · Road crashes

1 Introduction

According to reports of the Federal Road Safety Corps (FRSC), over 5000 persons died yearly due to road traffic injuries on Nigerian roads between 2000 and 2017 [1]. Given the economic, social, and health impacts of road injuries on children, young adults, elderly, families, and the society, road traffic crashes (RTC) are a major health problem in Nigeria. Hence, road safety is an important health priority that requires specific and appropriate intervention.

Human behaviors that increase the risk and severity of crashes include inappropriate or excessive speed, non-use of seat belt, child restraint and helmet, drink-driving, and driver distraction [2]. In 2017, 71% of road crashes in Nigeria were due

Y. C. Akinyemi (✉)
Department of Geography, University of Ibadan, Ibadan, Nigeria
e-mail: chiomajaja@yahoo.com

M. V. L. R. Anjaneyulu et al. (eds.), *Recent Advances in Transportation Systems Engineering and Management*, Lecture Notes in Civil Engineering 261,
https://doi.org/10.1007/978-981-19-2273-2_52

to human factors, specifically, speed violation, loss of control, dangerous driving, wrongful overtaking, and use of phone while driving [1].

Studies have shown that seat belt use is an effective way of preventing and reducing injury severity among vehicle occupants during road crashes [3]. Seat belt hold down vehicle occupants in their seats and prevent them from colliding with objects or being thrown out from the vehicle [4]. Use of seat belt reduces the risk of death by 45–50% among drivers and front seat occupants and 25% among rear seat occupants [5]. Fatal and non-fatal injuries in front and rear seat occupants can be reduced by 60% and 44%, respectively [6]. Also, risk of sustaining fatal and serious injury is 8.3 times and 5.2 times higher among drivers without seat belt compared to drivers who wear seat belt [7].

Driver distraction is a major cause of road crashes as it accounts for 1–50% of road crashes [8]. Driver distraction involves the driver attending to other activities rather than paying attention to activities critical for safe driving [9]. Distraction occurs when the driver shifts attention to some event, activity, object, or person within or outside the vehicle, causing delay in recognition of information needed to accomplish driving task [10]. Mobile phone use while driving is a very risky source of distraction compared with other sources. Mobile phone activities while driving involve mainly answering and making calls, replying, sending, and reading text messages [11].

Studies in the literature indicate that use of mobile phone while driving escalates the risk of road crashes, injuries, and fatalities as well as impair driver's performance and behavior. Redelmeier and Tisbshirani [12] noted that the use of mobile phones while driving increased crash risk four times compared with non-use of a phone. Violanti [13] noted that drivers using a phone when collision occurred had a nine-fold risk of a fatality. Mobile phone conversation of more than 50 min in a month resulted in a 5.59 increased risk of having a RTC [14], and risk of a road crash by 2–9% [2]. Texting increased the risk of a RTC by six fold [15]. Drivers who text message and dial a mobile phone while driving were 23.2 and 5.9 times likely to be involved in a road crash [16].

Further, mobile phone use while driving results in increase or decrease in reaction time [17], impaired detection and reaction to changes in speed of front vehicles [18], lane deviation [19], increase mental workload [20], influence vehicle speed [21], affect response to unexpected brake and cause more frequent braking [22], reduce glances to the mirror, roadway, and speedometer [23], impair perception and decision-taking, and causes delay in recognition and response to traffic events [24].

Enforcement of laws mandating the use of seat belt and prohibiting mobile phone use by drivers has been shown to be effective in changing driver behavior. Although Nigeria has national seat belt and mobile phone use laws which are enforced by the FRSC, compliance to these laws is not optimal. According to the national child restraint law in Nigeria, child passengers are required to use child restraints until seven years of age while those above seven should wear a seat belt [5]. However, child occupants are rarely protected using appropriate restraints. Non-use of child restraint by children increases crash risk and fatalities. Available data from FRSC indicate that a total of 149,857 seat belt violation offenders and 7243 drivers using mobile phones while driving was arrested in 2010 [25]. Analysis of the prevalence

and factors associated with seat belt and mobile phone use among drivers is important for the implementation of public health interventions that will reduce injuries and fatalities associated with road crashes. Observational and self-reported studies on the use of seat belt and mobile phone by drivers are replete in the literature. However, studies on the rate of compliance and factors related to the non-use of seat belt and mobile phone use among drivers in Nigeria are sparse.

Most of the studies on the use of seat belt and mobile phone while driving focus on high-income countries with low(7%)-road traffic deaths compared with low- and middle-income countries which account for 13% and 80% of road deaths, respectively [5]. Very few studies have examined the use of seat belt and mobile phone by drivers on roads in sub-Saharan African countries [26–28] and Nigeria [29–31] in particular. With the exception of studies by Sangowawa et al. [32] and Popoola et al. [33], most of the previous researches conducted in Nigeria utilized self-reported rates which are influenced by social–desirability bias as participants increase the rate of their seat belt use and reduce their mobile phone use rate, thereby making the data unreliable [34]. Given the increasing rate of phone subscription and high rate of non-use of seat belt in Nigeria, regular roadside observations surveys are required to determine the level of seat belt and phone use among drivers.

The study objectives are to (1) assess the level of mobile phone use and of seat belt non-compliance by drivers on roads in Ibadan metropolis, Nigeria using a direct observation approach, (2) examine the relationship between use of mobile phone and seat belt non-compliance, and driver's gender, estimated age, time of day, vehicle type, and vehicle usage using binary logistic regression analysis, and (3) investigate the association between seat belt non-compliance and mobile phone use. Results from the study will aid the identification of high-risk groups and guide the development of educational campaigns and enforcement of traffic safety regulations.

2 Material and Methods

2.1 Research Design

A fixed observational methodology was adopted in this study since the goal was to examine drivers' use of seat belt and mobile phone while driving in Ibadan Metropolis, Nigeria.

2.2 Sample Size

Following Sangowawa et al. [32], the sample size was determined using the formula for estimating population proportion: $n = z^2_{1-\alpha/2}\,[0.25]/d^2$ where n is the sample

size, z is confidence level, and d represents precision. We assumed confidence level of 95%, estimated population proportion of 20%, and precision of 0.01. A sample size of 6147 was determined. Hence, 615 vehicles were observed at each of the 10 selected sites.

2.3 Site Selection

Vehicle drivers were observed at intersections controlled by traffic light where vehicles are stationary or slowed down. Selected sites are located in both the rural and urban parts of the metropolis. The research assistants were stationed at a raised median so that only vehicles on the kerb lanes were observed. This was to enable the field assistants observe the interior of vehicles. In order to avoid observing a driver more than once, only one site was selected along roads with several intersections. Due to limited budget and resources, ten sites were selected for the study.

2.4 Observer Training and Pilot Testing

The research assistants were trained on safety measures to be adopted, data collection procedure and observation protocols. A supervised pilot survey was conducted at one of the selected sites to identify problems related to the observational procedure and data collection. After the pilot survey, issues identified were discussed so as to avoid observer bias.

2.5 Observational Checklist

Information on the driver's gender and estimated age, vehicle type, vehicle usage, presence of a child aged less than eight years, number of vehicle occupants, the use of seat belt and mobile phone was collected. Driver's age was classified into three age groups: 18–24 years, 25–59 years, and 60 years and older. Vehicles observed were restricted to sport utility vehicle (SUV), car, taxi, van, and pick-up. Vehicles used as taxi are painted in a specific color to distinguish them from other vehicles. Trucks, buses, and service vehicles such as police cars, ambulance, and fire vehicles were excluded. Observed indicators of mobile phone use were driver holding a phone to the ear, using a headset or Bluetooth while talking, manipulating a handheld device, texting and reading a message. An observational form was used to record the information collected.

2.6 Data Collection

The observational survey was conducted on weekdays by trained field assistants. The survey was conducted from 7 to 11 am and 3 to 6 pm at each site on weekdays (Monday–Friday) for a period of one week. Traffic is usually heavy during these periods. Two observers were assigned to each site for observation. A total of 20 research assistants conducted the survey. The observers were positioned at the driver's side of the road. When vehicles were stationary at a red light, one observer recorded information on mobile phone use by the driver, while the other observer recorded information on drivers' seat belt use. Observation forms with inconsistent and incomplete information were excluded. Overall, observations for 6056 vehicles were used for the analysis.

2.7 Data Analysis

Descriptive statistics were presented in frequency and percentages. Pearson chi-square tests were performed to determine the association between mobile phone, seat belt use, and the explanatory variables. Further, multivariate logistic regression analysis was used to assess the factors associated with seat belt non-compliance and use of mobile phone by drivers. Seat belt was coded as 1 = Yes, if the driver used seat belt while driving and 0 = No, if otherwise. Similarly, mobile phone use was coded as either 1 or 0. Correlation analysis and variance inflation factor (VIF) were used to test for multicollinearity. In the model for seat belt non-compliance and mobile phone use, the VIF for all the variables were less than 2.0, and the correlation coefficients between the variables were less than 0.6 indicating absence of multicollinearity problems. The statistical package for the social sciences (version 25.0) was used for bivariate and logistic regression analyzes at statistical significance levels of $p < 0.05$.

3 Results

3.1 Sample Characteristics

The analysis was based on information obtained on 6056 drivers. The sample characteristics are presented in Table 1. There were 5045 (83.3%) male and 1011 (16.7%) female drivers. A high proportion (93.9%) of the drivers was aged 25–59 years (93.9%). This was followed by drivers aged 60 years and above (3.6%) and 18–24 years (2.5%). Vehicles observed were mostly cars (54.9%), followed by SUV (22.5%) and taxi (16.6%). A total of 3716 vehicles (61.4%) had multiple occupants,

while drivers were the only occupant in 2340 vehicles (38.6%). Vehicles observed were used mainly for private (75.0%) and commercial (20.5%) purposes.

Table 1 Driver and vehicle characteristics

Variable	Category	Frequency	Percentage
Gender	Male	5045	83.3
	Female	1011	16.7
Age	18–24 years	154	2.5
	25–59 years	5685	93.9
	60 years and above	217	3.6
Vehicle type	SUV	1361	22.5
	Car	3325	54.9
	Taxi	1003	16.6
	Van	238	3.9
	Pick-up	129	2.1
Vehicle usage	Private	4544	75.0
	Commercial	1243	20.5
	Government	57	0.9
	Company	212	3.5
Vehicle occupant	Single	2340	38.6
	Multiple	3716	61.4
Child passenger < 8 years	Yes	445	7.3
	No	5611	92.7
Mobile phone use behavior	Holding phone to the ear	248	4.1
	Talking using a headset or hands-free	140	2.3
	Texting or reading a message	107	1.8
	Talking on handheld	80	1.3
	Manipulating handheld phone	234	3.9
Mobile phone use	No	5445	89.9
	Yes	611	10.1
Seat belt use	Yes	4153	68.6
	No	1903	31.4
Vehicle occupant	Single	2340	38.6
	Multiple	3716	61.4
Time of day	7–11am	3749	61.9
	3–6 pm	2307	38.1

3.2 Mobile Phone and Seat Belt Use by Drivers

Table 1 indicates that out of the 6056 vehicles observed during the survey, 611 (10.1%) drivers used a mobile phone while driving while 5445 (89.9%) did not use a phone. Drivers who used a mobile phone held the phone to the ear (4.1%), manipulated a handheld phone (3.9%), and talked with a headset or hands-free device (2.3%). Some of the drivers used their mobile phone for dual purposes, for example, talking with a hands-free device and manipulating a handheld phone. Further, 4153 (68.6%) drivers were observed wearing seat belt while 1903 (31.4%) did not wear seat belt.

Results of bivariate analysis of seat belt and mobile phone use, driver and vehicle characteristics are presented in Table 2. A higher (10.4%) proportion of male drivers used a mobile phone compared with female drivers (8.7%). Seat belt use compliance was higher among female (86.9%) than male (64.9%) drivers. Table 2 reveals that mobile phone use is not related to gender of the driver, however, seat belt non-compliance was significantly associated with gender ($\chi^2 = 189.98$, $p = 0.00$). Drivers' age was significantly associated with mobile phone use ($\chi^2 = 6.904$, $p = 0.03$) but not associated with non-use of seat belt. The analysis of prevalence rates by age group indicates that drivers aged 18–24 years had a significantly higher rate (15.6%) of mobile phone use compared with persons aged above 25 years. In terms of vehicle type, majority of drivers who used a mobile phone drove cars (10.6%) and taxis (10.5%), while the least usage of mobile phone was among pick-up (7.8%) drivers.

The rate of seat belt non-compliance was higher among drivers who drove taxis (94.8%) while most SUV (85.7%) drivers used seat belt. The type of vehicle is significantly associated with the use of seat belt but not related to mobile phone use. The greatest usage of mobile phone was among private vehicle drivers (10.2%), followed by government (10.5%), company (9.9%), and commercial vehicle (9.8%) drivers. A higher proportion of commercial drivers (90.3%) did not wear seat belt. Seat belt compliance was higher (84.4%) among private vehicle drivers. The association between vehicle usage and phone use was not significant, but seat belt use was significantly related to vehicle usage ($\chi^2 = 2527.04$, $p = 0.00$).

The results in Table 2 further indicate that there was a highly statistically significant relationship between number of vehicle occupant, mobile phone ($p = 0.00$), and seat belt ($p = 0.00$) non-compliance. The prevalence of mobile phone use was higher (11.1%) among drivers who were the only occupants in the vehicles compared with multiple occupant vehicles (9.4%). Non-use of seat belt was higher among drivers with other vehicle occupants (38.5%) compared with drivers that were alone in the vehicle (20.2%). Drivers who had children aged less than eight years in the vehicle had a higher rate of mobile phone use (17.1%) and non-use of seat belt (34.4%). The proportion of drivers who used a phone while driving was high (10.5%) between 3 and 6 pm while 32% of drivers did not wear seat belt between 7 and 11 am. Time of day was not significantly associated with phone and seat belt use.

Table 2 Characteristics of seat belt and phone users and non-users

Variable	Mobile phone use						Seat belt use					
	Yes	%	No	%	χ^2	*p*-value	Yes	%	No	%	χ^2	*p*-value
Gender					2.57	0.11					189.9	0.00*
Male	523	10.4	4522	89.6			3274	64.9	1771	35.1		
Female	88	8.7	923	91.3			879	86.9	132	13.1		
Age					6.90	0.03*					5.373	0.07
18–24 years	24	15.6	130	84.4			116	75.3	38	24.7		
25–59 years	571	10.0	5114	90.0			3879	68.2	1806	31.8		
60 years and above	16	7.4	201	92.6			158	72.8	59	27.2		
Vehicle type					4.36	0.36					2311.7	0.00*
SUV	123	9.0	1238	91.0			1166	85.7	196	14.3		
Car	353	10.6	2972	89.4			2700	81.2	625	18.8		
Taxi	105	10.5	898	89.5			52	5.2	951	94.8		
Van	20	8.4	218	91.6			141	59.2	97	40.8		
Pick-up	10	7.8	119	92.2			94	72.9	35	27.1		
Vehicle usage					0.15	0.99					2527.0	0.00*
Private	462	10.2	4082	89.8			3834	84.4	710	15.6		
Commercial	122	9.8	1121	90.2			121	9.7	1122	90.3		
Government	6	10.5	51	89.5			40	70.2	17	29.8		
Company	21	9.9	191	90.1			158	74.5	54	25.5		
Vehicle occupant					4.39	0.04*					222.4	0.00*
Single	260	11.1	2080	88.9			1867	79.8	473	20.2		

(continued)

Table 2 (continued)

Variable	Mobile phone use						Seat belt use					
	Yes	%	No	%	χ^2	*p*-value	Yes	%	No	%	χ^2	*p*-value
Multiple	351	9.4	3365	90.6			2286	61.5	1430	38.5		
Child passenger					25.866	0.00*					1.95	0.16
Yes	76	17.1	369	82.9			292	65.6	153	34.4		
No	535	9.5	5076	90.5			3861	68.8	1750	31.2		
Time of day					0.66	0.42					1.710	0.19
7–11 am	369	9.8	3380	90.2			2548	68.0	1201	32.0		
3–6 pm	242	10.5	2065	89.5			1605	69.6	702	30.4		
Phone use											0.414	0.52
Yes							426	69.7	185	30.3		
No							3727	68.4	1718	31.6		
Total	611	10.1	5445	89.9			4153	68.6	1903	31.4		

*Significant at $p < 0.05$

Generally, the result shows that 3727 drivers obeyed the law relating to non-use of mobile phone and use of seat belt while driving. This represents 68.4% of the drivers observed during the survey. Of the 611 drivers who used their phone while driving, 426 (69.7%) wore seat belt, while 185 (30.3%) did not wear seat belt. There was no significant relationship between seat belt and phone use.

3.3 Factors Associated with Mobile Phone and Seat Belt Use Among Drivers

Results of the multivariate logistic regression analyzes assessing the association between mobile phone and seat belt use by drivers and explanatory variables are presented in Table 3. Hosmer Lemeshow test indicated that goodness of fit of the model for mobile phone (Chi-square = 7.971, $df = 8$, $p = 0.436$) and seat belt non-compliance (Chi-square = 7.037, $df = 8$, $p = 0.533$) was good.

The odds of male drivers using mobile phones were significant and 34% higher relative to female drivers (Adjusted odds ratio-AOR = 1.338, 95% confidence interval-CI: 1.047–1.709). The variable, age of drivers, was significantly associated with mobile phone use ($p < 0.03$). Drivers aged 18–24 years had a significantly higher odd of using mobile phone compared to drivers aged 60 years and above (AOR = 2.332, 95% CI:1.189–4.577). Although vehicle type had no statistically significant association with mobile phone use, but the odds of mobile phone use among taxi drivers were two times the odds among pick-up drivers (AOR = 2.085, 95% CI: 0.900–4.828). Number of vehicle occupant was another variable that had significant odds ratio of driver's mobile phone use. Compared to drivers who had other occupants in the vehicle, those who were alone in the vehicle had significantly higher odds of using a mobile phone (AOR = 1.374, 95% CI: 1.143–1.653). Presence of children aged less than eight years in the vehicle was significantly associated with use of mobile phone by drivers. Drivers who had children in their vehicles were two times more likely to use a mobile phone (AOR = 2.266, 95% CI: 1.722–2.982).

As shown in Table 3, the odds of non-use of seat belt by male drivers were 61% higher than females ($p < 0.000$). Although the age group variable had no statistically significant association with seat belt non-compliance, the odds of non-use of seat belt among drivers aged 18–24 years (AOR = 1.072, 95% CI: 0.98–1.924) and 25–29 years (AOR = 1.078, 95%CI: 0.731–1.589) were higher than for those aged 60 years and above. For the variable vehicle type, the odds ratio for non-use of seat belt by taxi drivers was 7.7 times higher than pick-up drivers. Compared with drivers of company vehicles, drivers of commercial (AOR = 7.157, 95% CI: 4.612–11.109) vehicles had significantly higher odds of not wearing a seat belt, while private vehicle drivers had a lower odd (AOR = 0.609, 95%CI: 0.400–0.926). The variables vehicle occupant, presence of child passenger aged less than eight years and time of day had no statistically significant association with driver's non-use of seat belt. However, drivers, who were alone in the vehicle, had a child passenger and those observed in

Table 3 Results of multivariate logistic regression analysis of factors associated with mobile phone and seat belt non-compliance by drivers

	Mobile phone use			Seat belt non-compliance		
Variable	Adjusted odds ratio	*p*-value	95% CI	Adjusted odds ratio	*p*-value	95% CI
Gender						
Male	1.338	0.020*	1.047–1.709	1.615	0.000*	1.302–2.002
Female	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
Age						
18–24	2.332	0.014*	1.189–4.577	1.082	0.791	0.603–1.943
25–59	1.431	0.176	0.851–2.407	‘1.080	0.705	0.733–1.593
>60	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
Vehicle type						
SUV	1.318	0.469	0.624–2.784	0.766	0.292	0.466–1.258
Car	1.548	0.243	0.743–3.227	0.997	0.990	0.616–1.614
Taxi	2.085	0.086	0.900–4.828	7.746	0.000*	4.347–13.804
Van	1.148	0.737	0.513–2.570	0.990	0.969	0.593–1.654
Pick-up	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
Vehicle usage						
Private	0.804	0.483	0.438–1.477	0.608	0.020*	0.400–0.925
Commercial	0.614	0.164	0.308–1.221	7.134	0.000*	4.596–11.073
Government	1.103	0.845	0.413–2.944	1.150	0.681	0.590–2.244
Company	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
Vehicle occupant						
Single	1.374	0.001*	1.143–1.653	0.983	0.825	0.843–1.145
Multiple	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
Child passenger less than 8 years						
Yes	2.266	0.000*	1.722–2.982	0.965	0.811	0.722–1.291
No	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
Time of day						
7–11am	0.935	0.447	0.786–1.112	1.073	0.360	0.922–1.249
3–6 pm	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
Phone use						
No				1.111	0.401	0.869–1.420
Yes				Ref.	Ref.	Ref.

CI Confidence interval, *Significant at $p < 0.05$

the morning had lower odd of not wearing a seat belt compared with drivers who had other occupants and had no child passenger and those observed in the afternoon. Although use of seat belt is not significantly associated with phone use, drivers who did use their phone while driving are more likely not to use a seat belt.

4 Discussion

This observational study examined the use of seat belt and mobile phones while driving among drivers in Ibadan metropolis, Nigeria. The factors associated with seat belt non-compliance and mobile phone use by drivers have not been thoroughly studied in Nigeria despite the fact that the country had the highest (39,802) modeled number of road traffic deaths in Africa in 2016, and most of these deaths were due to human factors [1, 5].

In this study, of the 6056 vehicles observed, 68.6% of the drivers wore seat belt. This indicates improvement in seat belt use rates compared with the previous observational studies that reported a rate of 18.7% [32]. The increase in seat belt wearing rates among drivers could be attributed to improved enforcement by FRSC. However, prevalence of seat belt use was lower than the rate reported in South Africa −81% [35].

The results indicated a strong association between use of seat belt and gender. Male drivers were significantly more likely not to wear seat belt while driving compared to female drivers. This is consistent with findings by Shaaban and Abdelwarith [36], Mohammadi [37], Mahfoud et al. [38]. High rate of compliance to seat belt use by women could be related to their low risk-taking behavior. Young drivers accounted for the least of number of drivers observed (2.5%), but most of them (75.3%) used a seat belt compared with drivers aged 25–59 years (68.2%) and >60 years (72.8%). Similar high rate of seat belt use by young drivers was reported by Ojo and Agyemang in Ghana [39]. The use of seat belt by young drivers is particularly important due to their risky driving behavior [40]. There was no significant association between driver's age and seat belt non-compliance in this study. This is similar to the result of the bivariate analysis which showed that there was no significant difference in non-compliance to seat belt use by drivers in the different age groups. This is because both young and old aged drivers did not wear seat belts. Vehicle type and usage were significantly associated with seat belt use.

Non-compliance to seat belt use was highest among taxi drivers. The adjusted OR shows that taxi drivers had high odds of non-use of seat belt compared with drivers of other vehicle types. Similarly, commercial vehicle drivers were significantly more likely not to wear seat belt compared to company vehicle drivers. Further, drivers of private vehicles were significantly less likely not to wear a seat belt. This result corroborates findings by Ojo and Agyemang [39]. Non-use of seat belt by commercial vehicle drivers has been shown to be due to inconvenience associated with frequent stops and poor safety concerns [41]. Another possible reason is that the FRSC officials

enforce the use of seat belt among private vehicle drivers on urban roads while neglecting commercial drivers.

Of the 6056 drivers observed, 10.1% used mobile phone while driving. Phone usage rate is higher than the rate obtained in the previous studies in Ibadan −4.6% [31]. The high prevalence of mobile phone use by drivers could be due to their persistent daily use of phones and inefficient enforcement of the law prohibiting mobile phone use by drivers. It was found that the association between age, number of vehicle occupants, number of child passengers, and mobile phone use by drivers was significant in the bivariate analysis, while gender, vehicle type, vehicle usage, and time of day were not significant. Further, the result of logistic regression analysis indicated that gender was significantly associated with mobile phone use. Male drivers were significantly more likely to use mobile phone while driving compared to female drivers. This result is similar to findings obtained by Cooper et al. [42], Grøndahl and Sagberg [43] but contrary to results obtained by Shaaban and Abdelwarith [36]. The high prevalence of mobile phone use by male drivers is probably due to work-related reasons and frequent phone use in everyday life [44].

This observational survey revealed strong association between driver's age and mobile phone use. In addition, the prevalence of mobile phone use was high among lower age group categories. Drivers aged 18–24 years had significantly higher odds of using mobile phone while driving more than older drivers. This result corroborates the previous findings [36, 42]. Young persons are heavy users of mobile phones in day-to-day life and are likely to use it while driving. Young drivers spend more time talking, texting, downloading games, music, and sending e-mails via a mobile phone [45].

There was no significant association between vehicle type, vehicle usage, and mobile phone use. As shown in Table 2, the proportion of drivers observed using a mobile phone varied between 7.8% for pick-up to 10.6% for car and from 9.8% for commercial vehicles to 10.5% for government vehicles. This suggests that there is no significant difference in mobile phone use among the various types of vehicles observed. This result is similar to those obtained from the previous studies [42].

The number of occupants in the vehicle was significantly associated with the use of mobile phone by drivers. The adjusted odds ratio shows that drivers who were alone in the vehicle were more likely to use a mobile phone compared to those with passengers. Possibly, the presence of passengers in the vehicle discourage driver's use of phone. Drivers with a child aged less than eight in the vehicle had significantly higher odds of using a mobile phone compared with drivers without a child in the vehicle. The use of mobile phone by drivers with child passengers exposes such passengers to great risk when a crash occurs.

5 Conclusion

Using observational approach, this study examined the rate of seat belt and mobile phone use by vehicle drivers in Ibadan metropolitan area, Nigeria. In addition, the

association between these behaviors, vehicle, and driver's socio-demographic characteristics was analyzed using multivariate logistic regression. The results showed that out of 6056 vehicles observed, 10.1% of drivers were observed using a mobile phone while 31.4% did not wear seat belt. These rates are high considering the impact of mobile phone use on road crashes, injuries, drivers' behavior, and performance. Use of mobile phone was significantly associated with age, gender, number of vehicle occupants, and number of children younger than age eight. Seat belt use was significantly related to gender, vehicle type, and usage.

A major contribution of this study is that it has determined the rate and factors associated with seat belt non-compliance and mobile phone use by drivers based on on-road observation. Findings indicate that a high proportion of drivers is distracted through the use of mobile phone while driving and non-compliance to regulations relating to seat belt use is high. One limitation of the study is that the results represent seat belt and phone use at the times and places where observations were conducted. Hence, the results cannot be generalized to the whole country. However, it provides an insight into the use of mobile phone and seat belt by drivers in a developing country with high-road crashes, injuries, and fatalities.

Findings in this study have important policy implications. Given the high rate of mobile phone use and non-compliance to seat belt use, the road safety agencies need to strengthen enforcement of the law relating to seat belt and mobile phone use while driving through the adoption of automated approach. This will ensure that offenders are arrested and penalized adequately. In addition, strategies that will motivate behavior change are necessary. These include educational campaign in schools and commercial vehicles motor parks, advertisement on mass media, stricter enforcement, and installation of road side cameras. Policymakers should increase the fine drivers pay for violating the rules. Vehicle inspection officers should check the availability of seat belts in vehicles before they are registered.

References

1. Federal Road Safety Corps (2017) 2017 Annual report. Abuja, Nigeria
2. World Health Organisation. Mobile phone use: a growing problem of driver distraction. Geneva, Switzerland. http://www.who.int/violence_injury_prevention/publications/road_tra€c/en/index.html. Last assessed 12 May 2021
3. Carpenter CS, Stehr M (2008) The effects of mandatory seatbelt laws on seatbelt use, motor vehicle fatalities, and crash-related injuries among youths. J Health Econ 27(3):642–662
4. Abbas AK, Hefny AF, Abu-Zidan FM (2011) Seatbelts and road traffic collision injuries. World J Emergency Surgery 6:18
5. World Health Organization (2018) Global status report on road safety 2018. Geneva, Licence: CC BYNC-SA 3.0 IGO
6. Hoye A (2016) How would increasing seat belt use affect the number of killed or seriously injured light vehicle occupants? Accid Anal Prev 88:175–186
7. Febres JD, García-herrero S, Herrera S, Gutiérrez JM, Mariscal M (2020) A: Influence of seat-belt use on the severity of injury in traffic accidents. Eur Transp Res Rev 12:9
8. Lee JD (2005) Driving safety. Rev Hum Factors Ergon

9. Lee JD, Young KL, Regan MA (2008) Defining driver distraction. In Regan MA, Lee JD, Young K (eds) Driver distraction: theory, effect, and mitigation. CRC Press, Boca Raton, pp 31–40
10. Stutts JC, Reinfurt DW, Staplin L, Rodgman EA. The role of driver distraction in traffic crashes. www.aaafoundation.org Assessed last on 23 Mar 2021
11. Shi J, Xiao Y, Atchley P (2016) Analysis of factors affecting drivers' choice to engage with a mobile phone while driving in Beijing. Transp Res Part F 37:1–9
12. Redelmeier DA, Tibshirani RJ (1997) Association between cellular-telephone calls and motor vehicle collisions. New England J Med 336(7):453–458
13. Violanti JM (1999) Cellular phones and fatal traffic collisions. Accid Anal Prev 30(4):519–524
14. Violanti JM, Marshall JR (1996) Cellular phones and traffic accidents: an epidemiological approach. Accid Anal Prev 28(2):265–270
15. Drews FA, Yazdani H, Godfrey CN, Cooper JM, Strayer DL (2009) Text messaging during simulated driving. J Hum Factors Ergon Soc 51(5):762–770
16. Olson R, Hanowski R, Hickman J, Bocanegra J (2009) Driver distraction in commercial vehicle operations (Report No. FMCSA-RRR-09-042). Federal Motor Carrier Safety Administration, Washington, DC
17. Charlton SG (2009) Driving while conversing: cell phones that distract and passengers who react. Accid Anal Prev 41:160–173
18. Törnros J, Bolling A (2006) Mobile phone use-effects of conversation on mental workload and driving speed in rural and urban environments. Transp Res Part F 9:298–306
19. Spyropoulou I, Linardou M (2019) Modelling the effect of mobile phone use on driving behaviour considering different use modes. J Adv Transp 26:1–10
20. Alm H, Nilsson L (1994) Changes in driver behaviour as a function of hands-free mobile phones—A simulator study. Accid Anal Prev 26(4):441–451
21. Crisler MC, Brooks JO, Ogle JH, Guirl CD, Alluri P, Dixon KK (2008) Effect of wireless communication and entertainment devices on simulated driving performance. Transp Res Rec 2069:48–54
22. Hancock PA, Lesch M, Simmons L (2003) The distraction effects of phone use during a crucial driving maneuver. Accid Anal Prev 35:501–514
23. Nunes L, Recarte MA (2002) Cognitive demands of hands-free-phone conversation while driving. Transp Res Part F 5:133–144
24. Caird JK, Willness CR, Steel P, Scialfa C (2008) A meta-analysis of cell phone use on driver performance. Accid Anal Prev 40:1282–1293
25. Federal Road Safety Corps (2010) 2010 Annual report. Abuja, Nigeria
26. Peltzer K, Pengpid S (2016) Seatbelt use among university students from 26 low-, middle- and high-income. Afr Saf Promot J 14(1):26–41
27. Woldegebriel MK, Aregawi BG, Gebru HT (2019) Assessment of seat belt use and its associated factors among public transport drivers in North Gondar, Ethiopia: a cross-sectional study. BMC Research Notes, pp 1–6
28. Donkor I, Gyedu A, Edusei AK, Ebel BE, Donkor P (2018) Mobile phone use among commercial drivers in Ghana : an important threat to road safety. Ghana Med J 52(3):122–126
29. Akande TM, Ajao MS (2006) Awareness of hazards and use of GSM mobile phone among non-commercial drivers in Ilorin, Nigeria. Ann Afr Med 5(4):166–169
30. Olubiyi SK, Jibril UN, Hauwa UG, Balarabe F (2016) Relationship between use of mobile phone and road traffic accident amongst motorists in Zaria. Res J Health Sci 4(4):285–295
31. Olumami HO, Ojo TK (2014) Rate of mobile phone usage by automobile drivers in Ibadan Metropolis, Nigeria. Eur J Bus Manage 6(31)
32. Sangowawa AO, Alagh BT, Ekanem SEU, Ebong IP, Faseru B, Adekunle BJ, Uchendu OC (2010) An observational study of seatbelt uses among vehicle occupants in Nigeria. Inj Prev 16:85–89
33. Popoola SO, Oluwadiya KS1., Kortor JN, Denen-Akaa P, Onyemaechi NOC (2013) Compliance with seat belt use in Makurdi, Nigeria: an observational study. Ann Med Health Sci Res 3(3):427–432

34. Grimm P (2010) Social desirability bias in Wiley International Encyclopedia of Marketing
35. Olukoga A, Noah M (2005) The use of seat belt by motor vehicle occupants in South Africa. Traffic Inj Prev 6(4):398–400
36. Shaaban K, Abdelwarith K (2018) Understanding the association between cell phone use while driving and seat belt noncompliance in Qatar using logit models. J Transp Safety Secur. https://doi.org/10.1080/19439962.2018.1477895
37. Mohammadi G (2009) Mobile phone and seat belt usage and its impact on road accident fatalities and injuries in southeast Iran. Int J Crashworth 14(4):309–314
38. Mahfoud ZR, Cheema S, Alrouh H, Al-thani MH, Al-thani AAM, Mamtani R (2015) Seat belt and mobile phone use among vehicle drivers in the city of Doha, Qatar: an observational study. BMC Public Health 15(937):1–6
39. Ojo TK, Agyemang W (2018) Occupants' seatbelt use are related to vehicle type and usage on a Ghanaian university campus. Int J Inj Contr Saf Promot 26(2):1–6
40. Fergusson DM, Swain-Campbell NR, Horwood LJ (2003) Risky driving behaviour in young people: prevalence, personal characteristics and traffic accidents. Aust N Z J Public Health 27(3):337–342
41. Kim K, Yamashita EY (2007) Attitudes of commercial motor vehicle drivers towards safety belts. Accid Anal Prev 39(6):1097–1106. https://doi.org/10.1016/j.aap.2007.02.007
42. Cooper JF, Ragland DR, Ewald K, Wasserman L, Murphy CJ (2013) Observational study of use of cell phone and texting among drivers in california comparison of data from 2011 and 2012. Transp Res Rec 2365:66–72
43. Grøndahl AB, Sagberg F (2011) Driving and telephoning: Relative accident risk when using hand-held and hands-free mobile phones. Saf Sci 49:324–330
44. Brusque C, Alauzet A (2008) Analysis of the individual factors affecting mobile phone use while driving in France: socio-demographic characteristics, car and phone use in professional and private contexts. Accid Anal Prev 40:35–44
45. Dragutinovic N, Twisk D (2005) Use of mobile phones while driving – effects on road safety (Report No. R-2005–12). SWOV Institute for Road Safety Research, Leidschendam, The Netherlands