

Research Article

Prevalence and Risk Factors Associated with Road Traffic Crash among Bus Drivers in the Southern Region of Cameroon: A Cross Sectional Study

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Abstract

Background: Annually, road traffic crash account for more than 1.2 million deaths and up to 50 million injuries worldwide, making it a leading cause of death globally. Given the low rate of vehicle ownership in developing countries, most of the population depends on buses for public transport. In Cameroon, buses are frequently involved in road traffic crashes. The aim of this study was to determine the prevalence of road traffic crashes and risk factors associated with road traffic crash among bus drivers in the South West Region-Cameroon.

Methods: This was a cross-sectional study involving bus drivers with at least 3 years driving experience in passenger transportation. Multi-stage sampling was employed with random selection of six parks from three divisions in the South West Region of Cameroon. Proportionate sampling was done to select the bus drivers at the selected parks. Data was collected using a structured questionnaire. It was inputted and analyzed using EPI info version 3.5.4. Bivariate and multivariate analysis were used to identify risk factors associated road traffic crash history within 3 years prior to the survey with statistical significance set at $p < 0.05$.

Results: Out of the total 422 participants recruited, 98 bus drivers reported, giving an overall crash prevalence of 23.2%. Among the crashed group, 72 drivers (12.1%) were involved in more than one crash within the past 3 years (2014-2017). Multivariate analysis showed excessive speed [AOR 6.98 95% CI; 3.7-12.8], drinking alcohol during driving hours [AOR 10.15, 95% CI; 4.7-21.8], phone distraction (AOR=6.48, 95% CI; 3.8-10.8), passenger distraction [AOR 8.77, 95% CI; 4.6-16.2], violating road traffic rules [AOR=2.13, 95% CI; 1.2-3.5] and fatigue [AOR 0.17, 95 & CI; 0.05-.053] as factors that are significantly associated with road traffic crash among bus drivers within the past 3 years (2014-2017).

Conclusion: Almost a quarter (23.2%) of bus drivers have a history of road traffic crash within the past 3 years. Many factors have been found to be associated with road traffic crash occurrence among these drivers and these calls for urgent sensitization campaigns, amelioration of road conditions and proper law enforcement on road safety issues.

Keywords: Prevalence; Risk factors; Bus drivers; South west region; Cameroon

Introduction

Road traffic crash which is defined as a collision or incident that may or may not lead to injury, occurring on a public road and involving at least one moving vehicle has become a global development and public health crisis requiring great and diverse attention [1,2]. Each year, road traffic crashes account for more than 1.2 million deaths and up to 50 million injuries worldwide, making it a leading cause of death globally.

With a global the risk of dying at 17.4 per 100 000 population in 2015, the African region has the highest rate at 26.6 per 100 000 population and that of Cameroon is at 27.6 per 100,000 population. Increase in the number of vehicles on world's roads has been identified as one of the factors responsible for high rates of road traffic crashes [3].

However, even though vehicle ownership continues to rise, some regions in developing countries like the African region in particular, remains the least motorized of the six world regions, possessing only 2% of the world's vehicles but suffers the highest rates of road traffic fatalities and contributes to 16% of global deaths [4]. In Cameroon vehicle ownership is very low, estimated at 20 cars per 1000 persons but the country loses about 3,512 people for every 100,000 cars every year [5,6].

Due to low vehicle ownership, most developing countries depend on public transport, particularly, the road. The road remains the most dangerous of all means of transport especially in SSA. Most of the public transport is mostly through second-hand and accident-prone buses [7]. In Cameroon, bus accidents are very frequent and usually fatal [8].

Human factors have been found to account for more than 80% of road traffic crashes in developing countries than vehicle and environmental factors [9]. WHO global status report for road safety has stated that identifying the risk factors associated with road traffic crashes is very important in developing strategies for its reduction [1]. This is in addition to another report that recommended a major focus on research and interventions for road traffic crash in developing nations [10]. Cameroon has a road safety strategy to stabilize and to reduce road traffic crash deaths by 50% by 2020 [11] but limited work has been published work on risks for RTCs in the country. Thus, well-conducted, scientifically rigorous research on the burden of RTCs, risk factors and effectiveness of interventions are crucial elements that need to be prioritized in order to prevent and control RTCs [12]. Therefore, this study aims to determine the prevalence of RTCs among bus drivers in the SWR as well as the risks factors that are associated with the occurrence of the RTCs.

Methods

Study Setting and Design

The study was conducted in the South West region of Cameroon which is about 54.7km to Douala, the economic capital of Cameroon [13]. The South West region is connected to two other regions of the country through two axes where accidents mostly occur. The South West is linked to that the Littoral region where the economic capital is found through the Tiko- Douala road. Road traffic accidents are very prevalent on this road. Linking to North West Region, is the Buea-Muyuka stretch that also records very fatal accidents particularly along the Mile 29 slope found on this stretch [14]. Road traffic accidents are the second cause of death in Cameroon after malaria [15]. A cross-sectional study was conducted on bus drivers who were ran-

domly selected from six different parks and road traffic accident history with the past three years was obtained. Quantitative techniques were employed.

Study Population and Variables

Bus drivers involved in passenger transport in the South West region with at least 3 years of experience were included in the study. The dependent variable in this study was history of involvement in one or more RTC(s) within the past three years. The independent variables were several factors related to the driver, the environment or the vehicle.

Sample Size and Sampling Techniques

The sample size was determined using Lorentz formula, assumed prevalence of 50%, with 95% two-sided confidence interval, a total sample size of 422 was calculated with an added 10% non-response rate. Multistage sampling was employed with random selection of six parks from three divisions and proportionate sampling of bus drivers at the parks.

Data Collection Process and Data Quality Control

Data was collected using a structured questionnaire and pre-tested to check the consistency and understandability of the questions. Every day, after data collection, data were checked for completeness and coherence.

Data Processing and Analysis

The data were entered and analyzed with EPI Info version 3.5.4. Bivariate logistic regression analysis was carried out to distinguish the independent effect of each variable. Using multivariate logistic regression analysis, 95% CI and Adjusted Odds Ratios (AORs) were computed in order to identify any statistically significant associations between risk factors and RTC involvement. The level of statistical significance was set at $P < 0.05$.

Ethical Considerations

Ethical clearance was obtained from the Institutional Review Board, Faculty of Health Sciences, University of Buea. Administrative authorization was obtained from the Regional Delegation of Public health, Regional Delegation of transport, Divisional Delegations of transport, park managers and bus agency managers. Consent was obtained from all the participants who were also informed that participation was voluntary and were free to withdraw any time during the study.

Results

Socio-Demographic Characteristics

A total of 422 bus drivers participated in the study. The mean age of the drivers was 41.3 ± 8.6 years with respondents ranging from 18 to 60 years old. As seen in Table 1, most of the drivers were between the ages of 31-40 years ($n=171$, 40.5%), married/living with partner ($n=266$, 63.1%), Christians ($n=345$, 81.8%). primary level of education (367, 87.0%), and full time (331, 78.6%). A majority (401, 95%) had more than 3 years driving experience.

Prevalence of Road Traffic Crash among Bus Drivers

Proportion of bus drivers with history of RTC within the past 3 years: A total of 98 out of 422 of the selected bus drivers had a history of road traffic crash within the past 3 years, giving a proportion of 23.2% (95% CI 19 -27.6%)

Time and place where road traffic crash occurred: Most of the accidents (61.2%) occurred during the day and 38.8% occurred at night. A higher proportion (73.2%) occurred along the highway while the lowest (5.2%) occurred at a bus station (Table 2).

Causes of road traffic crashes among bus drivers with RTC history: Out of the 98 bus drivers who have had a crash within the past 3 years, a majority 66.3% attributed the cause of crash to human causes, 17.4% to environmental and 11.2% to vehicle causes while about 5.1% did not know what may have caused the crash. This is shown in Figure 2 below.

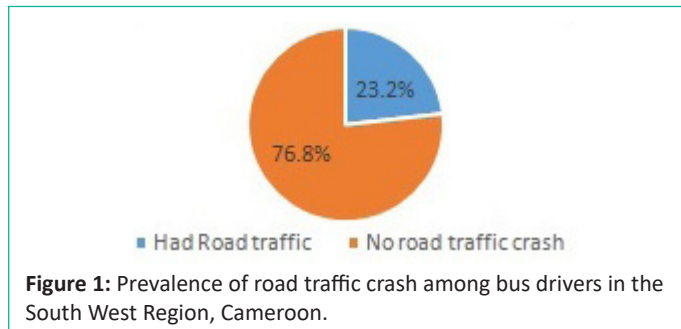


Figure 1: Prevalence of road traffic crash among bus drivers in the South West Region, Cameroon.

Table 1: Socio-demographic characteristics of bus drivers within the past 3 years in South West Region, Cameroon.

Characteristic	Frequency (No.)	Percent (%)
Age Group (Years)		
21-30	42	10.0
31-40	171	40.5
41-50	138	32.7
51-60	71	16.8
Mean \pm SD 41.3\pm8.6		
Marital Status		
Married/Living with partner	266	63.1
Single	150	35.5
Widowed	6	1.4
Religion		
Christians	345	81.8
Muslims	64	15.2
No Religion	13	3.0
Level of Education		
Primary	367	87.0
Secondary	53	12.6
Tertiary	1	0.2
No Education	1	0.2
Nature of job		
Full time bus drivers	331	78.6
Part time bus driver	90	21.4
Years of Experience with a bus		
At most 3 years	21	5.0
More than 3 years	401	95.0
Mean 11.8\pm6.57 SD		
Type of bus (n=420)		
Microbus (7-10 seats)	150	35.7
Minibus (11-25 seats)	228	54.3
Midibus (26-45 seats)	29	6.9
Coach (Above 45 seats)	13	3.1

Table 2: Time and place of road traffic crash occurrence among bus drivers within past 3 years in South West Region, Cameroon.

Variable	Response	No.	%
Time crash occurred	Day	60	61.2
	Night	38	38.8
Place Crash occurred	Along the highway	71	73.2
	In a town	21	21.6
	Bus station	5	5.2

Socio-demographic factors of road traffic crash: After conducting bivariate analysis of various socio-demographic variables with road traffic crash within the past 3 years, our results showed that there was an association between the age group 31-40 years and road traffic crash history within the past 3 years ($p=0.005$). Religion also showed association with history of road traffic crash within the past 3 years with Christian bus drivers being more likely to have a road traffic crash than the Muslim drivers or bus drivers with no religion ($p=0.021$). There was an association between being a full time driver and having a road traffic crash than being a part time bus driver; ($p=0.003$). Married bus drivers showed association with road traffic crash history within the past 3 years ($p=0.003$). However, level of education did not show any statistical significance with road traffic crash occurrence within the past 3 years.

Behavioral factors influencing road traffic crash: Bivariate analysis showed that bus drivers who were distracted during driving (phone and passenger) were more likely to have had a road traffic crash within the past 3 years; ($p=0.000$). Consuming bitter/red kolanut during or before driving ($p=0.005$), sleeping or feeling sleepy while driving ($p=0.000$), driving while tired ($p=0.000$), driving at night ($p=0.000$), driving at excessive speed ($p=0.000$) and violating road traffic rules ($p=0.006$) were all found to be significantly associated with road traffic crash history within the past 3 years as seen with their respective p -values stated above. There was no association between coffee consumption and having a road traffic crash within the past 3 years; ($p=0.110$). Also, law enforcement, showed no significant association between being punished by law and having road traffic crash within the past 3 years; ($p=0.054$) even though more than half (52.6%) of those who had violated road traffic law went unpunished.

Vehicle and Environmental factors: In terms of vehicle factors, type of bus was associated with road traffic crash in bivariate analysis. There was an association -between driving a microbus (7-10 seats) and having a road traffic crash within the past 3 years ($p=0.004$). In terms of breakdown, there was no significant statistical association between vehicle breakdown and road traffic crash but those who usually have breakdown while driving have a higher odd of having a road traffic crash than those who have never had a vehicle breakdown while driving ($p=0.43$; OR=1.25). Also, no environmental factor was significantly associated with road traffic crash occurrence within the past 3 years but the odds of road condition being responsible for a road traffic crash is higher than the weather ($p=0.210$, OR=2.99).

After bivariate analysis, all factors which were significantly associated with road traffic crash ($p=0.05$) within the past 3 years were run in a multivariate logistic regression while controlling for age, religion, educational level, nature of job, marital status, religion and years of experience as confounders. After adjusting for confounders, the multivariate analysis showed that drinking during working hours had the strongest association with the outcome ($p=0.000$; AOR=10.15), followed by passenger distraction ($p=0.000$; AOR=8.77), excessive speed ($p=0.000$; AOR=6.98), phone distraction ($p=0.000$; AOR=6.48), violated road traffic laws ($p=0.004$; AOR=2.13) and fatigue (p -value= 0.002; AOR=0.13). These findings are presented in Table 6 below.

Discussion

RTC has become a global public health and developmental

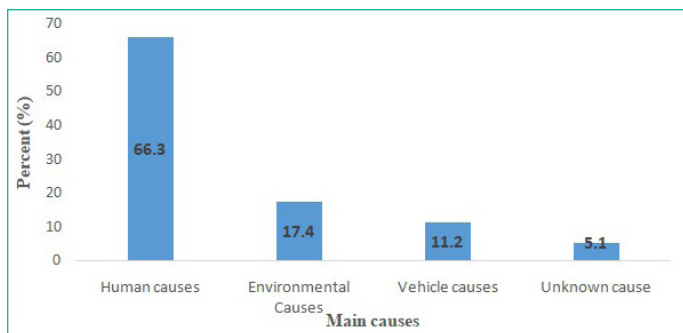


Figure 2: Factors related to RTC involvement in South West Region, Cameroon.

Table 3: Socio-demographic factors influencing road traffic crash among bus drivers within the past 3 years in South West Region, Cameroon.

Variable	History of road traffic crash within the past 3 years					
	Yes No. (%)	No No. (%)	Total (n)	95% CI	OR	P-Value
Age group (Years)						
21-30	16(16.3)	26(8)	42			
31-40	51(52)	120(37)	171	0.10-0.66	0.26	0.005
41-50	21(21.4)	117(36.1)	138			
51-60	10(10.2)	61(18.8)	71			
Marital Status						
Unmarried	48 (48.9)	218 (67)	266			
Married	50 (51.0)	106 (33)	156	0.31-.78	0.49	0.003
Religion						
Christians	66 (67.3)	265 (82)	345			
Non-Christians	32 (32.7)	58 (18)	77	1.1-4.6	1.13	0.021
Education level						
Primary or less	80(81.6)	288(88.9)	54			
More than primary	18(18.4)	36(11.1)	368	0.97-3.33	1.8	0.082
Nature of Job						
Full time bus driver	66(67.3)	265(82)	331			
Part time bus driver	32(32.7)	58(18)	90	0.27-0.75	0.45	0.003

crisis. This problem is evident in developing countries like Cameroon.

Analysis from the findings of this study showed that 98 (23.2%) out of 422 selected bus drivers in the South West Region have had at least one road traffic crash within the past 3 years. This figure is slightly higher than the findings of a study in Vietnam where 20% of bus drivers had had at least one road traffic crash within 3 years. Our study further revealed that 12.2% of the bus drivers have had more than one crash within the past 3 years. This is about 3 times higher than the findings in Vietnam where only 4% of the bus drivers had had more than one crash within the past 3 years [16].

A higher proportion of the crashes (73.2%) occurred along the highway and this is similar to the findings in Ghana where 72% of the bus accidents occurred in rural areas along the highway due to excessive speed [17].

Most (66.3%) of the causes of road traffic crash among bus drivers with crash history were attributed to human causes. This is in line with other findings which reported that about 64-95% of road traffic crashes in developing countries are due to human error [9].

Table 4: Behavioral factors influencing road traffic crash among bus drivers within the past 3 years in South West Region, Cameroon.

Variable	Had RTC 3 years			95% CI	OR	P-Value
	Yes No. (%)	No No. (%)	Total (n)			
Bitter cola /Red cola						
Yes	50(51)	112 (34.6)	162			
No	48 (49)	212 (65.4)	260	1.24-3.11	1.97	0.005
Coffee						
Yes	6 (6.1)	9 (2.8)	15			
No	92 (93.9)	315 (97.2)	407	0.79-6.5	2.32	0.110
Passenger distraction						
Yes	82 (83.7)	135 (41.9)	217			
No	16 (16.3)	187 (58.1)	203	3.97-12.6	7.09	0.000
Phone distraction						
Yes	64 (65.3)	76 (23.5)	140			
No	34 (34.7)	248 (66.5)	282	3.76-10.01	6.11	0.000
Sleeping/Sleepy while driving						
Yes	75 (76.5)	115 (35.5)	190			
No	23 (23.5)	209(64.5)	232	3.52-9.96	5.92	0.000
Driving hours per week						
Above 45 hours	75 (76.5)	110 (34.0)	185			
Below	23 (23.5)	214 (66.0)	237	3.76-10.6	6.34	0.000
Drive at Night						
Yes	84 (85.7)	145 (44.8)	229			
No	14 (14.3)	179 (55.2)	193	4.06-13.50	7.42	0.000
Excessive speed						
Yes	83 (84.7)	142 (43.8)	225			
No	15 (15.3)	182 (56.2)	197	3.90-12.8	7.09	0.000
Drink alcohol during working hours						
Yes	54 (70.1)	21(21.2)	101			
No	23(29.9)	78(78.8)	75	3.42-13.4	8.72	0.000
Violated road traffic law						
Yes	38 (39.2)	81(25.0)	119			
No	59 (60.8)	243 (75.0)	302	1.19-3.11	1.93	0.006
Punished by law						
No	20 (52.6)	58 (72.5)	78			
Yes	18 (47.4)	22 (27.5)	40	0.18-0.94	0.42	0.054

Table 5: Vehicle and Environmental Factors influencing road traffic crash among bus drivers within the past 3 years in South West Region, Cameroon.

Variable	Had RTC 3 years			95% CI	OR	P-Value
	Yes No. (%)	No No. (%)	Total (n)			
Vehicle breakdown during driving						
Never	25 (14.3)	46 (18.6)	71			
Usually	150 (85.7)	201 (81.4)	351	0.70-2.25	1.25	0.431
Bus type						
Not Microbus (Above 10 seats)	48 (49.0)	222(68.9)	270			
Microbus (7-10seats)	50 (51.0)	100(31.1)	150	1.45-3.66	2.31	0.004
Biggest environmental influence on driving ability						
Weather	2 (2.0)	19 (5.9)	21			
Poor road condition	96 (98.0)	305 (94.1)	400	0.68-13.01	2.99	0.210

Table 6: Multivariate Analysis of all factors associated with road traffic crash within the past 3 years in South West Region, Cameroon.

Variable	Had RTC within the past 3 years				
	N	%	AOR	95% CI	P-Value
Drinking alcohol during working hours	75	70.1	10.15	4.72-21.84	0.000
Consumes Bitter/Red cola during driving	162	51	0.41	0.34-2.12	0.632
Passenger distraction	217	83.7	8.77	4.67-16.27	0.000
Phone distraction	140	65.3	6.48	3.80-10.80	0.000
Sleeping/Sleepy while driving	192	76.5	1.46	0.44-4.77	0.531
Fatigue (Driving above 45 hours per week)	237	76.5	0.13	0.072-0.22	0.002
Drive at Night	229	85.7	1.86	0.56-5.80	0.285
Excessive speed	225	84.7	6.98	3.78-12.88	0.000
Violated road traffic law	303	60.8	2.13	1.26-3.55	0.004
Minibus	50	50.1	0.42	0.014-0.86	0.311

Bus drivers between 31-40 years were more likely to have a road traffic crash than drivers aged 51-60 years. This was related to the findings in USA [7], which stated that younger bus drivers (less than 46 years) are more prone to road traffic accidents and to other studies which found that drivers less than 40 years were more likely to have RTCs than older drivers [18]. Previous authors have reported common risky behaviors such as over speeding, non-adherence to safety measures and high intake of psychoactive substances such as alcohol among this group of drivers [19]. This could also be due to the fact that younger drivers are usually more aggressive in driving than older ones [7]. However, the finding was contrary to a study carried out in Nigeria, in which the prevalence of RTA was higher among older drivers (above 50 years) than among younger drivers below 50 years [20].

With respect to religion, Christian bus drivers were more likely to have RTC than Muslim bus drivers. This finding is similar to the study which revealed that Muslim bus drivers had lower rates of RTA than Christian drivers. This can be explained by the fact that Muslims less frequently engage in risky road safety behaviors like alcohol consumption [21].

This study has also shown that full time bus drivers are more likely to have a crash than part time drivers. This finding was contrary to that in Nigeria and to that in the United Kingdom, who mentioned that part time drivers are more likely to have road traffic accidents than full time drivers [22]. However, this difference can be attributed to the fact that most (82%) full time drivers in our study, stated that they drive above 45 hours and usually all through the week with no rest while most (18%) part time drivers drive only during weekends or when they are called and usually drive below 45 hours per week. According to other studies in USA, bus drivers who drive above 45 hours have a higher chance of having a road traffic crash than those who do not [23].

Excessive speed was found to be significantly associated with road traffic crash occurrence. This result stands in line with that of a study carried out in Ethiopia which found excessive speed to be associated with road traffic crash and it is also in line with that carried out by the WHO which stated that excessive speed was responsible one-third of all crashes as the higher the speed, the greater the stopping distance and the higher the risk of road traffic crash [1,9]. Most of the drivers engage in excessive speed for various reasons such as avoiding traffic, trying to catch up with time and make multiple trips or under pressure from employers who usually expect at least a to-and-fro journey per day, irrespective of the distance covered per trip.

In relation to distracted driving, there was significant association between phone use and engaging in passenger discussion while driving and having road traffic crash within the past 3 years. The study's result is related to some studies in United States of America and England and [24,25].

Bus drivers who drink alcohol during driving hours were seven times more likely to have a crash within the past 3 years. This finding is consistent with that of a study carried out in Nigeria and in Ethiopia which found drinking and driving at the same time to be highly associated with road traffic crash history [9,26]. This also falls in line with WHO report [9] which made it clear that drivers with any blood alcohol content greater than zero are at higher risk of a crash than those with zero blood alcohol content. This is because alcohol impairs the central nervous system functioning predisposing the driver to crash risk.

In terms of fatigue, bus drivers who drove above 45 hours a week were more likely to have a road traffic crash. This is comparative to other findings which stated that bus drivers who drive above 45 hours per week are at higher risk of road traffic crash as this will result to tiredness [23]. Most of these drivers are employees of public transport vehicles owners who, in pursuit of increased profits, frequently force drivers to work unduly long hours and to work when exhausted [1]. Fatigue is also common among bus drivers due to the frequent stops they make and their interaction with difficult passengers and this increases the chances of road traffic crash occurrence [22].

Also, those who drive at night had higher odds of having road traffic history than those who do not. This is similar to the study in Malaysia which revealed that bus accidents occur more during the midnight to early hour between 12am – 6.00am [27]. This result also concurs with that of Howard et al [28] in Australia who found out that sleepiness was associated with increased risk of a crash in commercial vehicle drivers. This is attributed to the fact that human related risk factors such as fatigue, risky driving and speeding are prevalent during the early hours (12 am to 6 am) of the day [15]. Moreover, there was an association between those who reported that they have felt sleepy or fallen

asleep while driving and having a road traffic crash within the specified period.

The study also revealed that violating road traffic laws was associated with road traffic crash occurrence among the drivers. This result is complementary to a study carried out in Ethiopia and in South East Iran which indicated that violation of road traffic laws to be associated with road traffic crash occurrence among drivers [9,29].

In terms of law enforcement, there was no significant association between punishment and road traffic crash within the past 3 years. However, more than half (52.6%) of those who had been caught violating road traffic law said they either negotiated with the police for their crime or went unpunished. This is similar to the findings in Zimbabwe [30] and that of Nigeria [26] which indicated that it is common to see police collecting bribes and drivers giving bribes to police for road traffic crimes committed. This poor law enforcement could be due to the fact some policemen do not know what to implement especially when it comes to drink-driving and this could be responsible for most of the road traffic crashes occurring on national roads [31].

It was observed that most (51%) of those who drive the minibuses which according to related studies are commonly called CI and in Cameroon were more likely to have crash than drivers of other bus types (49%) [32]. Our result is similar to that obtained in Kenya which stated that the Matatus (73%) are more likely to have road traffic crash than other bus types [33]. This could be due to the fact that the vehicle carrying capacity is small hence these vehicles carry less passengers but with usual overload to compensate for the small capacity and they usually engage in excessive speed in order to make numerous trips for profit making.

In terms of environmental factors, no environmental factor according to our study, was significantly associated with road traffic crash occurrence within the past 3 years. However, the odds of road condition being responsible for a road traffic crash was high. Most (95%) of the drivers complained of the narrow width of the road being a potential risk for road traffic crash for buses as they have to compete with heavy trucks on such small road space.

Conclusion

A crash prevalence of 23.2% was identified among the bus drivers. Several of the risk factors for road traffic crash that were identified in this study relate to direct and habitual violation of existing traffic laws, including speedy driving, drink-driving, and mobile phone use and discussing with passenger while driving, road traffic law violation and fatigue.

The results of this study show that bus drivers in the South West region of Cameroon usually place themselves at increased risk of road traffic crashes by violating traffic laws, speedy driving, mobile phone use, passenger distraction, alcohol drinking, and fatigue. This research can serve as baseline data to monitor progress or regress on the prevalence of road traffic crash among bus drivers in the country, develop new strategies to reduce risk factors and to support re-evaluation of the enforcement of road traffic laws.

Author Statements

Competing Interests

The authors declare that they have no competing interest.

Author's Contributions: Conception of the study design: O.M.A and A.N.N; Investigation and acquisition of data: O.M.A and A.N.N; Analysis, interpretation of data and manuscript writing: O.M.A and A.N.N; Review and edition of the final version of the article: all authors.

Limitation of this Study

Selection bias, recall bias, and survival bias. Bus drivers are highly mobile population, which can create inconsistency in the selection of study participants using stratified systematic random sampling. The study was based on self-report of the past three years and therefore may have been subject to recall bias. In addition, the study only included living drivers, which through survival bias can lead to under-estimation of the effect magnitude.

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