



International Journal of Injury Control and Safety Promotion

ISSN: 1745-7300 (Print) 1745-7319 (Online) Journal homepage: <https://www.tandfonline.com/loi/nics20>

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To cite this article: Thomas K. Ojo & William Agyemang (2019) Occupants' seatbelt use are related to vehicle type and usage on a Ghanaian university campus, International Journal of Injury Control and Safety Promotion, 26:2, 145-150, DOI: [10.1080/17457300.2018.1515230](https://doi.org/10.1080/17457300.2018.1515230)

To link to this article: <https://doi.org/10.1080/17457300.2018.1515230>



Published online: 13 Nov 2018.



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Occupants' seatbelt use are related to vehicle type and usage on a Ghanaian university campus

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ABSTRACT

Seat belt use does not only save lives but prevents the severity of injuries in road traffic crashes (RTCs). Vehicle type and usage have been found to influence the use of seat belt in cities like Kumasi, the host of Kwame Nkrumah University of Science and Technology (KNUST) campus. This paper presents a study on an un-obstructive survey of seat belt use by vehicle occupants entering and leaving KNUST campus through the four entrances from 7 to 9 am and 3 to 5 pm on five weekdays. A total of 5489 vehicles with 9542 occupants comprising 5489 drivers, front-right and first back seat and second back seat passengers were observed. The majority of the private and SUV drivers used seat belts. Meanwhile, almost all the commercial drivers did not use seat belts. There is a statistically significant relationship between vehicle type and use and the use of seat belt in KNUST.

ARTICLE HISTORY

Received 15 March 2017
Accepted 17 August 2018

KEYWORDS

Seat belt use; use of vehicle; type of vehicle; vehicle occupants; KNUST

Introduction

Road traffic crashes (RTCs) is the 11th killer disease in the world and it is expected to be the third killer by the year 2020 (Peden et al., 2004, 2008). It causes 13% of the disease from injuries and 1.2 million deaths yearly (Peden et al., 2004, 2008). Of which, 65–85% is mainly from developing countries (Afukaar et al., 2010; Crandon et al., 2004; Mamady et al., 2014).

The total annual costs of RTCs to developing countries are estimated to be about the US \$100 billion, which is two-fold in the amount of all the development assistance these countries receive from the donor states (Wahid Al-Kharusi, 2008). The economic consequences of road traffic injuries (RTIs) also include costs of prolonged medical care, loss of family breadwinner and loss of income due to disability, which together often push families into poverty (Khan et al., 2007).

In Ghana, more than 6 and 1600 road traffic deaths (RTDs) are recorded daily and annually, respectively (NRSC, 2015). Almost all the victims are vehicle occupants. The majority of these RTDs might have been averted if the vehicle occupants had worn seat belts (Ojo, 2018). The usefulness of seat belt does not only save lives but also prevents the severity of injuries in case of RTCs (Han et al., 2015). The use of seat belt with airbags can also reduce more than half of RTCs' effects (Cummings et al., 2002). Seat belt use can significantly reduce the proportions of traumatic brain injury and other head, face and neck injury (Han et al., 2015).

The rate of seat belt use in developed countries (such as the US, South Korea and England) is very high compared to those of developing countries (such as Ghana and Nigeria)

(Glassbrenner, 2002; Popoola et al., 2013). Studies have determined low seat belt use in Ghanaian and Nigerian cities and towns hosting university campuses (Afukaar et al., 2010; Sangowawa et al., 2013; Simons & Edunyah, 2014). Passenger seat belt use is significantly less prevalent than driver's seat belt use (Afukaar et al., 2010; Briggs, Lambert, Goldzweig, Levine, & Warren, 2008).

In Ghana, the Road Traffic Act (2004) and the Road Traffic Regulation 2180 stipulate the compulsory use of seat belt by all vehicle occupants. But seat belts are not fitted in public buses and trucks and its provisions in cars are not evenly distributed between front and rear seat passengers. Therefore, its enforcement by the officials of the Motor Transport and Traffic Department (MTTD) of the Ghana Police Service mainly target the drivers and sometimes front-right passengers. Drivers hurriedly wear the seat belt on approaching a police checkpoint. As such, there is a wild belief that seat belts are meant for drivers and front-right passengers (Popoola et al., 2013).

Seat belt use is significantly higher by vehicle occupants riding in cars of greater value (Colgan, Gospel, Petrie, Adams, Haywood, & White, 2004). Commercial drivers tend to use seat belt-less because of the associated challenges with their nature of work (Afukaar et al., 2010; Kim & Yamashita, 2007). For instance, commercial drivers make frequent stops as demanded by work to pick and drop passengers (Ogunleye-Adetona et al., 2018; Ojo, 2018). Afukaar et al. (2010) indicated that seat belt use in Kumasi is low across vehicle occupants. But driver's use of seat belt was significantly greater than front-right passengers. The study further indicated that private car drivers use seat belt the more compared to the taxi, minibus and large buses and

truck drivers. Kwame Nkrumah University of Science and Technology (KNUST) as an institution of higher learning may exhibit different results because of the high educational level and socio-economic status.

University campuses are like small towns and cities (Ojo, Agyemang, & Amoako-Sakyi, 2014). They share some characteristics with the host towns or cities like a traffic jam, poor quality of transport services, the incidence of RTCs and low seat belt use. However, it is expected that seat belt use will be higher than what obtains in the host cities and towns because of the high educational level and socio-economic status (Clayton & Helms, 2009; Kamal et al., 2015).

Clark (1993) submitted that seat belt by members of the university community was significantly lower than that of reported statewide. This was even greater for front-seat passengers than for drivers on campus. However, Clark, Schmitz, Conrad, Estes, Healy, and Hiltibidal (1999) revealed that use of seat belt in a small private university in San Diego, US was high (79%). Kamal, Masuri, Dahlan, and Isa (2015) indicated that more than 47% of educated young adults use the seat in an urban university in Turkey. Therefore, this present study seeks to determine how type and use of vehicle influence seat belt use by drivers and passengers on KNUST campus.

Therefore, this study seeks to answer the following questions:

1. What is the rate of seat belt use by vehicle occupants in KNUST?
2. Does the vehicle type influence the seat belt use by vehicle occupants? and
3. Is there a relationship between vehicle use and the seat belt use by vehicle occupants?

The current study will add to the literature on seat use belt on a university campus as against the preponderance nature of studies on seat belt use in towns and cities. The findings can help not only the university management but other relevant stakeholders such as the National Road Safety Commission (NRSC) and the MTTD of the Ghana Police Service to know the direction to toll in campaigning for the use of seat belt as a panacea to reduce the effects of RTCs on occupants in the university environment in particular and other towns and cities in general.

Materials and methods

Study design

The present study is an un-obstructive observational study of seat belt use in the KNUST, Ghana. This was carried at four out of five entrances into the university from 7 to 9 am and 3 to 5 pm during weekdays. KNUST as an institution of learning attracts and generate much traffic during these periods. The National Road Safety Commission (NRSC) approved the study as an addendum to an ongoing national survey on seat belt use in Ghana. Permissions were also sought from the University Security Section.

Study population

The study population included 5489 vehicles entering and leaving the university campus during the period of observation. The vehicles observed were taxis, minibuses, trucks, large buses, SUV and private cars. For all eligible vehicles, drivers, front-right and two rear passengers (if any) were observed to determine the rate of seat belt use.

Observational checklist and measurements

The observational checklist sought to elicit information on vehicle type and usage, gender and age group of drivers and gender and age group of the front-right seat and two back seat passengers. It also contained the use of seat belt. All data collections were carried out during the day and in fine weather at designated lane of traffic where vehicles were entering and leaving the university campus. The observational study was carried in five entrances KNUST-Main entrance, Bomso, Ahense, Tech Police Station and Ayebiase Gates.

Use of seat belt was determined by mere looking at the drivers or passengers seated in the vehicles. Due to the nature of the observational study, only two rear seat passengers seated very close to the window or doors were observed. However, it was not possible to observe back seat passengers in large buses and heavy trucks because the study was an un-obstructive one. No information on the names of the occupants and vehicle registration numbers for identification.

The driver's age group was categorized into three-<26, 26-50 and >50. This is in consonance with the statutory age of acquiring a license as a commercial driver or become eligible to be employed as a corporate/company driver in Ghana. The Road Traffic Act and Road Traffic Regulation (LI 2180) enjoins all vehicle occupants to use the seat belt with the exception of <18 years old passengers who have to be supervised by the driver or an adult passenger as the case may be. Initially, there was a discrepancy in the data collected on age groups of drivers and passengers. The research assistants had to agree on the data to be used.

Reliability and validity

A pilot study was conducted at traffic lights intersections in the University of Cape Coast to fine-tune the observational checklist. Sixteen research assistants were trained in a classroom environment. For inter-reliability, two research assistants focused on each of the lanes of traffic flow. However, only two research assistants manned the Bomso entrance because it is one lane. A total of 6250 observations were made out of which 761 were incomplete, thus usable. Eventually, 5489 observations were analyzed.

Data analysis

The data were reviewed and coded for the results of the observational survey in Microsoft Excel spreadsheet by the

research team. Data were stored in a secure and password-protected network requiring an invitation for access. The analysis was conducted using SPSS V21. Summary statistics (frequencies and percentages) were used to describe characteristics of the studied sample and the use of seat belt. Cross tabulations were conducted to determine the use of seat belt by driver and passengers and their socio-demographic characteristics such as gender and age. Chi-square was used to establish the relationship between the rate of seat belt use and vehicle type and usage. This hypothesis was divided into two based on vehicle use and type. Furthermore, the relationships between use of seat belts by each occupant (drivers, front-right seat, first rear and second rear passengers) according to vehicle type and usage were established.

Results

Overview

In all 8224 occupants comprising 5489 drivers, 1723 front, 567 first and 445-second rear seat passengers were successfully observed. The majority were males across all occupants. The majority of the drivers were between the ages of 26 and 50 and the majority of the passengers were within the age group of 18–50 irrespective of seating positions. Seat belt use in KNUST among vehicle occupants was 31.6%. Around 41.6% of the drivers used seat belts, with the incidence of the seat belt was very high among truck drivers (85%), private car drivers (47.9%) and SUV drivers (50.7%). A lower percentage of front-right (15.9%), first rear (4.9%) and second rear seat passengers (3.6%) used seat belts.

Gender of occupants and use of seat belts

As revealed in Table 1, more than half of the female drivers used the seat belt as against 38.4% from male drivers.

Similarly, almost a fifth (19.7%) of front-right passengers with 12.8% of males used seat belts. More female first (9.4%) and second (9.6%) rear passengers as against that of their male counterparts (2.4% and 1.5%), respectively, used the seat belt.

Age group of occupants and use of seat belts

On Table 1, almost two-third (60%) of the drivers aged <26 years of age used the seat belt with the least usage (40.3%) emanating from 26 to 50-years-old cohorts. On the other hand, almost a fifth (19.9%) of the front-right passengers aged >50 years used the seat belt with the least usage from <18-years-old cohorts. The first rear passengers aged 18–50 years old used seat belt than those within 18–50 years old.

Vehicle type and use of seat belts

The highest of seat belt use as shown in Table 1 applies to SUV drivers (50.7%) with the least from the taxi (14.7%) and large buses (14.7%). More than a fourth (25.9%) and a fifth (20.3%) of front-right passengers on board private cars and SUV used the seat belt. More than a tenth (10.6%, 13.1%) of first rear passengers on private cars and SUV used the seat belt as against 4.1% on board taxi. The majority of second rear seat passengers who used belt were on board SUV.

Vehicle use and use of seat belts

As shown in Table 1, more than half (55.6%) of drivers of government/institutional vehicle used the seat belt with the least usage from commercial drivers. The highest and lowest usage (22.2%, 2.3%) of the seat belt by front-right passengers applied to those on private and commercial vehicles,

Table 1. Observed seat belt use by drivers, front-right passengers and two other rear-seat passengers.

Observed variables		Drivers		Front-right passenger		First rear passenger		Second rear passenger	
		% of belt use	No. observed	% of belt use	No. observed	% of belt use	No. observed	% of belt use	No. observed
Gender	Male	38.4	4480	12.8	945	2.9	386	1.5	331
	Females	55.5	1009	19.7	778	9.4	181	9.6	114
Age-group of drivers	<26 years old	60	120	–	–	–	–	–	–
	26–50 years old	40.3	4962	–	–	–	–	–	–
	>50 years old	51.1	407	–	–	–	–	–	–
Age-group of passengers	<18 years old	–	–	12.2	148	6.7	45	0	19
	18–50 years old	–	–	15.9	1439	4.8	517	3.8	420
	>50 years old	–	–	19.9	136	0	5	0	6
Vehicle type	Private cars	47.9	2973	20.3	767	10.6	142	8	87
	SUV	50.7	1249	25.9	359	13.1	76	16.3	49
	Taxi	14.7	618	4.7	212	4.1	72	1.9	52
	Minibus	17.7	541	2.9	343	0	266	0	251
	Large bus	14.7	34	0	13	0	7	0	0
	Heavy truck	8.5	74	1.7	29	0	4	0	2
Vehicle usage	Private	48	4138	22.2	1113	11.4	220	11.3	141
	Commercial	13.6	1008	2.3	504	0.6	326	0	290
	Company	43.1	262	16.3	80	6.3	16	0	11
	Government/institutional	55.6	81	8.3	26	0	5	0	5

Table 2. Relationship between occupants' seat belt use and vehicle type.

Variables	Value	Df	<i>p</i> -value
Drivers' seat belt use and vehicle type	411.843	5	.000
Front-right passenger's seat belt use and vehicle type	103.498	5	.000
First rear seat passenger's seat belt use and vehicle type	34.990	5	.000
Second rear seat passenger's seat belt use and vehicle type	38.127	5	.000

p*-value < .05.Table 3.** Relationship between occupants' seat belt use and vehicle use.

Variables	Value	Df	<i>p</i> -value
Drivers' seat belt use and vehicle use	402.476	3	.000
Front-right passenger's seat belt use and vehicle use	103.145	3	.000
First rear seat passenger's seat belt use and vehicle use	32.655	3	.000
Second rear seat passenger's seat belt use and vehicle use	36.012	3	.000

**p*-value < .05.

respectively. Among rear seat passengers, the use of seat belt was highest by those on private vehicles as against that of commercial vehicles.

Occupants' use of seat belt versus vehicle type and usage

The hypothesis posed for this study was divided into two based on the number of occupants' considered-drivers, front-right seat passenger and two rear seat passengers. As shown in Table 2, there is a relationship between vehicle occupants' use of seat belt and vehicle type at $p < .05$. Furthermore, Table 3 reveals that there is a relationship between occupants' use of seat belt and vehicle use at $p < .05$.

Discussion

Seat belt use in the developed country (like the US and England) can be as high as 80% as against 10–40% in developing countries (like Ghana, Nigeria) (Afukaar et al., 2010; Han et al., 2015; Sangowawa et al., 2013). Besides the low use of seat belt by vehicle occupants, drivers use seat belt more than front-right and back seat passengers in that order.

This scenario is not that different from what obtains on university campuses in both the developed and developing countries (Colgan et al., 2004; Sangowawa et al., 2005). University campuses are expected to have a higher rate of seat belt use than cities and towns because of higher educational levels and socio-economic status. As evident in the current study, the use of seat belt by drivers and passengers is low. Drivers use seat belt more than front-right and rear seat passengers in that order. The use of seat belt by rear seat passengers is very low.

The differences in seat belt by drivers, front-right and rear seat passengers are accounted for by unavailability of seat belts in certain vehicles (like buses and trucks) and the unevenness of seat belts distributions in cars. There is also a misrepresentation of the Seat Belt Regulation (as enshrined

in the Road Traffic Act, 2004) that only drivers and front-right seat passengers are to wear seat belts in Ghana.

Rear seat safety has been topical in recent years because of the higher risks of deaths and severe injuries as a result of RTCs by rear seat passengers (Bose, Arregui-Dalmases, Sanchez-Molina, Velazquez-Amejjide, & Crandall, 2013; Durbin et al., 2015; Shimamura et al., 2005). To Shimamura, Yamazaki, and Fugita (2005), unrestrained rear seat passengers may sustain unexpected injuries to themselves during RTCs and also endanger other vehicle occupants. Among rear-seat passengers, females and extremely young or old age are at a higher risk of death as a result of RTCs (Bose, Crandall, Forman, Longhitano, & Arregui-Dalmases, 2016; Lardelli-Claret, et al., 2006). Aged passengers in the rear-seats are also significantly more vulnerable to serious injuries and fatalities because of their physiological conditions (Bose et al., 2016). Therefore, low use of seat belt by rear passengers indicates that they are more exposed to the risks of RTCs.

The socio-demographic characteristics (such as gender, age, vehicle type and use) of vehicle occupants have a strong relationship with the use of seat belt (Afukaar et al., 2010; Han et al., 2015; Popoola et al., 2013). Generally, there are more observed male drivers and passengers in road safety studies in Ghana (Ojo et al., 2014; Sam, 2015). In the study, more than two-thirds of the drivers and passengers (front-right, first rear and second rear seat passengers) were male. This predisposes the danger the male population is exposed to in case of RTCs (Sangowawa et al., 2005).

In spite of the majority of the observed drivers and passengers being male, use of seat belt is low compared to their female cohorts in the present study. This underlines the fact that female drivers and passengers have a higher risk perception (Crandon et al., 2004; Williams, McCartt, & Geary, 2003). Younger vehicle occupants (including drivers and passengers) use seat belts the more in Ghana and Nigeria (Afukaar et al., 2010; Popoola et al., 2013). Meanwhile, in the US, older drivers use seat belt the more (Han et al., 2015).

Colgan, Gospel, Petrie, Adams, Haywood, and White (2004), Sangowawa et al. (2013) and Popoola et al. (2013) revealed that seat belt use was highest among private cars occupants which are similar to what was revealed in the current study. Occupants of commercial vehicles such as taxis and minibusses use seat belt less in both developed and developing countries (Afukaar et al., 2010; Popoola et al., 2013). In developing countries, commercial drivers make frequent stops and many of them feel inconvenient using the seat belt. In the current study, there is a relationship between occupants' use of seat belts and vehicle type and usage. The findings are supported by a similar study conducted in Cape Coast and Kumasi (Afukaar et al., 2010; Ojo, 2018). The same observations were made on the University of Cape Coast Campus, Ghana (Ogunleye-Adetona et al., 2018).

Conclusion and recommendations

This study has satisfied its objectives. Generally, there is low use of seat belt in the study area irrespective of seating

positions by the vehicle occupants. Drivers used seat belts the most followed by front-right and rear seat passengers in that order. Secondly, females used seat belt more than their male cohorts. Younger vehicle occupants have been found to use seat belt the more. There is a relationship between occupants' seat belt usage and vehicle type and usage. The final conclusion is that vehicle occupant of private cars and SUV used seat belt the most with least use from commercial drivers.

The law enforcement agents such NRSC and MTTD of the Ghana Police must intensify the road safety campaign targeted at improving on seat belt use in the University environment in particular and the general society at large. The University Management should enshrine Seat Belt Policy in the University Transport Policy. All occupants in institutional vehicles are to be advised to wear seat belts. This should be in tandem with the Seat Belt Policy in the Road Traffic Act, 2004. The security section at the entrances is to help enforce the use of seat belt on campus by making sure that all vehicle occupants properly wear seat belts.

Limitations to the study and further research

In interpreting the findings of the present investigations, a number of limitations must be taken into consideration. First, this study elicited seat belt usage in one university environment and as such the findings may not be applicable to other Ghanaian universities. A similar research adopting the methodology used in this study can help make a general assessment of seat belts use in Ghanaian universities.

Secondly, the exercise was undertaken within five working days and as such there might be different observations on weekends. Furthermore, the current study was carried out during the peak hours (7–9 am and 3–5 pm).

Thirdly, eliciting the views of occupants on the reasons for usage and non-usage might have to be more insightful. Further studies can address this shortfall. Furthermore, there is a possibility of a vehicle being observed more than once during the period of the study. As such, there was no information taken to forestall incidence of double counting during the survey.

In spite of the foregoing limitations, the current research has revealed the relationship between vehicle occupants' seat belt use and vehicle type and usage in an academic environment as against that of Afukaar et al. (2010) and Ojo (2018). It has also provided further insights into seat belt use by vehicle occupants in a university environment (Ogunleye-Adetona et al., 2018).

Disclosure statement

No potential conflict of interests was reported by the authors.

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