Original Article

Compliance with Seat Belt Use in Makurdi, Nigeria: An Observational Study

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Abstract

Background: Seat belts are designed to reduce injuries due to road crash among vehicle occupants. **Aims:** This study aims to determine the availability of seat belt in vehicles and compliance with seat belt use among vehicle occupants. **Materials and methods:** This was a 24-h direct observational study of seat belt usage among vehicle occupants in Makurdi, Benue State, Nigeria. By direct surveillance and using a datasheet, we observed 500 vehicles and their occupants for seat belt availability and compliance with its use. Chi-square test was used for test of significance between variables. **Results:** Twenty-five (5.0%) of the observed 500 vehicles had no seat belt at all. Overall, compliance was 277/486 (57.0%). Use of seat belt was highest in the afternoon with 124/194 (64.4%), followed by 111/188 (59.0%) in the morning and 42/95 (44.2%) at night. Compliance was highest among car occupants [209/308 (67.9%)] and private vehicles, and lowest among commercial vehicle occupants. Compliance among female drivers was 77.1% compared with 51.4% among male drivers. Among drivers, the mean age of seat belt users was 38.4 (7.7) years, which was significantly younger than the 41.3 (8.7) years mean age of non-users. Similar figures were obtained among other vehicle occupants. **Conclusions:** Compared with previous studies, seat belt usage has improved among Nigerian road users, but there is still room for improvement, especially early in the mornings and at nights. Since these were times when law enforcement agencies were not likely to be on the roads, we advocate for improved coverage by enforcement agents to enforce better compliance.

Keywords: Driver, Epidemiology, Nigeria, Observational survey, Passenger, Seat belt use

Introduction

According to the World Health Organization (WHO), Road Traffic Crash (RTC) causes an estimated death of 3000 people each day globally. This has become so worrisome that in 2008, the United Nations General Assembly passed a resolution to improve road safety globally.[1] One of the causes of deaths and injuries in an automobile crash is the occupant being thrown by inertia during a collision.[2] By using seat belts, these deaths and injuries can be reduced drastically because seat belts retain occupants in their seats and prevent them from hitting objects in the vehicle, and from being ejected from the vehicles.[2] It has been estimated that using seat belts can reduce the risk of fatalities in a RTC by 40-50% among front seat occupants and by 25-75% among rear seat car occupants.[3,4] This effectiveness of seat belts in reducing the severity of injury in vehicle occupants involved in collisions has been proven all over the world.[2,5-9]

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Compliance with seat belt usage in the highly motorized countries of Western Europe and North America falls between 79% and 95% among both front and rear occupants.[3] However, studies from the West African sub-region had shown compliance with seat belt usage to be generally low. In Ghana, an observational study by Afakaar, *et al.* in 2010 found a seat belt compliance percentage of 17.6%.[10] Studies from the South-western part of Nigeria showed a compliance percentage of between 18.7% and 44.5%.[11-13] In Ibadan, an observational study conducted at petrol stations in which 5757 occupants in 2870 vehicles were observed showed an overall percentage compliance of 18.7%.[11] In Benin, a roadside observational study of 367 vehicles found a compliance

percentage of 52.3% in drivers, 18.4% in front seat passengers and 6.1% in rear seat passengers.[12] In Abeokuta, road side observation of 462 vehicles at five selected entry points to the city showed a percentage compliance of 20% and 80% in commercial vehicle drivers and private vehicle drivers, respectively.[13] One limitation of the previous studies was that the observations were conducted on moving vehicles, which may have made it difficult to get accurate observation in some cases. Another limitation was that all the studies took place in urban centers. Finally, all the studies were from Southwest Nigeria. It is apparent that more studies are needed from Nigeria to adequately characterize seat belt usage in Nigeria.

In Nigeria, the Federal Road Safety Corps (FRSC) was established in 1988, and saddled with the responsibility of policy making on safety on Nigerian roads.[14] In 2003, the seat belt law was introduced, which makes it an offence for front seat occupants of vehicles not to wear seat belts.[11] The seat belt law is exclusively enforced in Nigeria by the FRSC. In order to enforce traffic laws, FRSC officers would "go on patrols" by mounting temporary check points on the road to identify and stop offending vehicles. But, the enforcement is weak because there is insufficient manpower and vehicles to give effective coverage. In addition, the law is silent on the provision of seat belt in vehicles.

Studies have shown that many factors affect the prevalence of seat belt use among vehicle occupants.[15] These include sociocultural factors, law enforcement and availability of seat belts in vehicles.[16] Accordingly, the prevalence of seat belt use might be different in different areas of a country. This is especially true of a country like Nigeria with its diverse ethnic and religious groups. Nigeria has one of the highest traffic fatality rates in the world. Between 2000 and 2005, 47,092 deaths were recorded in 98,494 crashes in Nigeria.[17] To the best of our knowledge, no study on seat belt usage had been published from the middle belt of Nigeria. This study aims to fill the gap in the literature by evaluating the compliance with seat belt usage among vehicle occupants in Makurdi, Benue State of Nigeria.

Materials and Methods

The study location was Makurdi, the capital city of Benue State in the middle belt region of Nigeria. The estimated population of Makurdi according to the 2007 census was 500,797. The main occupation is farming, and the main modes of transportation are by taxis, commercial minibuses, privately owned vehicles, motorcycles and walking. The roads in Makurdi are classified into urban (within the city), intercity (linking adjacent towns) and rural (linking villages and farm settlements).

Survey procedure

This was a single-day, 24-h study, done on Monday, 23rd March 2011, in three shifts: Morning (6.00 am to 11.59 am), afternoon (12.00 noon to 6.59 pm) and night (7.00 pm to 5.59 am). The information was captured on datasheets specifically designed for the study. Each datasheet was designed to capture the date and time of observation, plate number, type and usage of vehicle, number of occupants in the vehicle (this was used to assess for overloading), year of manufacture of the vehicle and availability of seat belts for each seat of the vehicle. Other variables captured were usage of seat belt by the driver and other vehicle occupants. Each driver's seat belt was assessed for slackness and retractility by pulling on it.

Prior to the main research, a pilot study was done on 60 vehicles to familiarize the researchers with the procedure and to determine both the sample size as well as the number of vehicles to be observed per shift. The 60 vehicles were observed over 173 min. Based on this, we arrived at a sample size of 500 vehicles over a 24-h period. We observed that traffic densities (measured in vehicle/hour), which were comparable in the morning and afternoon shifts, dropped by almost 50% during the night shift. On account of this, 200 vehicles and their occupants were observed each in the morning and in the afternoon shifts, while 100 vehicles were observed during the night shifts. In addition, we also observed that commercial bus drivers, who usually had 14-22 passengers in their vehicles, were becoming impatient after observing five to six occupants of their vehicles; for this reason, we limited our observation to a maximum of five occupants in the rear compartments starting from the occupant behind the driver's seat.

Three centers, one each on urban, intercity and rural roads, were chosen for the observation. From the pilot study, we had found that drivers were unwilling to stop for the researchers. Therefore, the procedure was conducted at police checkpoints along the designated roads to enhance consent from drivers and other occupants. Table 1 shows the characteristics of the three study sites. Ambulances, vehicles with absent year of manufacturing of seat belt and tractors were excluded from the study.

The data was analyzed using SPSS version 18. Apart from frequency analysis, which was used for univariate variables, Chi-square test was used for test of significance between variables. The level of significance (P) was 0.05.

Ethical consideration

There might be an element of coercion inherent in conducting the research at a police check point. To reduce

Table 1: Distribution of vehicles across the study sites and shifts

Site	Morning shift	Afternoon shift	Night shift	Total
Urban road	100	100	50	250
Intercity road	80	80	40	200
Rural road	20	20	10	50
Total	200	200	100	500

this risk, policemen were not actively involved in the procedure, and consent was sought from the drivers before the observations were taken. Still, some of the drivers might not have been convinced that their participation was voluntary. This is an acceptable risk in conducting an observational study of sensitive road behaviors in developing countries, because drivers were not always willing to be have "their travel disrupted solely for research purposes."[18] Vehicle occupants not wearing seat belts were not penalized, but were given on-the-spot counselling on the benefits of wearing seat belts.

Ethical approval for the study was obtained from the Ethics Review Board of the Benue State University Teaching Hospital, Makurdi.

Results

Over a 24-h period from 6.00 am on 23rd March 2011 to 5.59 am on 24th March 2011, we entered data on 500 randomly selected vehicles comprising 308 (61.6%) cars, 86 (17.2%) buses, 57 (11.4%) trucks, 14 (2.8%) lorries and 35 (7.0%) unclassified types, referred to as "others."

Availability of seat belts

Twenty-five (5%) of the observed vehicles were not fitted with seat belts; 16/25 (64%) of these were trucks [Table 2]. Two hundred and eighty-two (54.6%) vehicles had seat belts fitted to all seats, 79/500 (15.8%) had seat belts fitted to the driver seat only, 77/500 (15.4%) had seat belts on both driver and outer front passenger seats only while 37/500 (7.4%) had seat belts fitted on all front but not all back seats. Only trucks, buses and lorries had middle front seats, and none of the middle seats were fitted with seat belts.

Wearing of seat belts

Only occupants of vehicles fitted with seat belts were included in the analysis of seat belt usage. There were 1754 such occupants comprising 1033 front seat and 721 rear seat persons. Four hundred and seventy-nine of the occupants (27.3%) wore seat belts while 1275/1754 (72.7%) did not. Table 3 shows some of the characteristics of seat belt users and non-users. Among front compartment occupants, drivers were significantly more likely to wear seat belts ($P = 0.01$). Just 3.1% (22/699) of the rear compartment passengers wore seat belts; this low compliance with seat belt use may have been caused by the fact that commercial buses usually take four passengers on each rear compartment row of seats, making it inconvenient for the passengers to wear seat belts. It appears as if males were significantly more likely to be wearing seat belts than females ($P = 0.01$), but this result may have been confounded by the fact that majority of the females were seated in the back compartment. When only front compartment alone was considered, then 54.6% of females versus 41.7% of males wore seat belts ($P = 0.01$). Users of seat belts were also significantly younger than non-users when all occupants of vehicles were considered together or when grouped according to seats and compartments. While 434 drivers claimed to have driving license, only 315 who could produce it on the spot were adjudged to be licensed. Vehicles driven by licensed drivers were significantly more likely to have at least one person wearing seat belts than those driven by drivers without licenses ($P < 0.01$).

Vehicular and time characteristics among seat belt users and non-users

As shown in table 4, the highest compliance with seat belt use was seen in the afternoon and evening shifts, while the lowest compliance was observed at night. The lowest compliance was observed for occupants of trucks, lorries and buses, less than one in three of which had belted occupants. On the other hand, more than two-thirds of cars had at least one belted occupant. Occupants of private vehicles were about three times more likely to wear seatbelts than

Table 3: Comparison of occupant characteristics between seat belt users and non-users

Occupant characteristic	User (%)	Non-user (%)	Total
Sex (*P*=0.001)			
Male	355 (29.5)	782 (70.5)	1137
Female	144 (22.6)	493 (77.4)	637
Age (mean (SD))			
All occupants (*P*<0.01)	34.0 (3.1)	37.8 (2.3)	1290
Driver (*P*<0.001)	38.4 (7.7)	41.3(8.7)	494
Front outer seat (*P*<0.001)	33.7 (9.5)	36.6 (10.8)	390
Rear seat (*P*<0.001)	31.1 (12.9)	36.7 (13.8)	406
Compartment (*P*<001)			
Front	457 (40.3)	676 (59.7)	1133
Rear	22 (3.1)	699 (96.9)	721
Front seat (*P*<0.01)			
Driver	275 (55.6)	219 (44.4)	494
Outer passenger	182 (46.6)	208 (53.4)	390
Driver license (*P*<001)			
Yes	206 (65.4)	109 (34.6)	315
No	53 (41.1)	76 (58.9)	129

Table 2: Availability of seat belts in the vehicles

Seat belt available	Car (%)	Bus (%)	Truck (%)	Lorry (%)	Others (%)	Total (%)
Yes	303 (98.4)	84 (97.7)	41 (71.9)	13 (92.9)	34 (97.1)	475 (95.0)
No	5 (1.6)	2 (2.3)	16 (28.1)	1 (7.1)	1 (2.9)	25 (5.0)
Total	308	86	57	14	35	500

P<001

Table 4: Comparison of vehicular and time characteristics between seat belt users and non-users

Characteristic	User (%)	Non-user (%)	Total
Period of the day (*P*<0.001)			
Morning	111 (59.0)	77 (41.0)	188
Afternoon/evening	124 (64.6)	68 (35.4)	192
Night	42 (44.2)	53 (55.8)	95
Type of vehicle (*P*<001)			
Car	209 (69.0)	94 (31.0)	303
Bus	26 (31.0)	58 (69.0)	84
Truck	10 (24.4)	31 (75.3)	41
Lorry	4 (30.8)	9 (69.2)	13
Others	28 (82.4)	6 (17.6)	34
Vehicle usage (*P*<001)			
Private	215 (75.7)	68 (24.0)	283
Commercial	36 (24.2)	113 (75.8)	149
Company/business	11 (47.8)	12 (52.2)	23
Government	15 (75.0)	5 (25.0)	20
Front compartment overloaded (*P*<0.001)			
Yes	23 (31.5)	50 (68.5)	73
No	254 (63.2)	148 (36.8)	402
Year of manufacture (*P*<0.001)			
Before 1980	0 (0.0)	4 (100.0)	4
1980-1989	56 (47.5)	62 (52.6)	118
1990-1999	114 (57.2)	86 (43.0)	200
After 1999	107 (69.9)	46 (30.1)	153

occupants of commercial vehicles. Seventy-eight (15.6%) vehicles were overloaded with occupants, 44 in the front compartment, 22 in the rear compartment and 12 in both compartments. Only the 56 vehicles that had either the front compartment alone or both front and rear compartments overloaded with passengers were included in the analysis in the "front compartment overloaded" section of Table 4. Occupants of overloaded vehicles were less than three times less likely to use seat belts than occupants of non-overloaded vehicles. Also, the older the year of manufacture of the vehicle, the less likely were the occupants to be compliant with seat belt use.

Discussion

Previous studies on seat belt compliance from Nigeria showed a low compliance percentage when compared with studies from other parts of the world.[11-13] The 27.3% compliance percentage recorded in this study is in agreement with these previous reports. This is a cause for worry because wearing seat belts has been found to reduce the risk of fatalities in road traffic accidents by 40-50% among front seat occupants and by 25-75% among rear seat car passengers.[3,4,19,20] Similarly, there is a striking difference in seat belt usage between different categories of vehicle occupants, and between occupants of front and rear compartments. Front compartment occupants were more than 12 times more likely to be wearing seat belts than rear seat compartments. The obvious reason for the low compliance with seat belt use among rear compartment occupants is that seats in the rear compartments of certain vehicles (buses and trucks) were almost never fitted with seat belts. This cannot be the only reason, though, because even in cars, where seat belts were more uniformly distributed among the two compartments, compliance percentage was significantly higher among front compartment occupants. The other reason is likely due to the widely held belief that the current seat belt law in Nigeria is enforced only among drivers and front seat passengers.[11]

We observed the lowest compliance with seat belt use among occupants of commercial vehicles. This is in keeping with findings from studies in both LMIC and HIC countries.[1,10-12,21] Many of the drivers in those studies cited discomfort and inconvenience as their reasons for non-compliance with seat belt usage.[12,21,22] In many LMIC countries, commercial vehicles make frequent stops, and drivers had to alight at many of these stops to attend to passengers' needs, which makes it rather inconvenient for the drivers to use seat belts. Kim *et al*. in Hawaii and Irhibogbe in Nigeria also found that commercial drivers who made frequent stops were less likely to wears seat belts.[12,21] In Hawaii, it has been reported that commercial drivers who also drive their own personal cars were less likely to wear seat belts when driving commercial vehicles than when driving their private cars.[21] One of the reasons given for this behavior was that they felt safer in the bigger vehicles.

The finding that drivers were more likely to use seat belts in the afternoons than at any other time of the day also hints at the subtle positive effect of enforcement on road safety behaviors. In Markudi, FRSC officers usually come out in the afternoons for surveillance, and it may be that road users, being familiar with this routine, would take precaution by wearing their seat belts.

The average age of compliant seat belt users was 34 years, compared with 38 years for non-compliant occupants. This is in keeping with a previous finding on seat belt usage in a south-west Nigerian city, where older drivers between 45 and 75 years were more likely to believe that there was no seat belt regulation and therefore less likely to use seat belts.[22]

Occupants of older vehicles were also less likely to wear seat belts; in fact, none of the four vehicles that were manufactured before 1980 had seat belt users. Are there problems with older seat belt designs? Were the seat belts in these vehicles more difficult to put on or were they more likely to be uncomfortable? These are questions that could be addressed in future studies.

Finally, our study showed that vehicles driven by drivers who were already violating one statuette or the other were more likely to have non-compliant occupants: Vehicles driven by drivers without licenses as well as vehicles with front

compartment overloading were significantly more likely to have non-compliant occupants.

Conclusion

Previous studies have shown a high level of awareness of seat belt regulation and the penalty for non-compliance with seat belt usage while driving in Nigeria.[22] Therefore, knowledge might not be the key issue in the low compliance percentage observed in this study; rather, vehicle occupants still need to be encouraged and persuaded to start wearing seat belts. Thus, seat belt education should focus on encouraging compliance. Studies all over the world had shown enforcement to be one of the more important ways of ensuring compliance with safety laws.[8,9] There is a great need to both heighten and expand the enforcement of seat belt usage in this country. According to the WHO, enforcement must be "intelligence led," meaning that occupants who are most at risk, and the groups who are not using seat belts, such as commercial drivers, occupants of trucks and lorries and rear compartments of vehicles, are given attention.[23] Expansion of seat belt enforcement to include occupants of rear compartments as well as inner front seat occupants is advocated. But, how can enforcement be made to cover more segments of the day? A major problem faced by the FRSC is personnel shortage.[14] This can be improved by a greater involvement of special marshals as suggested by Sangowawa, *et al*.[11] The Special Marshals are volunteer men and women who are recruited to complement the regular Marshals. In addition, the Nigerian Police can be empowered to enforce seat belt laws because the extant laws allow the organization to stop and prevent criminal activities on Nigerian roads only; it does not empower it to enforce seat belt laws. We also advocate that it should become mandatory for all vehicles imported into the country be fitted with seat belts on all the seats in the vehicles.

Limitations of the study

Because this study was done only on one day, it suffers from some limitations. One day may not represent the true trend of seat belt wearing in Makurdi. It does not reveal variations between days as, for example, prevalence of seat belt use may be different on weekdays as compared with weekends. However, the study does have the strength of being the only study from Nigeria that covers a 24-h period. This allowed us to look at the variations between periods of the day.

This study also has the limitation of being limited to a single city. Nigeria is a large country with different ethnic groups. There may be significant differences in seat belt usage in different parts of the country; it will be difficult generalizing the findings from this study to the rest of the country. Future researches may be conducted in many locations spread between different parts of the country, and may include collection of data on attitudes and behaviors of road users.[24]

In addition, the presence of policemen might influence vehicle occupants to wear seat belts on sighting the officers thus inflating the compliance percentage. But, this is mitigated by the fact that policemen in Nigeria are not empowered to enforce seat belt laws, only members of the FRSC are legally allowed to do it. For this reason, the members of FRSC who partook in the observation were in mufti.

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