Ethiopian Journal of Medical and Health Sciences
2022, Volume 2, Issue 2
https://journals.hu.edu.et/hu-journals/index.php/ejmhs

Open Access
ISSN (online): 2789-7087

Original Article

Outcome of alcohol breath analysis among road traffic accident victims: Experience from a southwestern Nigerian teaching hospital

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Abstract

Background: Road traffic accident (RTA) is a common occurrence globally, and much of the injury burden worldwide results from RTAs. Alcohol is estimated to be a factor in 20-30% of all RTAs. This study was conducted to determine the prevalence of alcohol use by breath analysis among the RTA victims and the factors that are associated with its usage.

Methods: It was a hospital-based descriptive cross-sectional study that involved a total of 300 participants. The respondents were recruited over a period of 11 months based on their consecutive arrival at the Accident and Emergency Department of the Bowen University Teaching Hospital, Ogbomoso. The study included consenting RTA victims aged 18 years and above, that presented at the Accident and Emergency Department of the hospital within six hours of sustaining their injuries. The severely injured patients who were unconscious and other victims of RTA that could not breathalyse were excluded from the study. The respondents had alcohol breath test conducted using a validated and calibrated handheld fuel cell sensor technology breathalyser (BACTRACK Select S80 Professional Alcohol Breathalyser). Subsequently, a pre-tested, and structured questionnaire was administered to each participant by the trained attending doctors. Descriptive statistics, binary and multivariable logistic regression models were used to determine the magnitude and predictors of positive alcohol breath test result.

Results: A total of 300 respondents (124 drivers/riders, 147 passengers, and 29 pedestrians) participated in the study; 221 (73.7%) were men; 44.3% (95% confidence interval [CI]: 38.7 – 50.0%) of the participants had positive alcohol

breath test results; about three-quarters (73.4%) of the drivers and riders tested positive to alcohol breath analysis; and none of the drivers and riders was tested for alcohol by the law enforcement agent(s) on the day of their accident. Ethnic group was the most important (AOR: 37.1, 95% CI [1.7 - 816.0]) among the factors associated with positive alcohol breath test. The others were the average monthly income in Naira (AOR: 11.5, 95% CI [2.3 - 57.3]), the category of road user (AOR: 4.2, 95% CI [1.4 - 11.9]), religion (AOR: 2.9, 95% CI [1.4 - 6.1]), and sex of the participants (AOR: 2.7, 95% CI [1.2 - 6.3]).

Conclusion: It is imperative to reiterate the importance of the enforcement of breath testing of drivers and riders randomly stopped at sobriety checkpoints, as well as drivers and riders flagged down for exhibiting driving behaviours that are indicative of driver impairment by the various agencies of the government saddled with the responsibility.

Key words: Alcohol, breath analysis, Nigeria, road traffic accident, road traffic accident victims

Introduction

Road traffic accident (RTA) is a common occurrence globally, and much of the injury burden worldwide results from RTAs (1). In 2019, the World Health Organisation (WHO) ranked RTA as the sixth among the leading causes of disease burden, in terms of disability adjusted life years (DALYs) lost globally (2).

Road traffic injuries (RTIs) place a heavy burden not only on national and international economies but also on household finances. Many families are driven deeply into poverty by the loss of breadwinners and the added physical, social and emotional burden of caring for members disabled by RTIs. Nearly 1.3 million people die annually from various degree of injuries sustained from RTAs, while close to 50 million people sustain non-fatal injuries every year (3).

The causes of RTA are broadly divided into human, vehicular, roadway and environmental factors (4). Human factors in RTA are factors related to the driver and other road users and these include poor visual and auditory acuity, poor decision-making ability, drivers' behaviour such as drink-driving, not using seat-belts and excessive speeding among others. Driver factor alone accounts for 57% of RTAs and 93% in combination with other factors (5). Alcohol use by road users contributes a significant part of the human factors. Alcohol is estimated to be a factor in 20-30% of all accidents (6). Studies have reported impairment by alcohol as an important factor influencing the risk of occurrence of RTAs (7,8).

Besides alcohol magnifying the risk of occurrence of RTAs, it also accentuates the probability of sustaining fatal injuries when RTA occurs (9-11). This is especially true for the motorcycle riders (10). In drink-driving, the risk of an RTA starts at low levels of blood alcohol concentration (BAC) and increases significantly when the driver's BAC is 0.04 g/dl and above (12). A variety of BAC limits are in place across the world. Setting and enforcing legislation on BAC limits of 0.05 g/dl could lead to significant reduction in alcohol-related accidents. About 89 countries, covering 66% of the world's population (4.55 billion people), now have a comprehensive drink-driving law, defined as a BAC limit of 0.05 g/dl or less, which is in line with best practice. However, more stringent drink-drive law such as setting lower BAC limits of 0.02 g/dl or less is recommended for high-risk drivers such as young and novice drivers and commercial drivers. This is predicated on the notion that the inexperienced young adults driving with a BAC level of 0.05 g/dl are more than twice as likely to have an RTA as the more experienced drivers (13).

It seems that a large portion of RTAs would be preventable if more efficient limitations against driving after intake of substances or alcohol could be applied (10,11). A comprehensive *driving under the influence of alcohol or substance abuse* law

could help many countries to reduce morbidities and mortalities caused by impaired driving (10), and it has been documented that strong drink-drive laws will protect almost 70% of the world's population (13). In Nigeria, the BAC limit for the general population, and the young or novice drivers is 0.08 g/dl (13). However, the enforcement is rated 2 on a scale of 0 to 10 (13). This might not be unconnected with the fact that optimal enforcement of drink-driving counter-measures requires access to alcohol testing equipment, which are often found lacking among the enforcement officers (14).

In order to accurately determine the BAC of an individual, quantitative testing of the BAC is sacrosanct (15). The measurement of the BAC either directly by blood analysis or indirectly by breath testing is analytically accurate methods of determining the blood alcohol level (16). The use of alcohol breathalyser has been described as the most immediate and cost-effective method of objective measurement of alcohol intoxication (17,18). The breathalyser was invented by Robert Borkenstein of the Indiana State Police in 1954 (19), and it has been used by many studies to determine BAC (20). They are electronic devices with alcohol specific sensors, such as lead selenide sensor that can measure BAC. They commonly consist of a mouth piece and a sample chamber (19). Although a breathalyser provides rapid results, it requires calibration on a regular basis (18,21), and patient cooperation which may be difficult in combative or comatose patients (21). Underestimation of BAC by about 15% when breath sampling is done has also been reported (22,23).

This might be due to the fact that their readings could be affected by the volume of breath sample, the presence and volume of other gases in the sample, and the concentration of alcohol molecules in the mouth (19). Therefore, the accurate readings of blood alcohol levels cannot be obtained until at least thirty minutes after the most recent alcoholic drink (19). If measured earlier, the breath sampling is more from the mouth rather than the lungs, and an erroneously higher reading might be recorded (19). Also, accuracy expectations are related to the cost of the breathalyser models. The models at the high price range use high quality components and could provide accurate test results. On the other hand, lower cost models might not yield laboratory accuracy or specificity. For instance, Andersson *et al* reported sensitivity and specificity of 98.4% and 95.8% respectively for infrared spectroscopy prototype (24), whereas Ashdown *et al* reported sensitivity of 89.5% to 94.7% and specificity of 64.1% for handheld breathalysers (25).

However, the cheaper brands are more cost-effective for certain cases like personnel detection, and they produce qualitative dependable results for such usage (19). For evidentiary purpose, more accurate equipment that matches laboratory accuracy is demanded (19). Thus the choice of breathalyser depends on the intended purpose. Overall, however, these devices are effective enough to detect dangerous drunk drivers and prevent accidents on the road (19). The basic four types are the semiconductor models, the fuel cell models, the infrared spectroscopy models, and the gas chromatography models (19).

The fuel cell models are handheld breathalysers (19), and they are targeted towards professionals and organisations requiring a device that can handle higher test volumes requiring higher accuracy and sensitivity (26). The units are more specific towards alcohol detection and their accuracy is comparable to a professional semiconductor unit. As a result, there is less chance of false readings from interfering non-alcohol substances unnoticeably present within the testing environment (19).

Among the handheld breathalysers, fuel cell units are the top standard (19,26). Therefore, police officers (19,26), employers, and substance-abuse counsellors use the fuel cell units to determine whether individuals consumed alcohol or not (19). Some of these breathalysers are designed as

evidential testers and their results could be used as evidence in a court of law (19). Evidence has shown that the results obtained from studies in which fuel-cell technology breathalysers were used correlated well with those of evidential breathalysers and blood testing (27).

This study was conducted to determine the prevalence of alcohol use by breath analysis, the pattern of injuries sustained, location of occurrence of the accidents and the factors that are associated with positive alcohol breath test result among the RTA victims that attended Accident and Emergency Department of Bowen University Teaching Hospital, Ogbomoso, Oyo State, Nigeria between June 2017 and April 2018.

Methods and materials

Study design, setting, and period

This hospital-based descriptive cross-sectional study was conducted at the Accident and Emergency Department of Bowen University Teaching Hospital, Ogbomoso. The hospital, formerly called Baptist Medical Centre was established in 1907 by the Baptist missionaries and upgraded to a teaching hospital in 2009. It is a 223-bedded capacity hospital that provides primary, secondary and tertiary care in all specialties of medicine. It is located on a busy A1 Road which is characterised by high volume of traffic. The road links Lagos (southwest Nigeria) to Maiduguri (northeast Nigeria). The Accident and Emergency Department of the hospital is manned by a team of experts headed by a consultant Family Physician and it opens for service delivery twenty-four hours daily.A total of 300 respondents were recruited into the study over a period of 11 months (June 2017 to April 2018).

Determination of sample size

The sample size was determined using the formula $\boldsymbol{n = Z^2pq / d^2}$ (28), where, n = minimal sample required; z = standard normal deviate which equals 1.96 at 95% confidence interval (CI); p = 23.32% (the prevalence of alcohol use among victims of RTA obtained from a previous study done in Benin, Nigeria) (29); $q = 1 – p = 1 - 0.23 = 0.77$; d = precision of the study = 5% = 0.05. A potential non-response rate of 10% was also considered. Consequently, the final sample size for the study became 300.

Operational definitions

In this study, any reading above 0.00 on alcohol breathalyser was regarded as a positive alcohol breath test, while the alcohol breathalyser reading of 0.00 was considered a negative alcohol breath test result.

Sampling technique

Convenience sampling method was used to recruit study participants. Every consenting eligible victim of RTA that presented during the study time frame based on their consecutive arrival at the Accident and Emergency Department was enrolled in the study until the desired sample size of 300 was attained.

Inclusion and exclusion criteria

All the consenting injured RTA victims aged 18 years and above who presented at the Accident and Emergency Department of the hospital within six hours of sustaining their injuries were included in the study. All the severely injured RTA victims who were unconscious and others who could not generate enough breath for analysis were excluded from the study.

Measurement tool, data collection procedure and quality assurance

With the aid of the security personnel, the nursing officers and closed-circuit television surveillance and security cameras stationed within and around the Accident and Emergency Department, it was ensured that no alcoholic beverage was present

within and around the Accident and Emergency Department. After stabilisation/resuscitation, each consenting respondent was moved to a designated room within the Accident and Emergency Department to further ascertain that the immediate testing area is free of alcoholic beverage. Each participant was told to rinse his/her mouth with sterile water, wait for twenty minutes without taking any substance by mouth.

For every test conducted, it was ensured that the mouthpiece was tightly fixed to the alcohol breathalyser. Each participant was then instructed to take a deep breath, hold his/her breath for a moment and exhale into the breathalyser through a disposable mouthpiece until when told to stop. The alcohol breath test was conducted using a validated and calibrated handheld fuel cell sensor technology breathalyser (BACTRACK Select S80 Professional Alcohol Breathalyser). The reading was documented in the space provided in the questionnaire. Subsequently, a validated, structured and pretested interviewer-administered questionnaire adapted from World Health Organisation collaborative study on alcohol and injuries was administered to each participant by the trained attending doctors. Information was obtained from the study participants on socio-demographics, the context in which drinking had occurred prior to their involvement in RTA, pattern of injury and the setting of occurrence of the RTA. There was no occurrence of any adverse event throughout the period of this study.

Data management and analysis

The data entry and analysis were done using IBM SPSS Statistics for Windows, Version 23.0 (Armonk, New York: IBM Corp). The analysis of the data included descriptive statistics such as differences in the distribution (frequency), and percentages of the socio-demographic characteristics of the respondents, alcohol breath test results, the pattern of the injuries sustained by the respondents, and the location where their accidents occurred. Additionally, testing and identification of the potential predictors of positive alcohol breath test result were done by using both the simple and multivariable logistic regression techniques.

In order to observe the impact of each independent variable on the alcohol breath test result in the sampled population, simple binary logistic regression analysis for each independent variable was performed against the dependent variable without adjusting for the effect of other explanatory variables. Thereafter, the independent variables were taken to the multivariable logistic regression models to ensure that the effect of each independent variable on the dependent variable was assessed by controlling for the possible confounders. Presentation of data was done with the aid of frequency tables and figures; and all values under the result section were rounded up to one decimal place.

Results

Overall, none of the drivers and riders who was among the RTA victims that participated in this study was stopped and tested for possible alcohol use by the law enforcement agent(s) while driving/riding on the day of their accident. The remaining results of the study are presented in the table and figures below.

Table 1 showed that the age group 21 to 40 years had the highest proportion of 57.4%, followed by the age group 41 to 60 years with the proportion of 28.3%, while the age group 61 to 80 years had the least proportion of 5.3%. Almost three-quarters (73.7%) of the participants were male while about one-quarter (26.3%) were female. The majority (73.6%) of the participants were married, the proportion of the the participants with primary education (28.3%) was highest, and most (80.7%) of the participants were from nuclear family type.

Table 1: Socio-demographic characteristics of road traffic accident victims that attended Accident and Emergency Department of Bowen University Teaching Hospital, Ogbomoso, Oyo State, Nigeria, between June 2017 and April 2018

Variables (N=300)		Frequency	Percentage
Age group (Years)	≤20	27	9.0
	21-40	172	57.4
	41-60	85	28.3
	61-80	16	5.3
Sex	Female	79	26.3
	Male	221	73.7
Level of education	No formal education	65	21.7
	Primary education	85	28.3
	Secondary	75	25.0
	Tertiary	75	25.0
Family type	Nuclear	242	80.7
	Single parent	7	2.3
	Polygamous	51	17.0
Marital status	Single	68	22.7
	Married	221	73.6
	Divorced	6	2.0
	Widow or widower	5	1.7

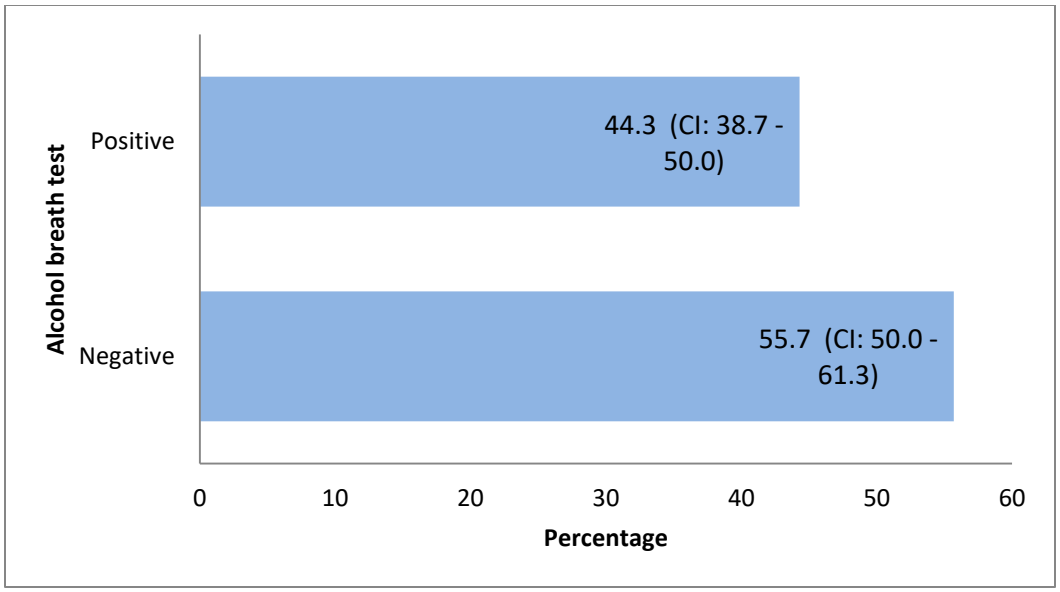
Note: N = Total number of participants

As shown in Figure 1, almost half (44.3%; 95% CI: 38.7 – 50.0%) of the participants were positive for alcohol use as determined by alcohol breath analysis.

Figure 2 reveals that 271 (90.3%), 116 (38.7%), and 55 (18.3%) of the participants had soft tissue injury, fracture, and head injury, respectively, while 6 (2.0%), 5 (1.7%), and 4 (1.3%) had chest injury, spinal injury, and abdominal injury respectively.

As depicted in Figure 3, more than half (51.3%) of the accidents occurred within the Ogbomoso township while one-third of the accidents occurred along the Ogbomoso-Oyo Road. Only 12.7% of the accidents occurred along Ogbomoso-Ilorin Road.

The finding of the study displayed in Table 2 showed that belonging to the Ikwerre and Yoruba ethnic groups, earning between Naira 100,000 and 199,999, being a driver/rider, practising Christianity religion, and being a male were factors that increased the likelihood of having a positive alcohol breath test result among the study participants. However, factors such as age, marital status and level of education did not raise the probability of having a positive alcohol breath test result.



Note: CI = 95% Confidence Interval

Figure 1: Alcohol use determined by alcohol breath analysis among road traffic accident victims that attended Accident and Emergency Department of Bowen University Teaching Hospital, Ogbomoso, Oyo State, Nigeria, between June 2017 and April 2018

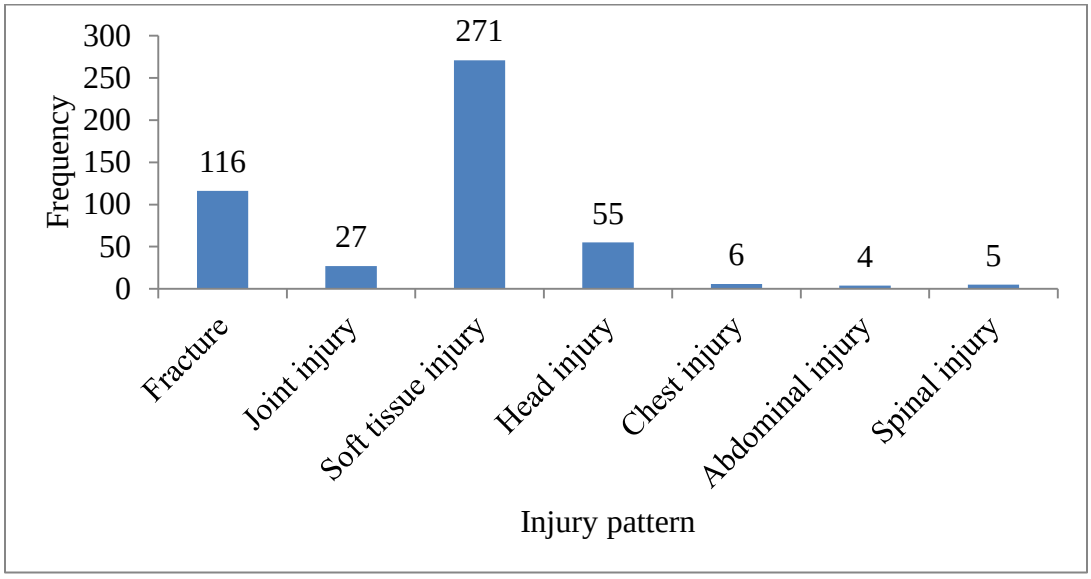


Figure 2: Pattern of injuries sustained by the road traffic accident victims that attended Accident and Emergency Department of Bowen University Teaching Hospital, Ogbomoso, Oyo State, Nigeria, between June 2017 and April 2018

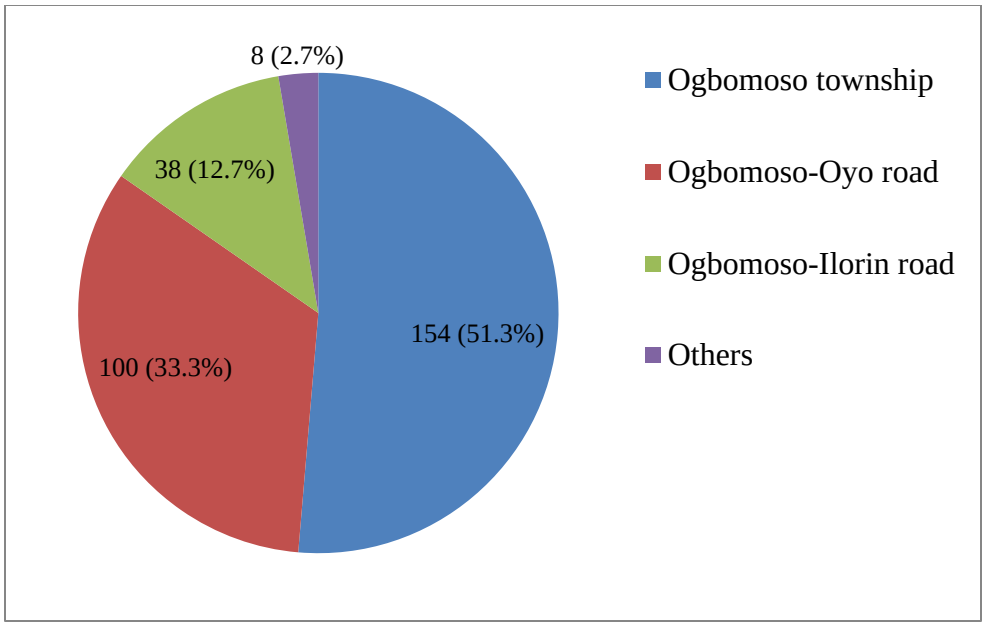


Figure 3: Location of accident of the road traffic accident victims that attended Accident and Emergency Department of Bowen University Teaching Hospital, Ogbomoso, Oyo State, Nigeria, between June 2017 and April 2018

The odd of having a positive alcohol test result was 37.1 times higher among the Ikwerre ethnic group and 4.7 times greater among the Yoruba ethnic group when both compared to the reference group (Hausa ethnic group). Similarly, the odd of testing positive to alcohol breath analysis was 11.5 times higher among those with average monthly income between Naira 100,000 and 199,999 when compared with the participants earning below Naira 50,000. Also, being a driver/rider increases the odds of having a positive alcohol breath test by 4.2, when compared with being a pedestrian. In the same vein, practising Christianity religion has 2.9 times higher odds of having a positive alcohol breath test result compared with being a Muslim, and finally, in comparison to being a female, being a male raises the odds of having a positive alcohol breath test result by 2.7 times.

Discussion

This hospital-based cross-sectional study determined the prevalence of alcohol use by breath analysis, the pattern of injuries sustained, location of occurrence of the accidents and the factors that are associated with positive alcohol breath test result among the RTA victims that attended Accident and Emergency Department of Bowen University Teaching Hospital, Ogbomoso, Oyo State, Nigeria, between June 2017 and April 2018. The findings are as discussed below.

In this study, the prevalence of alcohol use determined by alcohol breathalyser was 44.3%. The finding of this study is not in harmony with that reported by Sundet *et al* in a study on the prevalence of alcohol use among the victims of RTAs in Malawi, where a prevalence of alcohol use of 20.1% by alcohol breathalyser was found (30). The dissimilarity in the findings of these two studies despite the duo being hospital-based cross-sectional studies that recruited all categories of victims of RTAs, might be because they were conducted in two different countries where the level and pattern of alcohol consumption might be different. The lower prevalence reported in the Malawian study might have been a reflection of the slightly higher level of enforcement of the drink-driving law in the country as documented in

a World Health Organisation report that rated the enforcement 4 on a scale of 0 to 10, compared with a score of 2 out of 10 reported for Nigeria in the same publication (13).

Table 2: Bivariable and multivariable logistic regression analysis for factors associated with alcohol test result among road traffic accident victims that attended Accident and Emergency Department of Bowen University Teaching Hospital, Ogbomoso, Oyo State, Nigeria, between June 2017 and April 2018

Variables (N=300)		Alcohol test result		COR (95% CI)	AOR (95% CI)
		Yes	No		
Age group (Years)	≤20	6	21	1.0	1.0
	21-40	82	90	2.7 (1.1, 6.6)*	2.2 (0.7, 7.2)
	41-60	37	48	2.1 (0.8, 5.5)	1.0 (0.2, 4.0)
	61-80	8	8	2.2 (0.6, 8.2)	1.7 (0.2, 11.4)
Sex	Female	13	66	1.0	1.0
	Male	120	101	4.9 (2.6, 9.1)*	2.7 (1.2, 6.3)*
Marital status	Single	28	40	1.0	1.0
	Married	102	119	1.2 (0.7, 2.1)	0.8 (0.3, 2.0)
	Divorced	1	5	0.3 (0.0, 2.6)	0.1 (0.0, 1.4)
	Widow or widower	2	3	1.0 (0.1, 6.1)	1.5 (0.1, 17.9)
Level of education	No formal education	26	39	1.0	1.0
	Primary education	51	34	2.3 (1.2, 4.4)*	0.7 (0.2, 2.4)
	Secondary	28	47	0.9 (0.5, 1.8)	0.3 (0.1, 1.0)
	Tertiary	28	47	0.9 (0.5, 1.8)	0.3 (0.1, 1.1)
Religion	Islam	69	64	1.0	1.0
	Christianity	64	103	1.7 (1.1, 2.8)*	2.9 (1.4, 6.1)*
Ethnic group	Hausa	19	29	1.0	1.0
	Igbo	1	4	0.4 (0.0, 3.7)	1.1 (0.1, 21.6)
	Yoruba	109	127	1.3 (0.7, 2.5)	4.7 (1.3, 17.6)*
	Ikwerre	2	1	3.1 (0.3, 36.1)	37.1 (1.7, 816.0)*
	Fulani	2	6	0.5 (0.1, 2.8)	1.0 (0.1, 8.0)
Average monthly income (Naira)	<50,000	81	109	1.0	1.0
	50,000 – 99,999	41	52	1.1 (0.6, 1.8)	1.1 (0.5, 2.3)
	100,000 – 199,999	9	3	4.0 (1.1, 15.2)*	11.5 (2.3, 57.3)*
	200,000 - 499,999	2	3	0.9 (0.1, 5.5)	3.2 (0.3, 31.3)
Category of road user	Pedestrian	10	19	1.0	1.0
	Driver/rider	91	33	1.9 (0.8, 4.5)	4.2 (1.4, 11.9)*
	Passenger	32	115	9.9 (5.7, 17.3)*	0.5 (0.1, 1.4)

1.0 = Reference group; * = P-value <0.05; CI = Confidence Interval; COR= Crude Odds Ratio; AOR: Adjusted Odds Ratio

The finding of this study is equally at variance with the finding of a hospital-based cross-sectional study conducted by Świątkiewicz *et al*. They reported the prevalence of alcohol use of 4.4% by breathalyser, 5.1% by clinical appraisal with Y91 ICD-10 codes, 4.7% by interviewer's observations and 9.6% by self-report of drinking within six hours before sustaining the injury or the onset of the medical condition (31). The prevalence of alcohol use by breathalyser gotten by Świątkiewicz *et al* was lower than the prevalence reported in this study probably because about 23.0% of their study participants did not perform alcohol breath analysis due to various reasons such as arrival at the Emergency Department more than six hours after sustaining their injury or the onset of their medical conditions and refusal of alcohol breath analysis. Furthermore, the lower prevalence of alcohol use by the various assessment methods employed by their study may not be unconnected with the characteristics of their study population which included subjects that sustained their injuries in various incidents aside RTAs and respondents with other medical conditions. The inclusion of participants with other medical conditions and injuries from other incidents aside RTAs might have also contributed to the lower prevalence of alcohol use reported by Świątkiewicz *et al* since alcohol use might not have been an important factor in many of the medical conditions and other injuries included in their study. Additionally, while the current study took place in a lower middle-income country, where the enforcement of drink-drive law is less than adequate (13), Świątkiewicz *et al* conducted their research in a high-income country with probable greater sanctions and enforcement which are capable of discouraging consumption of alcohol before and during driving.

The highest proportion of soft tissue injuries in this study is in agreement with the finding of a previous study carried out by Alfalahi *et al* (32). This might be because both were hospital-based descriptive cross-sectional studies. The occurrence of more than half (51.3%) of the accidents within the township of Ogbomoso might have been partly contributed by the high volume of traffic within the township. This is probably a consequence of the heavy vehicular movement of cars and buses including trailers and tankers from the northern part of Nigeria to the southwestern region of the country and vice-versa. Likewise, the occurrence of the one-third of the accidents along the Ogbomoso-Oyo portion of the Ibadan-Ilorin expressway might be because this section of the road is yet to be upgraded to the status of a dual carriageway like the Ogbomoso-Ilorin part of the Ibadan-Ilorin expressway where only 12.7% of the accidents were recorded.

The current study found that the odd of having a positive alcohol breath test result was 37.1 times higher among the Ikwerre ethnic group and 4.7 times greater among the Yoruba ethnic group. This is probably not unconnected with the age-long tradition of these ethnic groups, which is favourably disposed to the production and usage of alcoholic beverages, particularly the locally-produced gin (32,33), that is customarily engaged in some socio-cultural celebrations and rituals like religious rituals (34), child dedications (35), marriage ceremonies, kingship and chieftaincy enthronements, and even funerals (34, 35). The growing popularity of Christianity among these ethnic groups (36,37), might also explain the higher odds of positive alcohol breath test result found among them. Additionally, the Islamic religion strictly prohibits alcohol use (38), and the Hausa population that was used as the reference group in this study has Islam as one of its distinguishing attributes (39).

Also, being a driver/rider increases the odds of having a positive alcohol breath test by 4.2, when compared with being a pedestrian. This increased odds of the drivers and riders testing positive to alcohol breath analysis when compared with the pedestrians might have been due to the fact that the enforcement of the drink-driving law in Nigeria is low. The enforcement of the law in Nigeria was

rated 2 on a scale of 0 to 10 in a publication by the World Health Organisation (13). It has been documented that in places where the enforcement of the drink-drive law is suboptimal or perceived to be poor, the probability of the drivers/riders driving under the influence of alcoholic beverages is likely to be high, with the resultant failure of the law to achieve the reason for its promulgation (40).

The odd of having a positive alcohol breath test result is 2.9 times higher among the Christianity religion practitioners when compared with being adherents of Islam. Mamman *et al* identified religion as one of the important factors that influences alcohol use, and similar to the finding of this study, consumption of alcohol was highest among the Christian worshippers in their study (33). This might be attributable to the fact that aside the usage of wine during a specific part of their worship, some Christian denominations also permit responsible drinking of alcohol by their worshippers to some extent (41). The finding of the current study also resonates with the Islamic injunction that forbids consumption, production, handling, and sale of alcoholic beverages by the Muslims (42).

Finally, in comparison to being a female, being a male raises the odds of having a positive alcohol breath test result by 2.7 times. This finding is in agreement with the previous research reports conducted elsewhere (30,43,44), This might be because risky driving behaviours among the male gender is said to be higher (45). Furthermore, in the traditional African society, the males are more likely to consume alcohol, since the culture discourages alcohol consumption by the female members of their population (46).

Conclusion

It is imperative to reiterate the importance of the enforcement of breath testing of drivers and riders randomly stopped at sobriety checkpoints, as well as drivers and riders flagged down for exhibiting driving behaviours that are indicative of driver impairment by the various agencies of the government saddled with the responsibility. Furthermore, the dualisation of the busy A1 Road within the Ogbomoso Township and the Ogbomoso-Oyo portion of the Ibadan-Ilorin expressway is long overdue and it is advised that this should be considered a priority as soon as resources to execute the dualisation of these segments of the Ibadan-Ilorin expressway become available to the Federal Government of Nigeria.

With regards to drawing conclusion from the present study, the cross-sectional nature of the study design should be borne in mind, because the reported positive alcohol breath test result and the associated factors does not amount to an inference/interpretation of causality, since prospective studies are the suitable study designs to confirm causal effect. Additionally, the exclusion of the severely injured RTA victims who were unconscious and others who could not generate enough breath for analysis from the study might have led to an underestimation of the positive alcohol breath test.

Acknowledgement

The authors acknowledge the generous donation of handheld BACTRACK Select S80 professional alcohol breathalysers by Mr. Wasiu and Mrs. Margaret Adedeji (Virginia, United States of America).

Ethical considerations

Ethical clearance was obtained from the Research Ethics Committee of Bowen University Teaching Hospital, Ogbomoso. The approval was dated 21st December, 2016 with registration number NHREC/12/04/2012. The potential participants were informed of the study, assured of confidentiality, and their written informed consents for both the conduct of the study and publication of its findings were obtained before they were recuited into the study. Furthermore, the

confidentiality of the information was ascertained by using unnamed questionnaires and safe keeping of the data collected from the study participants.

Data availability statement

The datasets collected and/or analysed during the current study are available upon reasonable request from the corresponding author.

Conflicts of interest

The authors declare that they have no competing interests.

Funding statement

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

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