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NON-VISUAL MEDICAL RISKS OF COMMERCIAL DRIVERS WHO CAME FOR EYE SCREENING
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NON-VISUAL MEDICAL RISKS OF COMMERCIAL DRIVERS WHO CAME FOR EYE SCREENING

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ABSTRACT

Background: **Beside visual fitness, non-visual risks can impact on a driver's ability to drive safely.**
Objectives: **To describe the non-visual risks of commercial vehicle divers in Abakaliki.**
Methodology: **This was a cross sectional, descriptive study. Relevant data collected included bio- data, vital signs and lifestyle history of participants. Data was analysed using SPSS software package Version 22, and reported in simple tables showing frequencies, percentages and proportions. Relationship between the socio-demographic variables, vital signs and history of road traffic accident (RTA) were tested using the Chi Square statistic. Significance was set at $p < 0.05$.**
Results: **All 103 participants were males aged 24 to 75 years, with a mean of 43.2 ± 12.3. Majority (61.2%) were ≥40 years. High proportions: 37.5% and 9.7% were found to be hypertensive and diabetic respectively; 4 (3.9%) were epileptics; 50.5% and 25.2% use alcohol and tobacco respectively. Almost half (46.6%) self-reported having had RTA. The relationship between self-reported history of RTA and history of epilepsy was statistically significant ($P < 0.05$).**
Conclusion: **There is a high prevalence of non-visual medical risks to driving safety amongst this population. It is recommended that beside the pre-licensing visual acuity, general medical check be incorporated as part of requirements for issuance and renewal of driving licence for drivers in Nigeria. Those with epilepsy should be identified and never licensed to drive.**

INTRODUCTION

Nigeria's national road traffic regulation requires an intending driver to furnish the licensing authority with both certificates of visual acuity test and general fitness from an approved government hospital.[1] This is because any illness that affects vision or any other parts of the body, regardless of its aetiology, can impact negatively on a driver's ability (cognitive, perceptive, motor or decisional). Common ill-health conditions, either acute or chronic as well as their treatment can lead to unsafe driving, depending on the severity. Severe bouts of stress, sleep disturbance, stomach upsets, infections, migraine headaches, flu, severe colds, fever among others can impact negatively on driving performance. Furthermore fatigue, alcohol, negative emotions, drowsiness, headaches, respiratory disease, and fever can impair driver's fitness.[2]

Safe driving is a complex task that requires the driver to simultaneously interact with the vehicle and the environment as well as to promptly select and perform the appropriate road behaviours that promote safety.[2,3] To achieve this the driver must be able to perceive, process, and interpret the relevant information and also be able to respond appropriately without limitations.[3,4] Although vision is the most important source of information during driving and many driving -related injuries have been associated with visual problems, other factors such as age, training experience, familiarity with the driving environment, health status (including physical and psychological) as well as medication use for treating medical conditions can also directly affect driving performance. [4-6]

Cardiovascular diseases such as hypertensive heart disease, unstable coronary syndrome, arrhythmias, palpitations, congestive heart failure, hypertrophic obstructive cardiomyopathy, and valvular disease (especially when associated with pre-syncope, syncope or cognitive deficits), can cause transient visual loss, loss of attention, stroke and impaired motor function.[5,6,]

Neurologic diseases, including dementia and epilepsy can affect a driver's judgement and response to issues on the road. Psychiatric disease, including mood disorders, depression, anxiety disorders, psychotic illness, personality disorders, and alcohol or other substance abuse can also affect driver's performance. Metabolic disease, including type 1 and type 2 diabetes mellitus especially with hypoglycaemic attacks or severe swings in blood sugars; and hypothyroidism can create medical emergencies for the driver.[2,3,6]

Musculoskeletal disabilities, including arthritis and foot abnormalities can affect motor response.[7] There are many more conditions that can impact on driving ability including life style issues such as smoking, alcohol and substance abuse.[2,3,8] Some of these life style issues may not be detected ahead of an accident history as many potential drivers may not report these limitations while seeking diving licence. Intending drivers therefore require periodic formal medical assessment to determine the impact of these conditions on their level of function as part of medical assessment for driving licence or its renewal.

This study was aimed at determining the prevalence of five non-visual medical risks to driving safety (Hypertension, Diabetes Mellitus, Epilepsy, Alcohol and Tobacco use) among commercial vehicle drivers in Abakaliki metropolis.

METHODOLOGY

Background of study area: This study was carried out in Abakaliki, the capital of Ebonyi State which is one of the five south-eastern states in Nigeria. The state is made

up of 13 local government areas with three senatorial zones and has an estimated population of approximately 2.9 million people (2,880,400) as of 2018, estimated from the 2006 national census. It has a total land area of 5,533km^2 and is located at latitude $6^0$15'N and $6^0$20'N and longitude $8^0$05'E and $8^0$10'E.[9, 10] Abakaliki metropolis is the centre of most economic activities in the state. Commercial vehicle drivers, operating to and fro Abakaliki, play an important role in the economic activities of the state.

Study Design: This was a cross sectional, point prevalence, descriptive study.

Study Population: This was part of a larger study that assessed the ocular health status and non-visual medical risks of commercial vehicle drivers in Abakaliki metropolis. The detailed report on the study population, sampling technique and ethical issues has been reported in the ocular health status of commercial vehicle drivers already published.[5] This follow-up paper discusses the non-visual medical risks of the drivers.

Data collection: A structured questionnaire was developed for data collection. The research team was made up of a consultant ophthalmologist, Ophthalmologists-in training (resident doctors), a nurse, a laboratory scientist and medical students. The students were trained to fill the structured questionnaire. The relevant data collected for this part of the study were:

- Blood pressure measurement using Mercury Sphygmomanometer (Medicare Instrument WUXI Jiangsu China) by the nurses in the team. Two readings were taken 5 minutes apart, with the cuff tied at participant's mid arm just above the elbow, and the diaphragm of the Littmann stethescope (3M™ Littmann^{RM}) placed above the cubital fossa with the patient relaxed. The average of the two readings was taken as the measurement.
- Random blood sugar check using Glucometer, by the laboratory scientist in the team.
- Lifestyle history (Alcohol and Tobacco use) was obtained from participants and recorded in the questionnaire.

As part of ethical measures, all participants with abnormal findings, who needed further medical attention, were referred to the Alex Ekwueme Federal University Teaching Hospital Abakaliki (AE-FUTHA) for further management.

Data analysis: Data was entered into a personal computer, cleaned and analyzed using the Statistical Package for Social Sciences (SPSS), version 23 (SPSS Inc, Chicago, Illinois, USA), and reported as frequency distributions, percentages and means ± standard deviation.

Ethical Clearance: The ethical clearance for this study was obtained from the research ethics committee of the National Obstetric Fistula Centre (NOFIC), Abakaliki. As reported earlier, the vision and general medical screening exercise was done in collaboration with the Federal Road Safety Commission (FRSC), Abakaliki, as part of health promotion and vision screening for commercial drivers. Permission to carry out the study was granted by both the FRSC and the national union of road transport workers (NURTW). Ahead of the screening, the NURTW members were mobilized by the FRSC and the drivers participated actively.

Informed Consent: Written informed consent was obtained from participants and refusal of participation was respected.

RESULTS

Socio-demographic characteristics: The number of drivers interviewed was 103 and all of them were males. The minimum age was 24 years and the oldest driver was aged 75 years. The mean age was 43.2 ± 12.3. Majority 63 (61.2%) were ≥40 years. Most of the drivers 85 (82.5%) were married. Their

educational status reveals that over half the participants 53(51.4%) had ≤ primary education. See table 1.

Non-visual risks: On-site blood pressure check revealed that the Mean (SD) systolic blood pressure was 134.0 ± 24.1 mmHg and the mean (SD) diastolic blood pressure was 87.1 ± 12.2 mmHg. However, 39 (37.9%) had high blood pressure (BP ≥ 140/90 mmHg). Out of these, 14 (35.9%) were known hypertensive.

On-site blood sugar measurement revealed the mean (SD) Random blood sugar of participants to be 110.9 ± 41.3mg/dl. However, 10 (9.7%) of the participants had high blood sugar level (≥141mg/dl). Out of this, 5 (50%) were known diabetics. See table 2

Medical history revealed that 4 (3.9%) of the participants were known epileptics; and 24 (23.3%) reported current use of different medicines for treatment of chronic medical conditions.

Lifestyle behaviours show that 52 (50.5%) participants acknowledged a habit of alcohol intake with 4 (3.9%) acknowledging drinking 4 or more bottles per day. Tobacco use was acknowledged by 26 (25.2%) participants.

Self-report of RTA: A past history of road traffic accident (RTA) was reported by 48(46.6%) participants.

The relationship between RTA and Non-visual risks: The relationship between RTA and non-visual risks revealed that all the 4 (100%) participants with a medical history of epilepsy; 15 (57%) of those who used tobacco and 26 (50%) of those who took alcohol reported a past history of RTA. Among the 24 participants who were taking drugs for medical treatment, 11(45.8%) reported a past history of RTA. Only the relationship between epilepsy and RTA showed statistical significance. (Fishers Exact 2 tailed P value = 0.04). However, those who used alcohol had almost twice the Odds of having RTA, compared to those who did not, though the relationship was not statistically significant. See Table 3

Table 1

Socio-demographic characteristics of drivers in Abakaliki

Variable	**Frequency (n = 103)**	**Percentage**
Age: Mean age = 43 ± 12.2		
Age group:		
20-29	9	8.7
30-39	31	30.1
40-49	34	33.0
50-59	16	15.5
≥ 60	13	12.8
Educational Status:		
≤ Primary education	53	51.4
Secondary education	41	39.8
Tertiary education	9	8.8
Marital Status:		
Married	85	82.5
Single	16	15.5
Widower	2	1.9

Table 2

Blood pressure and blood sugar profile of drivers

Variable	Frequency	Percentage
Blood pressure:		
≤139/89	65	62.5
≥ 140/90	39	37.5
Mean (SD) Systolic blood pressure = 134.0 ± 24.1mmhg		
Mean (SD) Diastolic blood pressure = 87.1 ± 12.2 mmhg		
Random blood sugar profile: *		
Normal Random blood sugar ≤140mg/dl	93	90.3
High Random blood sugar (≥141mg/dl)	10	9.7
Mean (SD) Random blood sugar = 110.9 ± 41.3mg/dl		

**The reference values for random glucose test in an average adult are[11]:*

1. *"normal" 79–140mg/dl (4.4–7.8 mmol/l);*
2. *Pre-diabetics 140-199mg/dl (7.8–11.1 mmol/l);and*
3. *Diabetic ≥ 200 mg/dl.*

Among the participants, 4 of the 10 participants whose random blood sugar were high were classified as pre-diabetics while 6 were classified as diabetics.

Table 3

Relationship between socio-demographic variables, medical history of participants and history of Road Traffic Accident (RTA)

Variable	HISTORY OF ROAD TRAFFIC ACCIDENT (RTA) (N = 103)			Chi Squared (χ^2) and P levels
	YES	NO	TOTAL	
Age Range:				χ^2 =1.1454
20 – 39	16	24	40	P= 0.28
≥ 40	32	31	63	
Total	48	55	103	
Marital Status:				χ^2 = 0.041
Married	40	45	85	P=0.84
Single or widower	8	10	18	
Total	48	55	103	
Educational Level:				χ^2 = 0.264
≤ Primary education	26	27	53	P= 0.607
≥Secondary education	22	23	50	
Total	48	55	103	
***Tobacco Use*:**				χ^2 = 1.719
Yes	15	11	26	P= 0.189
No	33	44	77	(OR = 1. 82)
Total	48	55	103	
Alcohol Intake:				χ^2 = 0.487
Yes	26	26	52	P= 0.485
No	22	29	51	(OR = 1.3)
Total	48	55	103	
Epilepsy:				Fisher exact
Yes	4	0	4	test P value=

No	44	55	99	0.04
Total	48	55	103	

DISCUSSION

Driving a motor vehicle requires the ability to perform precise, complex actions in response to an environment that is continually changing. Disease processes or substance use (including medicines or recreational drugs) that affects perception, judgement, alertness and responsiveness will impair driving safety.[2,3]

There was a high prevalence of non-visual medical risks among these drivers. This could be explained by the preponderant older age group of the drivers as age greater than 40 years is associated with chronic non-communicable diseases.[2,6] Older age is also associated with such factors as early onset of fatigue, slowed responses, visual problems, impaired cognitive function, and impaired mobility.[3,6] A number of guidelines and consensus statements related to the 'medically at-risk driver' or 'older driver' have been published to provide information to health professionals in their country or specific locale.[3,6] The guidelines focus not only on the presence of these medical conditions, but on the risk and threat that such diagnosis represents on the road[2,3,6]

Hypertension was a significant finding in this population as 37.9% were found to be hypertensive. This finding compares with the upper limits of the prevalence range found in the general population in Nigeria and Sub-Saharan Africa.[12] This high level could be explained by the age group studied, the sedentary nature of the occupation studied and their high level of use of tobacco and alcohol. Uncontrolled hypertension has been found to be a major health problem in Nigeria, as many of the patients are unaware of their medical condition.[12] This was the case in this population as only 35.9% of those with high blood pressure gave a suggestive history. The effects of hypertension, if not controlled, are devastating and may include stroke, myocardial infarction, cardiac failure, and renal failure among others6,12. These consequences usually lead to severe disabilities that could incapacitate the driver or even cause sudden death, apart from its complication of hypertensive retinopathy. In this study hypertensive retinopathy was found to account for 7.1% of ocular disorders, highlighting the negative consequences of hypertension on sight[5].

Diabetes mellitus (DM) is another common medical condition that affects the general population. In a systematic review and meta-analysis of the prevalence and risk factors for diabetes mellitus in Nigeria, Uloko et al[13] reported a DM prevalence of 5.77% which suggests that 11.2 million Nigerians (1 out of every 17 adults) are living with the disease. They also observed an increase in the prevalence of DM in all regions of the country with the highest prevalence seen in the South-South geopolitical zone.[13] The blood sugar profile of this population revealed a 9.7% of high abnormal sugar profile (pre-diabetics and diabetics), which is higher than the general population reported above. While 4.9% of the participants volunteered a medical history of diabetes mellitus, some of these participants had never checked their blood sugar before this study. The potential risks of diabetes mellitus arise from the metabolic disturbances associated with control of blood glucose on the one hand, and the later complications of the disease especially end-organ damage on the other hand, which can affect virtually every part of the body.[3] From the perspective of driving safety, hypoglycaemia, which results from treatment of diabetes, is the most episodic potential problem. Its onset may rapidly impair the ability of an otherwise competent

and safe driver. It may result in poor motor coordination, impaired judgement and reaction times, inappropriate and aggressive behaviour, and even loss of consciousness, which all pose a potential risk on the road.[3] The risk of hypoglycaemia is greater with increased driving hours. On the other hand, hyperglycaemia and associated diabetic coma are generally of little significance to driver safety, as the onset is slow. Other disabling complications of diabetes mellitus develop over time due to end-organ damage affecting the eyes, the cardiovascular system, the brain and neurological system and may also affect motor function.

Epilepsy is a neurological disorder characterized by recurrent seizures which involve convulsive movements or other motor activity, loss of consciousness, sensory and behavioural abnormalities[14.] Epileptic seizures can occur while driving and will result in road traffic accident due to rapid incapacitation of the driver, placing both the driver and other road users in danger. Diller et al[14] in a study evaluating licensed drivers with medical conditions reported an increased rate of road traffic accidents in individual with epilepsy. This corroborates our finding in this study as the 4 participants who gave a history of epilepsy had all been involved in road traffic accidents. It is possible that this risk is under reported as some may not survive the crash and therefore not available for interview.

Driving under the influence (DUI) of alcohol or driving while intoxicated (DWI) involves operating a vehicle with blood alcohol content (BAC) level that exceeds restriction limits. The maximum allowed BAC varies between countries. Many European and Asian countries have restricted the maximum allowable BAC level to 0.05%. [15] However, even a small amount of alcohol can lead to harmful situations.[15] In this study 50% of those who acknowledged alcohol intake also reported a positive past history of RTA. Alcohol impairs judgement and slows responses and also makes the driver prone to risky behaviours on the road. Alcohol consumption before or during driving has been established to be a major risk factor for road traffic accidents with severe injury[15, 16]. Martin et al[16] reported that increased consumption of alcohol during or before driving was a cause of increased accidents and casualty rate. In this study, although 50% (26 out of 52) of drivers who consumed alcohol before or during driving had history of road traffic accident, the relationship between alcohol consumption and self - reported history of RTA was not statistically significant (χ^2 = 0.487; P=0.49). It is very possible that both the number of drivers who take alcohol, the quantity taken and the involvement in road traffic accidents were under-reported in this study, which is one of its limitations. For a known risk factor such as alcohol use, which can easily be denied in self report, objective tests for blood alcohol level would have made a better measurement.

Use of tobacco has been reported as associated with RTA amongst drivers. Igarashi *et al.* [17] and Leistikow *et al*.[18] reported a higher risk of road traffic accident deaths in drivers who smoked ≥20 cigarettes/day compared to non-smokers. This was independent of age, gender, educational level or marital status. This close relationship between tobacco and road traffic accidents has been attributed to impaired attention such as searching for cigarette, lightening of cigarette, disposing the ash and extinguishing a burning cigarette during driving.[18] In our study, those who used tobacco had almost twice the odds of RTA than those who did not, though this relationship was not statistically significant (OR = 1.82; P > 0.05).

The high rate of self- reported road traffic accidents (RTA) (46.6%) in this study is in keeping with reports from low income countries.[19]In Nigeria, RTA has become the third-leading cause of overall deaths, the

leading cause of trauma-related deaths and the most common cause of disability[19, 20] Therefore, besides vision screening, the enforcement of other medical aspects of fitness- to- drive appear suboptimal in our country as in other developing countries. Unlike in many developed countries where the patient medical record of acute diseases, chronic diseases, sleep disorders, eye disorders, psychiatric conditions, injuries, disabilities, hypertension and cardiovascular disorders, epilepsy, diabetes mellitus and other significant health disorders are easily accessible and linked for use as part of the assessment of health for driving, and are used to influence the process of obtaining a drivers licence, the same is not applicable in our setting. This calls for urgent consideration of these matters in granting or renewing licenses for commercial or even private drivers.

CONCLUSION

The prevalence of non-visual medical risks (older age, hypertension, diabetes mellitus, alcohol intake, epilepsy and tobacco use) was high in this population. Though the association between self-reported road traffic accidents was only significant with history of epilepsy amongst these drivers, these other risks identified in this study are serious health conditions that pose potentially fatal risks to safe driving.

It is therefore recommended that apart from the visual testing that is mandatory for renewal or issuance of driving license in Nigeria, assessment of the wider general health status of the potential driver be enforced to further promote driving safety.

Limitations of the Study: This study is limited by the fact that some of the relevant information in study are based on self-report and therefore may be influenced by participant's decision to release accurate information.

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