Diabetes and driving: Assessing knowledge of patient safety recommendations among medical doctors in Nigeria

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Abstract

Many complications of diabetes and its treatment modalities may reduce driving safety and contribute to increase in the number of accidents. Hence, we assessed doctors' knowledge on safety and driving with diabetes especially those on insulin. A total of 102 doctors of different cadres participated in the study conducted by an online survey in Nigeria over a 4 weeks period in April 2021. Of the 102 respondents, 97 (95.1%), 93 (92.2%), 69 (67.6%) knew that hypoglycaemia, retinopathy and neuropathy respectively predisposed to road traffic accidents. Only a third had ever discussed the possible risk of road traffic crashes with insulin-treated patients. While 32.6% participants knew glucose level be checked not later than 30 minutes before driving, 53.7% respondents knew the need to wait at least 30-45 minutes after treatment of mild to moderate hypoglycaemia before driving. Only 37.9% knows the acceptable blood glucose level considered safe to drive and 12.6% knew the recommended frequency and time to recheck glucose levels during a long trip. Results shows poor knowledge of doctors on several aspects of fitness to drive, hence, it is necessary for all doctors to have basic knowledge on requirements to drive among diabetics for appropriate advice.

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Informed consent: The questionnaire was circulated via WhattsApp. Participants were informed of the purpose and methods of data collection.

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Introduction

The prevalence of diabetes has been increasing in most countries just as the ownership of motor vehicles. For many Nigerians, driving is an essential part of daily living as it is important for both business and recreational activities. Most people regard driving to be a fundamental part of daily life; especially those with limited access to public transport. However, driving involves a complex and rapidly repeating cycles that requires a level of skill, rapid information processing, vigilance and ability to interact simultaneously with both the vehicle and the eternal environment.[1]

Although majority of individuals with diabetes are capable of driving safely, however, this ability to drive safely can be compromised by symptoms or complications of the disease.[2,3] Both acute and chronic complications of diabetes can potentially impair driving performance leading to vehicular mishaps. These complications include but not limited to hyperglycaemia, hypoglycaemia, neuropathy (which impair sensory or motor functions), retinopathy (which causes visual impairment) and other forms of diabetes complications like amputation, and vascular disease.[3,4] For instance, when reduced sensation and impaired proprioception affect the lower limbs of people with diabetes, they may find it more difficult to gauge pressure on the accelerator, brake or clutch pedals. In addition, many of the agents used for neuropathic pain such as gabapentin or amitriptyline can have a sedative effect, hence predisposing to road mishaps.

Also, occurrence of transient cognitive dysfunction or loss of consciousness from glucose lowering medications-induced hypoglycaemia (primarily related to insulin or insulin secretagogue agents) may affect cognitive domains necessary for safe driving performance.[5,6] In addition, other medical disorders associated with type 2 diabetes, such as sleep apnoea, can also have an

adverse impact on driving performance. As the presence and extent of these factors vary from person to person, the fitness or otherwise of people with diabetes to drive is assessed on an individual basis as per national regulations where available.

In most developed countries, diabetes is considered to be a prospective disability so necessitating routine assessment of medical fitness to drive and the imposition of restrictions on the issue of driving licenses.[7] For instance, the American Medical Association (AMA) suggest that physicians should evaluate each patient's fitness to drive, and should report any substantial driving impairment when such impairment may increase the threat to safety of the patient and the public.[8] However, in many developing countries, drivers with diabetes including those using insulin are usually not subjected to any licensing restrictions. In Nigeria, routine screening for diabetes detection either for driving license acquisition or renewal is usually not done. Also, assessment for glycaemic control or presence of diabetic complications is not sought in those with diabetes. As the most populous country in Africa, the country at present has no statutory restrictions on the acquisition and possession of driving license for people with diabetes. The knowledge of physicians who see people living with diabetes was suspected to be inadequate concerning potential of diabetes risks to road mishaps. Hence, the aims of the present study were to access the degree of their knowledge about the potential risks associated with driving among people with diabetes. It also aimed to assess whether the doctors are aware of and follow the rules and recommendations about diabetes and driving in order to prevent the occurrence of road accidents.

Materials and Methods

An online survey was generated using a Google form that was then distributed to medical doctors via WhatsApp across Nigeria.

The survey was for a period of four (4) weeks. Reminders were sent regularly to WhatsApp platforms until convenient sample size was obtained. The composition of the questionnaire was based on extensive review of similar studies online.[7,8]

Questionnaire

The questionnaire was structured, consisting of two sections. The first section includes participants' demographics information (age, gender, specialty, job title, duration of practice, frequency, and percentage of patients with diabetes seen by the physician compared to other patients), their awareness of the recommendations regarding diabetes and driving, and whether they had a patient who had experienced a driving mishap resulting from diabetes. Section 2 was developed to assess the physician's knowledge toward diabetes and driving specifically. The participants were also asked about diabetes as a driving risk; if they discuss diabetes and driving with their patients; if they advise their patients to self-monitor blood glucose before driving and below which glucose level it is not safe to drive; if for them, impaired awareness to hypoglycaemia and severe hypoglycaemia might be contraindications to driving. Ethical approval was obtained from the Ethics Committee, Ladoke Akintola University of Technology, (LAUTECH) Teaching Hospital, Ogbomoso.

Statistical analysis

IBM Statistical Package for the Social Sciences (SPSS) Statistics for Windows, version 21 (IBM Corp., Armonk, N.Y., USA) was used for data analysis. Descriptive statistics such as the mean, standard deviation, frequency distribution, and percentages were used. The level of significant is less than 0.02(p<0.02).

Results

A total of 102 medical doctors of different cadres completed the survey. Sixty-four point seven percent (64.7%) were males with overall mean age of 40.9 (8.6) years. The majority, 83 (81.4%) of the respondents were from the south-western part of the country. Consultants/specialists (49.0%) formed the bulk of the physicians in the study group, while Internal Medicine (43.1%) was the most common specialty, then Surgery (8.8%) as shown in Table 1.

Sixty-two (60.8%) had practiced medicine for more than 10 years while 21 (20.6%) had been in practice for 5-10 years. Fifty-eight participants (56.9%) had received some form of formal training in endocrinology/diabetes-related programme but only a third

Table 1. Summary of participants' demographic characteristics.

Variables	n / (%)
Sex category	
Female	36 (35.3)
Male	66 (64.7)
Geographical Region	
South West	83 (81.4)
South South	8 (7.8)
South East	1 (1.0)
North Central	9 (8.8)
North East	1 (1.0)
Rank (Job Title)	
Consultant	50 (49.0)
Resident Doctor	28 (27.5)
Medical Officer	17 (16.7)
House Officer (Medical Intern)	6 (5.9)
Other	1 (1.0)
Specialty	
Family medicine	8 (7.8)
Internal medicine	44 (43.1)
Surgery	9 (8.8)
Obstetrics & Gynaecology	4 (3.9)
Child health & Paediatrics	5 (4.9)
Other	32 (31.4)
Proportion of patients with diabetes among patients seen	
< 10%	38 (37.3)
10- 29%	29 (28.4)
30 - 49%	18 (17.6)
≥ 50%	17 (16.7)
Primary Practice setting	
Private	8 (7.8)
Public	47 (46.1)
Academic	45 (44.1)
Other	2 (2.0)
Duration of practice	
< 2 years	14 (13.7)
2 – 5 years	5 (4.9)
6 – 9 years	21 (20.6)
≥ 10 years	62 (60.8)
Have you received Post graduate training in endocrinology/diabetes?	
Yes	58 (56.9)
No	44 (43.1)

(34.3%) of the study participants claimed competence with prescription of insulin in the management of diabetes. Sixty-eight (66.7%) were not aware of recommendations for insulin-treated patients with diabetes and safe driving and only a third (33.3%) had ever discussed the possible risk of road traffic crashes with insulin-treated patients in clinic setting at least occasionally.

Majority of the respondents knew that hypoglycaemia (97, 95.1%) and retinopathy (93, 92.2%) predispose to road traffic accidents, while fewer (69, 67.6%) were aware that neuropathy may also be a risk factor. Three-quarters of study participants (77, 75.0 %) knew that insulin-treated patients with diabetes required evaluation for their ability to drive (Table 2). However, only 31 (32.6%) participants correctly answered that that it is necessary that patients check blood glucose levels not later than 30 minutes

Table 2. Physicians' knowledge regarding diabetes as a potential risk factor for road traffic accidents.

Variables	n (%)
Do you consider diabetes as a potential risk for road traffic crashes?	
Yes	93 (91.2)
No	3 (2.9)
Don't know	6 (5.9)
Are you aware of the recommendations for insulin-treated patients with diabetes and safe driving?	
Yes (Aware)	34 (33.3)
No (Unaware)	68 (66.7)
Have you ever discussed the possible risk of road traffic crashes with insulin-treated diabetes patients before?	
Yes	34 (33.3)
No	68 (66.7)
If Yes to the question above, how often do you do it?	
Often	8 (14.7)
Occasionally	21 (61.8)
Rarely	5 (14.7)
Which of these diabetes risks do you think can predispose to road traffic crashes? **	
Hypoglycaemia	97 (95.1)
Retinopathy	92.2 (92.2)
Neuropathy	68 (66.7)
Do you assess patients with diabetes for eligibility to drive motor vehicle?	
Routine for all patients	3 (2.9)
Occasionally for some group	20 (19.6)
No	79 (77.5)
If answered yes, to the question above, in which categories of diabetic patients do you assess for eligibility to drive? **	
Patients on Insulin	13 (56.5)
Patients with Retinopathy	18 (78.3)
Patients with Neuropathy	11 (47.8)
Patients with Hypoglycaemia	15 (65.2)
All diabetic patients	8 (34.8)
Have you ever had a patient who experienced driving mishaps due to his diabetes?	
Yes	16 (15.7)
No	86 (84.3)
How competent are you to prescribe insulin to manage diabetes condition?	
Not competent	2 (2.0)
Minimally competent	17 (16.7)
Moderately competent	48 (47.1)
Very competent	35 (34.3)
In your opinion, which of the following are the reasons for not screening for eligibility to drive by diabetic patients? **	
Don't know if required	30 (29.4)
Never heard of recommendation to screen	67 (65.7)
Patient won't comply	19 (18.6)
What is your view regarding the development of clinical practice guidelines on the safety assessment of eligibility to drive a vehicle by diabetes patients?	
Much needed, as clear guidelines on the topic are lacking	69 (67.6)
Helpful	31 (30.4)
Not necessary, as the screening will not be complied with	2 (2.0)
Insulin–treated patients with diabetes require evaluation for their ability to drive?	n = 95
Yes	77 (81.1)
No	1 (1.1)
Don't know	17 (17.9)
Insulin-treated patients with diabetes need to check their blood glucose before driving?	n = 95
Yes	74 (77.9)
No	8 (8.4)
Don't know	13 (13.7)

** Multiple responses.

before driving, while 51 (53.7%) respondents correctly knew the need to wait for at least 30-45 minutes after treatment of mild to moderate hypoglycaemia before driving. Although 72% agreed that insulin-treated patients need to check their blood glucose before driving, only 37.9% knew the acceptable blood glucose level considered safe to drive. While 12.6% knew the recommended frequency and time at which to recheck blood glucose levels during a long trip, only 4.5% of study participants advised their patients to test their blood glucose levels prior to driving (Table 3). Sixty-seven participants (67.0%) believed that development of clinical practice guidelines on the safety assessment of eligibility to drive a vehicle by people living with diabetes is much needed, as clear guidelines on the topic are lacking.

Discussion

This is the first study in Nigeria to the best of our knowledge that has evaluated knowledge of medical doctors on safety issues among drivers who have diabetes. While only one-thirds of participants identified the importance of evaluating their patients for their ability to drive, and same one-thirds were aware of the recommendations for drivers with insulin-treated diabetes and safe driving; this represent a significant deficiency in the knowledge level. Similar study in Saudi Arabia reported that two-thirds of their physicians were aware of the recommendations for drivers with insulin-treated diabetes and safe driving.[9] Although one-thirds of our physicians knew that insulin-treated patients requires evaluation for safe driving, but only 4.5% ever informed patients to check their blood glucose prior to driving. Hence, this represents non-translation of knowledge to clinical practice. Knowledge of the need to check blood glucose levels before driving and the importance of not driving immediately after effective treatment of mild to moderate hypoglycaemia was also suboptimal; these are important factors when assessing safe driving in patients with diabetes. Many physicians in our study do not know the blood glucose levels below which it is considered safe to drive within the hypoglycaemic range. Therefore, it will be difficult for these healthcare providers to inform their patients with diabetes of the precautions they need to take to minimize their risk on the road and ensure safe driving. This would also limit them from educating their patients of the risk associated with driving with hypoglycaemic symptoms, which is considered as a major cause of accidents among diabetic drivers.[10,11] Hypoglycaemia-induced traffic accidents can be prevented by checking the blood glucose level in insulin-treated patients with diabetes before driving and after 2 hours of driving.[12] In our study, only 37.9% were able to identify the correct level of blood glucose at which it is safe for the patient to drive. This is higher than finding in a Scottish study which showed that 13% of health care professionals thought it safe to drive with blood glucose <72 mg/dL (4 mmol/L).[12] These findings indicate that majority of our physicians had low knowledge regarding diabetes and safe driving, and that they underestimated the potential risk of hypoglycaemia while driving in patients with diabetes. Hence, physicians managing vehicle drivers with diabetes particularly those on insulin, need accurate knowledge on various aspects of diabetes condition, complications and treatments that have the potentials of causing road traffic accidents and measures required to mitigate them.

Evaluation of drivers with diabetes must include whether the driver has conditions that can impair his or her ability to safely operate a motor vehicle. The treating physician who is knowledge-

Table 3. Physicians' awareness on the recommendations for drivers with insulin-treated diabetes and safe driving.

Variables	n (%)
The level of blood glucose which is safe for the patient to drive is?	
> 4mmol/L	27 (28.4)
>5mmol/L	36 (37.9)
>6mmol/L	15 (15.8)
>7mmol/L	4 (4.2)
Don't know	13 (13.7)
The recommended time for checking blood glucose before driving is?	
Just before driving	17 (17.9)
30 minutes before	31 (32.6)
60 minutes before	2 (2.1)
90 minutes before	2 (2.1)
Don't Know	43 (45.3)
Persons with diabetes should not drive after effective treatment of mild to moderate Hypoglycaemic until at least…	
5 to 10 minutes	. (0.0)
15 to 20 minutes	5 (5.3)
30 to 45 minutes	51 (53.7)
Don't know	39 (41.1)
Driving long-time trip, the recommended time for rechecking blood glucose is?	
Every hour	8 (8.4)
Every two hours	12 (12.6)
Every three hours	4 (4.2)
Every four hours	23 (24.2)
Don't Know	48 (50.5)
Do you agree that patient with insulin-treated diabetes needs any form of restrictions on their driving licensing in order to promote road safety?	
Strongly agreed	33 (35.1)
Agreed	29 (30.9)
Somewhat agreed	21 (22.3)
Disagreed	11 (11.7)

able about diabetes is the best source of information concerning the driver's diabetes management and history. The input of such a physician is essential to assess a person's diabetes management and determine whether operation of a motor vehicle is safe and practicable. Although the definition of safe practice is debatable for drivers with diabetes, any of the following situations is unsatisfactory: not measuring blood glucose before driving; not carrying carbohydrate when driving; not stopping the vehicle when driving to self-treat hypoglycaemia; and believing that a blood glucose level below 54mg/dL is compatible with safe driving. In our study, almost two-third of the participants in this study failed to identify one or more of this basic standard of safety. The single most significant factor associated with driving collisions for drivers with diabetes appears to be a recent history of severe hypoglycaemia, regardless of the type of diabetes or the treatment used.[2,13-16] Hence, all measures should always be taken to limit occurrence of hypoglycaemia among diabetics especially the insulin-treated ones. Also, individuals whose diabetes poses a significantly elevated risk to safe driving must be identified and evaluated prior to getting behind the wheel.

Conclusions

Doctors' knowledge of fitness to drive was overall inadequate. This has obvious implications for the drivers with insulin-treated diabetes and the public at large. We suggest that this lack of knowledge should be remedied by giving the subject more attention both in undergraduate and postgraduate education from which it is almost completely untaught. It is suggested that teaching on management of diabetes should include questions on fitness to drive and regular assessment of predisposition to road mishaps especially those prone to severe hypoglycaemia.

References

1. Frier BM. Living with hypoglycaemia. In: Frier BM, Heller SR, McCrimmon RJ, editors. Hypoglycaemia in Clinical Diabetes. 3rd ed. Chichester: John Wiley & Sons; 2014. p. 369–8.
2. Lorber D, Anderson J, Arent S, Cox DJ, Frier BM, Greene MA, et al. Diabetes and driving. Diabetes Care 2014;37:97–103.
3. Warren RE, Frier BM. Hypoglycaemia and cognitive function. Diabetes Obes Metab 2005;7:493–503.
4. Graveling AJ, Deary IJ, Frier BM. Acute hypoglycaemia impairs executive cognitive function in adults with and without type 1 diabetes. Diabetes Care 2013;36:3240–6.
5. Graveling AJ, Frier BM. Driving and diabetes: problems, licensing restrictions and recommendations for safe driving. Clin Diabetes Endocrinol 2015;1:8.
6. Cox DJ, Singh H, Lorber D. Diabetes and driving safety: Science, ethics, legality & practice. Am J Med Sci 2013;345:263.
7. Beshyah SA, Beshyah AS, Yaghi S, et al. A global survey of licensing restrictions for drivers with diabetes. Br J Diabetes Vasc Dis 2017;17:3–10.
8. Riddick FA Jr. The code of medical ethics of the american medical association. Ochsner J 2003;5:6-10.
9. Mohammed AB, Ayedh KA, Mohammed AA, et al. Diabetes and driving recommendations among healthcare providers in Saudi Arabia. Saudi Med J 2018;39:386–94.
10. Hassoun AA, Abdella N, Al Arouj M, et al. Driving and diabetes mellitus in the Gulf Cooperation Council countries: Call for action. Diabetes Res Clin Pract 2015;110:91–4.
11. McCrimmon RJ, Deary IJ, Huntly BJ, et al. Visual information processing during controlled hypoglycaemia in humans. Brain 1996;119:1277–87.
12. Watson W, Currie T, Lemon J, Gold A. Driving and insulin treated diabetes: Who knows the rules and recommendations? Pract Diab Int 2007;24:201–6.
13. Lee JD. Fifty years of driving safety research. Hum Factors 2008;50:521–8.
14. Moon S, Ranchet M, Tant M, et al. Comparison of unsafe driving across medical conditions. Mayo Foundation Med Educ Res 2017;92:1341–50.
15. Diabetes E, Safety CMV. Plymouth meeting. Pennsylvania: ECRI; 2011.
16. Hostiuc S, Negoi I, Hostiuc M. Diabetes and collision risk. A meta-analysis and meta-regression. Int J Clin Pract. 2016;70:554–68.