



## Short article

## Driving with diabetes: What is the Portuguese doctors' and patients' knowledge?



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## ABSTRACT

**Introduction:** In the last years there was an increasing interest about diabetes and driving. Nowadays there are strict rules for diabetic drivers in most countries. The aim of this study was to assess whether the patients and the doctors were aware of the rules and recommendations in Portugal.

**Methods:** An anonymous questionnaire was applied to diabetic patients who were drivers attending our center for 8 weeks. A web-based questionnaire was e-mailed to the Endocrinology, Diabetes and Metabolism Portuguese Society and Diabetes Portuguese Society associates.

**Results:** Ninety-three patients were surveyed. Only 20 patients had discussed this subject with their doctor and 69.9% thought there was not any risk to driving by being a diabetic. Twenty-nine percent never tests blood glucose prior to driving and for the majority it is safe to drive until blood glucose is 60 mg/dl. One patient reported a crash due to hypoglycemia. Eighty-eight doctors completed the questionnaire. Fourteen did not associate diabetes with an increased risk of car accidents and 59.1% discuss the driving and diabetes issue with less than 50% of their diabetic patients. Only 54% advise their patients to test blood glycaemia prior to driving and for 46.6% it is safe to drive with blood glucose lower than 90 mg/dl. Sixteen did not know recurrent hypoglycemia was a contraindication to driving and eight that impaired awareness of hypoglycemia might also be a contraindication.

**Discussion/conclusions:** This study shows a lack of patients' knowledge about safe driving and the rules they must follow. In our opinion, it is fundamental to improve doctor's and patients' knowledge in this subject.

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## Conduzir com diabetes: Qual o conhecimento dos médicos e dos doentes portugueses?

## RESUMO

**Introdução:** Nos últimos anos tem-se registado aumento do interesse sobre o tema Diabetes e Condução. Existem regras definidas, na maioria dos países, para os condutores com diabetes. O objectivo deste estudo foi avaliar o conhecimento dos médicos e dos doentes sobre as regras e recomendações vigentes em Portugal.

**Métodos:** Foi aplicado um questionário anónimo aos doentes diabéticos condutores observados no nosso centro durante 8 semanas. Um questionário electrónico foi enviado aos sócios da Sociedade Portuguesa de Endocrinologia, Diabetes e Metabolismo e da Sociedade Portuguesa de Diabetes.

**Resultados:** Foram inquiridos 93 doentes. Vinte haviam discutido este tema com o seu médico. Para 69,9% não há risco em conduzir sendo diabético, 29% nunca testam a glicemia capilar antes de iniciar a condução e a maioria considerou ser seguro conduzir com um valor de glicemia até 60 mg/dl. Um doente referiu um acidente por hipoglicemia. Oitenta e oito médicos responderam ao questionário. Catorze não associavam a diabetes a aumento do risco de acidentes e 59,1% discutiam este tema com menos de 50% dos seus doentes diabéticos. Apenas 54% aconselhava a realizar pesquisa de glicemia antes de conduzir e 46,6% considera

## Palavras-chave:

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ser seguro conduzir com glicemia inferior a 90 mg/dl. Dezasseis desconheciam que hipoglicemia é uma contra indicação para a condução e 8 que o não reconhecimento do estado de hipoglicemia também o é. *Discussão e conclusão:* Este estudo demonstra falta de conhecimento dos doentes sobre uma condução segura. Na opinião dos autores, é imperativo melhorar o conhecimento dos doentes e dos profissionais de saúde sobre este assunto.

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## Introduction

In recent years there has been an increasing concern about Diabetes and driving. As a result, most countries impose strict rules to diabetic drivers.

The increased crash risk for diabetic patients is not fully established. A recent meta-analysis concluded that the magnitude of increased crash risk for diabetic people, when compared with comparable drivers, was weak and not statistically significant (Risk ratio = 1.126).<sup>1</sup> On the other hand, some studies indicated that type 1 diabetic drivers are at increased risk for driving mishaps and that there is no increased risk for type 2 diabetic drivers, even on insulin.<sup>2,3</sup>

Diabetes could impair the ability to drive due to side effects from the treatment of diabetes (mainly hypoglycaemia) and the potential risk imposed by the developing complications as retinopathy or cataract formation impairing vision and neuropathy affecting the ability to feel foot pedals.<sup>2,4</sup> Research studies have demonstrated that hypoglycaemia is a significant factor in impaired driving.<sup>2</sup> Cox and colleagues have documented driving impairment at relatively mild hypoglycaemia (61–72 mg/dl).<sup>5</sup> As driving performance decline at lower levels of glycaemia, patients' decisions concerning driving or taking correct action may also be compromised.<sup>6</sup> Hypoglycaemia unawareness is another concerning issue because these patients are more likely to drive during hypoglycaemia.<sup>6</sup>

To avoid car crashes patients who are at risk for disruptive hypoglycaemia should be counselled to: carry a blood glucose meter and some sugar source in their vehicle; always measure blood glycaemia before driving; never begin an extended drive with low normal blood glucose (70–90 mg/dl) without prophylactic carbohydrate consumption; stop the vehicle as soon as any of the symptoms of low blood glucose are experienced; measure and treat the blood glucose level; not resume driving until their blood glucose and recognition have recovered.<sup>4</sup>

The European Union published a directive in 2009 in order to harmonize rules about driving licensing in member states.<sup>7</sup> According to this directive, in Portugal there are new rules for diabetic drivers since January 2013. Group 1 drivers are considered unfit to drive if they have severe or recurrent hypoglycemia. Group 2 drivers need to present a medical report certifying they have good diabetes control, have not had any severe or recurrent hypoglycemia in the last twelve months and that there are not any other diabetes complications.

The aim of this study was to assess whether the patients and the doctors are aware and follow the rules and recommendations about diabetes and driving in Portugal, mainly in order to avoid the occurrence of hypoglycaemia.

## Methods

### Subjects

From all the diabetic patients who attended our Diabetes Centre during an 8-week period we selected the ones who had driven within the two preceding years. The study was approved by the

Hospital Ethics Committee. Verbal consent was obtained from all patients and anonymity was maintained.

A web-based questionnaire was e-mailed to the Endocrinology, Diabetes and Metabolism Portuguese Society and Diabetes Portuguese Society associates. In total, 88 doctors answered the questionnaire.

### Questionnaire

Patients were given a questionnaire that they themselves completed in the clinic. They were asked about clinical information, if they had ever talked about diabetes and driving with their doctor, if for them there were any risks to drive being a diabetic, blood glucose testing in relation to driving, hypoglycaemia and driving and history of car crashes due to hypoglycaemia.

We asked doctors about diabetes as a driving risk; if they discuss diabetes and driving with their patients; if they advise their patients to test 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.

### Analysis

SPSS version 20 was used. Categorical variables were compared using chi-square tests. Statistical significance was accepted at  $p < 0.05$ .

## Results

### Patients

Ninety-three patients completed our questionnaire. Sixty-four (69%) were male and 29 (31%) female. Mean age was 59 ± 14.4 years. Fifteen (16.1%) had type 1 diabetes and 78 type 2 diabetes (83.9%). Forty-three patients were on oral medication (46.2%) and 50 patients (53.8%) on insulin (Table 1).

Only 20 (21.5%) patients had discussed this subject with their doctor. No differences were found between patients who were or were not using insulin. For the majority (65, 69.9%) there is not

**Table 1**  
Patients' characterization.

Sex	
Male	64 (68.8%)
Female	29 (31.2%)
Age (years)	59 ± 14.420–87
Diabetes mellitus	
Type 1	15 (16.1%)
Type 2	78 (83.9%)
Diabetes duration (years)	13.35 ± 10.05
Therapeutic	
Oral agents	43 (46.2%)
Insulin	27 (29%)
Insulin + oral agents	23 (24.8%)

**Table 2**  
Patients' answers to the questionnaire.

	N (%)
<i>Has your doctor ever talked to you about Diabetes and Driving?</i>	
Yes	20 (21.5)
No	73 (78.5)
<i>Do you think there is any risk to driving being a diabetic person?</i>	
Yes	28 (30.1)
No	65 (69.9)
<i>How many times do you test your blood sugar before driving?</i>	
Always	19 (20.4)
Frequently	25 (26.9)
Rarely	20 (21.5)
Never	27 (29.0)
<i>Is there any glucose level below which you think isn't safe to drive?</i>	
Yes	66 (71.0)
No	27 (29.0)
<i>If you said yes, which value?</i>	
<60 mg/dl	44 (47.3)
<90 mg/dl	5 (5.4)
<110 mg/dl	4 (4.3)
<130 mg/dl	15 (16.1)
<i>Do you have any source of sugar in your car?</i>	
Yes	60 (64.5)
No	33 (35.5)
<i>Have you had a hypoglycaemia during driving in the last two years?</i>	
Yes	8 (8.6)
No	85 (91.4)
<i>Have you had a car accident due to hypoglycaemia in the last two years?</i>	
Yes	1 (1.1)
No	92 (98.9)

any risk to drive being a diabetic. Only 19 patients (20.4%) always tested and 27 patients (29%) would never test blood glucose prior to driving. Seventy-one percent considered there is a blood glucose level from which it is not safe to drive. Most of them (43.7%) think it is safe to drive until blood glucose is 60 mg/dl, 5.4% believe it is not safe to drive with glycaemia lower than 60 mg/dl, 5.3% lower than 110 mg/dl and 16.1% lower than 130 mg/dl. Sixty patients (64.5%) always carry some source of sugar while driving. Eight patients have experienced at least one hypoglycaemia while driving in the last two years, but only one reported a crash due to hypoglycaemia (Table 2).

### Doctors

Eighty-eight doctors completed the questionnaire. Sixty-nine percent were specialists of Endocrinology, Diabetes and Nutrition, 16% were Internists specialized and dedicated to Diabetology and 15% were family doctors. Fourteen doctors (16%) did not associate diabetes with an increased risk of car accidents. The majority (59.1%) discuss the driving and diabetes issue with less than 50% of their diabetic patients who are drivers, 23% with more than 50% of their patients, 7% with all of their patients and 11% never do it. Only 45.9% advise their patients to test blood glycaemia prior to driving. For 47.1% it is safe to drive until blood glucose is under 60 mg/dl, for 45.9% until 90 mg/dl and for 7% until 110 mg/dl. Sixteen (18.2%) did not know recurrent hypoglycemia was a contraindication to driving and eight (9%) that impaired awareness of hypoglycemia might also be a contraindication.

### Discussion

This study shows a lack of patients' knowledge about safe driving and the rules they must follow. It is alarming that only a small percentage of patients had discussed diabetes and driving with

their doctor. Probably this is why the majority of patients do not know there is a risk to driving by being a diabetic person. To assess the fitness to drive, a driver in risk of having a hypoglycaemia must know his blood glycaemia. Given the fact that 53.8% of the patients were on insulin, it is disconcerting that only 20.4% always measure blood glucose prior to driving. Using a threshold of 90 mg/dl as the limit to drive provides a larger blood glucose range before the driver's blood glucose levels decrease to a point where driving is significantly impaired.<sup>2</sup> Because of this, it is concerning that for almost half the drivers 60 mg/dl was the minimum blood glucose level for safe driving. Treating hypoglycaemia appropriately while driving is vital. So, it is comfortable to know that almost two-thirds of the drivers always carry sugar with them while driving. As the majority of patients do not know the importance of having normal glucose levels during driving, it is more probable that patients carry sugar because they are afraid of having hypoglycaemia in general and not specially during driving.

The answers given by health professionals show this subject is not a priority on diabetic patients' education for Portuguese doctors who treat diabetes. It is disturbing that fourteen doctors (15.9%) do not associate diabetes with an increased risk for driving and the majority only speaks about this theme with few patients. These answers show that doctors are not aware of the rules their patients must follow.

In our opinion, it is a limitation in the few number of type 1 diabetic persons interviewed. This sample represents the diabetic population in our center that is mainly composed by type 2 diabetics. This weakness was overpassed by the number of patients using insulin: more than half. The large number of males in this study results from the fact that older males are more likely to drive than women. The doctors were selected from a pool of health professionals interested in Diabetes once they were all members of the Endocrinology, Diabetes and Metabolism Portuguese Society or of the Diabetes Portuguese Society. These could provoke a bias in doctor's answers.

These results are similar to two other studies concerning patients' knowledge about this theme. They showed that patients' education needs to be improved.<sup>8,9</sup> In another study from the United Kingdom, 117 patients with insulin-treated diabetes and 106 doctors were interviewed. In this country patients are obliged to inform the Driving and Vehicle Licensing Agency if they are on insulin. Despite this obligation, they conclude that patients do not follow the rules properly and that doctors need a greater availability of information about this subject.<sup>10</sup>

This is the first study in our country concerning diabetes and driving. In our opinion these results are really important to show the reality and how far are the rules from the real practice. In fact this is an issue forgotten most of the times but if the patients do not follow the rules to be safe drivers then their driving license is not renewed. This study is important to support the need to institute in our country rules concerning Diabetes and driving.

### Conclusions

This study shows a lack of patients' knowledge about safe driving and the rules they must follow. On the other hand, doctors' knowledge and preoccupation with this subject seems not to be enough. We would recommend a reinforcement of the medical staff information on this subject, in order to improve the education given to our patients. To reach this, it is important to establish rules for patients and health professionals to follow.

### Conflicts of interest

The authors have no conflicts of interest to declare.

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