Short communication

Risk factors for severe hypoglycaemia in type 2 diabetic patients admitted to hospital in Piraeus, Greece

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عوامل اختطار النقص الشديد في سكر الدم لدى مرضى السكري من النمط الثاني المقبولين بإحدى مستشفيات مدينة بيريوس باليونان

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الخلاصـة: في دراسة استغرقت ثلاث سنوات تم تقييم معدَّل انتشار وأسباب الإصابة بالنقص الشديد في سكر الدم المرتبط بالمعالجة الدوائية لدى مرضى السكري من النمط الثاني المقبولين بالقسم الباطني في أحد مستشفيات مدينة بيريوس باليونان. ومن بين 2858 مريضاً من مرضى النمط الثاني هؤلاء، كان 207 (7.2٪) منهم مصابين بنقص حاد في سكر الدم: منهم 72 يُعالَجون بالإنسولين، و132 يتعاطون أدوية مخفضة للسكر عن طريـق الفـم، و3 يتلقون علاجاً مشتركاً مؤلفاً من الأدوية والإنسولين. وكان 28.5٪ فقـط مـن هـؤلاء المرضى يراجعـون عيـادات علاج السكري. وقد تم تحديد سبب الإصابة بنوبة انخفاض سكر الدم لدى 86.1٪ مـن الحـالات، وكـان السـبب لدى 30.8٪ منهم هو عدم تناول إحدى الوجبات. وأوضـحت المقـابلات الـتي أجريـت مـع المرضى أن مسـتوى الوعي والمعرفة بالداء السكري وخاصة أعراض انخفاض سكر الدم لم يكن بالقدر المطلـوب. وقـد أوضـح التحليـل باستخدام طريقة التحـوُّف regression اللوجـستي أن وعـي ومعرفة المرضى بالـداء السـكري مـرتبط بالمسـتوى التعليمي وبمدى مراجعة المرضى لعيادات السكري.

ABSTRACT A 3-year study assessed the prevalence and causes of severe treatment-related hypoglycaemia in type 2 diabetes mellitus patients admitted to hospital in Piraeus. Out of the 2858 patients admitted, 207 (7.2%) had severe hypoglycaemia: 72 were being managed with insulin, 132 oral hypoglycaemic drugs and 3 combined insulin/oral drugs. Only 28.5% of patients were attending a diabetes clinic. The cause of the hypoglycaemic attack could be determined for 86.1% of cases; 30.8% were due to a missed meal. Interviews showed that education and level of knowledge about diabetes mellitus, and particularly hypoglycaemia symptoms, was inadequate. Logistic regression analysis showed that knowledge about diabetes mellitus correlated with educational status and with follow-up in a diabetes clinic.

Facteurs de risque d'hypoglycémie sévère chez des patients diabétiques de type 2 hospitalisés au Pirée (Grèce)
RÉSUMÉ Une étude sur trois ans a permis d'évaluer la prévalence et les causes de l'hypoglycémie sévère associée au traitement chez des patients atteints de diabète sucré de type 2 hospitalisés au Pirée. Parmi les 2858 patients hospitalisés, 207 (7,2 %) avaient une hypoglycémie sévère ; 72 étaient traités par insuline, 132 par hypoglycémiants oraux et 3 par l'association insuline antidiabétiques oraux. Seuls 28,5 % des patients consultaient dans une clinique du diabète. La cause de la crise d'hypoglycémie a pu être déterminée pour 86,1 % des cas, 30,8 % étant dus à un repas sauté. Les entretiens ont montré que l'éducation et le niveau de connaissances sur le diabète sucré, et en particulier les symptômes d'hypoglycémie, étaient insuffisants. L'analyse de régression logistique a indiqué qu'il y avait une corrélation entre les connaissances sur le diabète sucré, le niveau d'instruction et le suivi dans une clinique du diabète.

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Introduction

Severe hypoglycaemia is an important adverse effect of diabetes mellitus treatment and is accompanied by considerable morbidity and mortality [1,2]. In the study of Miller et al., treatment-related severe hypoglycaemia in a specialty diabetes centre occurred in only 3 patients (0.5%), all due to insulin treatment [3]. In such a setting, patients have strict goals for achieving optimal glycaemic control, are closely followed for disease complications and drug side-effects and receive intensive education about diabetes mellitus and the signs and symptoms of hypoglycaemia. Without such care, all these factors are unlikely to be achieved in everyday practice [4,5].

We performed a 3-year study to assess the prevalence and problems of severe treatment-related hypoglycaemia in type 2 diabetes mellitus patients admitted to a hospital medical department in Piraeus, Greece. We studied the risk factors for hypoglycaemia in terms of management of diabetes and patients' knowledge about diabetes mellitus and hypoglycaemia.

Methods

This study included patients with type 2 diabetes mellitus admitted to the medical department of the General Hospital of Nikaea, Piraeus due to severe hypoglycaemia. During this 3-year period (November 1996 to November 1999) a total of 3767 cases of diabetes mellitus were admitted for various reasons; 3631 of these were type 2 diabetes mellitus. Some cases were admitted more than once, so the total number of different type 2 diabetes mellitus patients was 2858.

The criteria for diagnosis of severe hypoglycaemia were: comatose or pre-comatose status (according to the Glasgow coma scale) on arrival at the emergency ward, serum glucose level < 2.8 mmol/L (50 mg/dL) and necessity for intravenous glucose administration for resuscitation. Glycosylated hemoglobin (HbA1c) levels were also measured.

Structured interviews were performed with patients and their close relatives after recovery to ascertain patients' demographic details, including education status, the management of their condition (current treatment for diabetes and follow-up attendance at a diabetic clinic) and the cause of the hypoglycaemic attack. A previously designed questionnaire [6] assessed patients' level of knowledge about diabetes mellitus. The questionnaire had 33 items in 5 sections: demographic data and history of diabetes (8 items, not scored); symptoms and complications (8 items); treatment and management (6 items); risk factors (5 items) and monitoring (6 items). Scoring was 1 point per each correct response; maximum score 25. The cut-off score for a good level of knowledge was 65% items correct.

The data were analysed using *SPSS*, version 8.0 for Windows. Means and standard deviations (SD) were computed. Statistical analysis was performed using Student's *t*-test for intra- and inter-group comparisons of continuous variables. A logistic regression analysis in a backwards stepwise approach was performed using the knowledge level about diabetes mellitus as the dependent variable and age, sex, educational status and follow-up in diabetes clinics as independent variables.

Results

Out of the 2858 type 2 diabetes mellitus patients admitted for any reason, 207 (7.2%) were admitted due to severe hypoglycaemia (85 males, 122 females). The demographic and clinical characteristics of

the patients are shown in Table 1. The mean (SD) age was 62.1 (8.7) years and the mean duration of diabetes was 7.4 (2.8) years.

Table 1 **Demographic and clinical data of 207 diabetic patients**

Variable	Mean (SD)	Range
Age (years)	62.1 (8.7)	45–88
Duration of diabetes (years)	7.4 (2.8)	1–14
HbA1c level (%)	6.8 (1.3)	
	No.	**%**
Sex		
Male	85	41.1
Female	122	58.9
Presentation		
Coma	146	70.5
Semi-coma	61	29.5
Usual treatment		
Insulin	72	34.8
Sulfonylureas	132	63.8
Insulin and sulfonylureas	3	1.4
Follow-up in diabetes clinic		
Yes	59	28.5
No	148	71.5
Educational status		
Illiterate	28	13.5
Elementary	117	56.5
Middle	47	22.7
Higher	15	7.3
Diabetes knowledge		
Poor	175	85.4
Good	30	14.6
Causes of hypoglycaemia		
Missed meal	76	30.8
Chronic renal failure	54	21.9
Exercise	28	11.4
Alcohol	20	8.2
Dosage error	16	6.5
Unknown	34	13.9

SD = standard deviation.
HbA1c = glycosylated haemoglobin.

Out of these 207 patients, 72 (34.8%) were being managed with insulin, 132 (63.8%) were on oral hypoglycaemic drugs and 3 (1.4%) were being treated with a combination of insulin and oral hypoglycaemics. Only 28.5% of patients were attending a diabetes clinic.

Of the patients, 140 (70.5%) presented comatose. Of the 61 non-comatose patients, 28 (46.0%) reported adrenergic symptoms and 60 (98.3%) had neuroglycopaenia.

The cause of the hypoglycaemic attack was determined as a missed meal for 30.8% of patients and chronic renal failure for 21.9% (Table 1). No cause could be established for 13.9%.

The mean (SD) HbA1c level of the patients overall was 6.8% (1.3%). In the patients who were taking oral hypoglycaemics the mean (SD) HbA1c was 6.6% (1.2%), while in the insulin-treated group it was 7.1% (1.5%) ($P > 0.05$).

The mean (SD) venous serum glucose level of patients on arrival at the emergency department was 30 (9) mg/dL for insulin-treated and 33 (12) mg/dL for those on oral drugs ($P < 0.05$).

All patients recovered after administration of intravenous glucose and no fatalities occurred. Cerebrovascular ischaemic stroke was established in 2 patients, while 2 more patients suffered a transient ischaemic attack and 3 presented with convulsions which were not repeated or did not need anticonvulsant treatment.

The questionnaire was completed by 205 of the 207 patients and showed that the knowledge level of the patients about diabetes mellitus, and particularly hypoglycaemia symptoms, was poor. Knowledge was judged to be "good" in only 14.6% of the sample. In the logistic regression analysis, knowledge about diabetes mellitus correlated with educational status ($\beta = 0.499$, SE =

0.05, $P < 0.0001$) and with follow-up in a diabetes clinic ($\beta = 1.055$, SE = 0.08, $P < 0.0001$).

Discussion

In our study, out of the total of type 2 diabetes mellitus patients admitted to the medical department, 7.2% were admitted due to severe hypoglycaemia. The percentage of cases where no cause could be established was almost 14%, which is relatively low compared with other similar studies showing the percentage where a clear cause for severe hypoglycaemia could be established ranges from 11%–94% [7–10].

We found in our study, as in similar ones, that the causes of hypoglycaemia, especially the most frequent ones (meal omission, alcohol intake, co-existing disease with reduced food intake), respond to prompt intervention and can be managed to prevent hypoglycaemia episodes [11,12]. In our study about two-thirds of hospitalized severe hypoglycaemia cases were in patients being managed with oral hypoglycaemic drugs. This percentage was less in other studies: about 33% [10,13,14]. The high rate of hypoglycaemia related to oral hypoglycaemic treatment in our study is possibly explained by the fact that cases of insulin-related hypoglycaemia are managed without referral to the emergency department or are not admitted after prompt intravenous administration of 10% glucose and recovery in the emergency department.

Only 28.5% of the patients were attending a diabetes clinic, a low rate, and, as would be expected, attending a diabetes clinic correlated positively with the level of knowledge about diabetes mellitus. Furthermore, the majority of the sample (85.4%) had a poor level of knowledge about diabetes mellitus and hypoglycaemia. The low rate of diabetes clinic attendance and poor level of knowledge about diabetes suggests that primary care physicians in Greece devote little time to diabetic patients and their management and confirms the need for better diabetes care in primary care [15].

As the causes of hypoglycaemia are preventable in the majority of cases, efforts are needed to improve patients' level of education about diabetes mellitus to prevent hypoglycaemia. Such efforts should be the development and implementation of a programme focussed on the treatment and prevention of diabetes complications, together with continuing education programmes for primary health care professionals.

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