

Prevalence of missed hyperglycaemia among Jordan University Hospital mortality discharges, 1995–97

E. Younis,¹ A. Badheeb,¹ H. Ajlouni,¹ S.A. Kareem¹ and K. Ajlouni¹

معدل انتشار فرط سكر الدم غير المشخص بين حالات الوفاة الخارجة من مستشفى الجامعة الأردنية، 1997-1995

إيناس يونس وأحمد باذيب وهيثم العجلوني وسمية عبد الكرم وكامل العجلوني

خلاصة: من أجل دراسة معدل انتشار الحالات المشخصة وغير المشخصة من فرط سكر الدم، تم الحصول على بيانات من مستشفى الجامعة الأردنية عن كل وفيات المستشفى ممن تبلغ أعمارهم عشرين سنة أو أكثر، وذلك خلال الأعوام 1995-1997. وقد اعتبرت حالة فرط سكر الدم بأنها كل حالة يبلغ فيها مستوى غلوكوز الدم على الريق 140 ميلليغرام/ديسيلتر أو أكثر، أو يبلغ فيها مستوى غلوكوز الدم في فحصين عشوائيين أو أكثر 200 ميلليغرام/ديسيلتر أو أكثر، أو كلا الحالتين المذكورتين معاً. ولقد وجد أن معدل انتشار السكري المشخص يبلغ 35.3%، في حين أن 19.2% كانت حالات غير مشخصة من فرط سكر الدم. ومن بين الحالات غير المشخصة كان مستوى سكر الدم أكثر من 250 ميلليغرام/ديسيلتر في 65.7% من الحالات. وهكذا فإن معدل انتشار فرط سكر الدم غير المشخص مرتفع بين المرضى الداخليين بالمستشفى. مما يتعين معه على الأطباء وغيرهم من العاملين بالمهن الصحية توخي مزيد من الحذر لدى استعراض النتائج المخبرية، وخصوصاً تلك المتعلقة بالسكري.

ABSTRACT To study the prevalence of recognized and unrecognized hyperglycaemia (defined as fasting blood glucose ≥ 140 mg/dL and/or random blood glucose ≥ 200 mg/dL on two or more occasions), data were collected from Jordan University Hospital on all hospital deaths in those ≥ 20 years of age, for the years 1995–97. The prevalence of diagnosed diabetes was 35.3% and 19.2% were missed cases of hyperglycaemia; of the missed cases, 65.7% had a blood glucose level > 250 mg/dL. Thus, the prevalence of missed hyperglycaemia among hospitalized patients is high, and greater vigilance needs to be exercised by physicians and other health professionals in reviewing laboratory results, especially those related to diabetes.

Prévalence de l'hyperglycémie passée inaperçue dans les cas de décès de patients hospitalisés à l'Hôpital universitaire jordanien, 1995-1997

RESUME Afin d'étudier la prévalence de l'hyperglycémie reconnue et non reconnue (définie comme une glycémie à jeun ≥ 140 mg/dl et/ou une glycémie aléatoire ≥ 200 mg/dl en deux occasions ou plus), des données ont été recueillies par l'Hôpital universitaire jordanien sur tous les décès hospitaliers de personnes âgées de 20 ans et plus, pour les années 1995-1997. La prévalence du diabète diagnostiqué s'élevait à 35,3 % et 19,2 % étaient des cas d'hyperglycémie passés inaperçus ; 65,7 % des cas passés inaperçus avaient une glycémie > 250 mg/dl. La prévalence de l'hyperglycémie passée inaperçue est donc élevée chez les patients hospitalisés, et une plus grande vigilance doit être exercée par les médecins et les autres professionnels de la santé dans l'examen des résultats de laboratoire, notamment ceux liés au diabète.

¹Centre for Diabetes, Endocrinology and Genetics, Jordan University Hospital, Amman, Jordan.

Received: 01/02/00; accepted: 15/06/00

Introduction

The increase in prevalence of diabetes mellitus in industrialized and developing countries to epidemic levels [1,2] has not been accompanied by a commensurate increase in commitment by governments and responsible health care organizations to deal with this health threat [1]. The American Diabetes Association has published data indicating that despite diabetes being one of the most common and costly diseases in the United States (US), National Institute of Health funding allocated for research into diabetes is among the lowest [3]. This lack of regard is reflected in the low levels of physician awareness of the size of the problem, and the consequent inadequate care often provided to diabetics by specialists and primary health care physicians alike [4]. In a study by Ieventan et al. [5], 66% of daily patient progress notes failed to comment on the presence of hyperglycaemia or diabetes in a teaching hospital in the US. Similarly, in Jordan, although diabetes prevalence is high [2], physician awareness of the problem is not. The purpose of our study was to report the prevalence of diabetes among patients who died at Jordan University Hospital from January 1995 to December 1997, and to examine the prevalence of missed diabetes or hyperglycaemia by the attending team, in the presence of high glucose levels.

Methods

Jordan University Hospital is a 500-bed referral hospital serving all sectors of the health care system in Jordan. It is the main teaching hospital for the University of Jordan Medical School. Records of all patients

aged ≥ 20 years who died between January 1995 and December 1997 at the hospital were reviewed. Attention was paid to previously diagnosed diabetes cases and to the presence of abnormally high blood sugar readings recognized or missed by the attending team. Because autopsies are not performed in this hospital, we reviewed the cause of death noted in the case file. Sugar readings were deemed to be high where fasting blood sugar was ≥ 140 mg/dL and/or random blood sugar was ≥ 200 mg/dL on more than two occasions.

The attending team was considered to have recognized the presence of diabetes or hyperglycaemia if either:

- Initial history or any medical problem list indicated the diagnosis of diabetes or presence of hyperglycaemia.
- Diabetes was documented as a possible diagnosis in any progress notes.
- Hyperglycaemia was mentioned in the daily progress notes.
- Any medical therapy for the treatment of hyperglycaemia was prescribed.
- There existed any documented instructions for bedside glucose monitoring.
- There was documentation of hyperglycaemia in the discharge summary.
- A follow-up plan for further diabetes work-up or therapy was presented in the final progress notes or discharge summary.
- A change in diet, related to diabetes, was prescribed.

Cases excluded from consideration were those who had received intravenous glucose infusion on the same day the blood sugar readings were reported to be high, and those where a high blood sugar reading was recorded only once.

Results

There were 1100 total in-patient deaths at Jordan University Hospital in the period January 1995–December 1997, of which 872 were aged ≥ 20 years. After excluding 169 cases, the study population numbered 703 (404 males and 299 females). Of these, diabetes had been diagnosed in 242 cases (34.4%), while an additional 132 (18.8%) hyperglycaemic cases were missed by their attending physician. Of those missed, 75% had died in the internal medicine department and 25% in the surgical department.

Missed hyperglycaemia cases were found across all age groups (Table 1), with increased prevalence in the > 40 -year-old age group, when diabetes would typically be expected. Of the missed cases, 65.7%

had a blood glucose level > 250 mg/dL. Among the 404 males, diabetes was diagnosed in 120 cases (29.7%); 80 cases (19.8%) of hyperglycaemia were missed (Table 1). In the 299 females, diabetes was diagnosed in 122 cases (40.8%); 52 cases (17.4%) of hyperglycaemia were missed (Table 1). In 65.7% of all missed cases, blood glucose levels reached 250 mg/dL.

The most common conditions causing death among recognized diabetics (Table 2) were cardiac (31.9%) and cerebrovascular (19.0%). Among missed cases, the most common conditions causing death were malignancy (33.8%) and cerebrovascular (18.9%). Of those who did not have hyperglycaemia, malignancy (39.6%) and cerebrovascular conditions (12.0%) were the most common causes of death.

Table 1 Prevalence of recognized and unrecognized diabetes mellitus among patients who died at Jordan University Hospital by sex and age group, 1995–97

Sex and age group (years)	Non-diabetics		Diabetics				Total No.	Ratio of missed: recognized
	No.	%	Recognized		Missed			
	No.	%	No.	%	No.	%		
<i>Males</i>								
20–29	19	86.4	0	0.0	3	13.6	22	3.0:0
30–39	20	71.4	2	7.1	6	21.4	28	3.0:1
40–49	21	43.8	13	27.1	14	29.2	48	1.1:1
50–59	39	44.3	31	35.2	18	20.5	88	0.6:1
60–69	51	43.6	48	41.0	18	15.4	117	0.4:1
70–79	27	45.8	22	37.3	10	16.9	59	0.5:1
80+	27	64.3	4	9.5	11	26.2	42	2.8:1
Total	204	50.5	120	29.7	80	19.8	404	0.7:1
<i>Females</i>								
20–29	6	42.9	1	7.1	7	50.0	14	3.0:0
30–39	15	71.4	2	9.5	4	19.0	21	3.0:1
40–49	12	48.0	10	40.0	3	12.0	25	1.1:1
50–59	17	36.2	21	44.7	9	19.1	47	0.6:1
60–69	43	40.2	45	42.0	19	17.8	107	0.4:1
70–79	21	40.4	25	48.1	6	11.5	52	0.5:1
80+	11	33.3	18	54.5	4	12.1	33	2.8:1
Total	125	41.8	122	40.8	52	17.4	299	0.7:1

Table 2 Cause of death for diagnosed and unrecognized diabetics and non-diabetics, Jordan University Hospital, 1995-97

Condition resulting in death	Diabetics %	Unrecognized diabetics %	Non-diabetics %
Cardiac	31.9	11.5	12.0
Cerebrovascular	19.0	18.9	8.4
Renal	6.5	4.0	0.3
Malignancy	15.4	33.8	39.6
Gastrointestinal	4.7	2.0	5.0
Liver	6.5	4.7	3.9
Pulmonary	2.5	6.7	5.6
Sepsis	10.4	10.8	8.4
Operative	1.1	1.3	0.8
Intestinal obstruction	2.2	0.0	0.5
Accident	1.1	4.7	3.6
Bum	0.0	1.3	0.5
Trombotic thrombocytopenic purpura	0.3	0.0	0.5

Discussion

Despite the documented increase in prevalence of diabetes mellitus in Jordan and worldwide, there would appear to be no parallel increase in the attention given by physicians to the diagnosis of diabetes among patients with high blood glucose, who initially present with other problems [4,6]. Our data reveal that the degree of awareness of diabetes as a major health problem is still lagging, with a consequent avoidable increase in morbidity and mortality [6-8]. It might be conjectured that some physicians assumed hyperglycaemia to be a transient phenomenon caused by the stress of acute illness, rather than considering a diagnosis of diabetes — but even that thinking was not reflected in their notes.

There are no unique diagnostic criteria or recommendations for making a definitive diagnosis of diabetes in a stressed state

[9,10]. However, significant hyperglycaemia should be noted, and follow-up is necessary to reach a final and definite diagnosis. Croxson et al. found that 60% of elderly people not previously known to have diabetes, with admission plasma glucose of between 8-13 mmol/L, in fact proved to have diabetes when retested using World Health Organization criteria [11]. Although impaired carbohydrate metabolism resulting in hyperglycaemia is seen in patients with and without diabetes in stressful conditions [17,18], studies have demonstrated that stress can also result in diminished glucose values [16]. Recent data have shown that correction of hyperglycaemia in patients with myocardial infarction decreases morbidity and mortality [12-14]. Husband et al. followed a group of hospitalized patients with acute myocardial infarction and newly recognized hyperglycaemia [15]. They

were evaluated by glucose tolerance testing 2 months after hospital discharge. It was concluded that an admission glucose value of ≥ 180 mg/dL predicted undiagnosed diabetes, rather than stress-induced hyperglycaemia.

The prevalence of missed hyperglycaemia among hospitalized patients in our data was high in both the medical and surgical departments. We as physicians should consider the extent of morbidity and mortality we might have avoided had sufficient attention been paid to the results of laboratory tests we had ordered, or had we been more generally aware of this very common problem. In Jordan, Khoury et al., using a verbal autopsy technique, found the two leading

causes of death to be myocardial infarction and cerebrovascular accidents, with the most common contributory causes for both being, hypertension and diabetes [18]. Even though drugs, such as corticosteroids or thiazides, may be precipitating factors for hyperglycaemia, it does not excuse the attending physician failing to recognize or treat the condition, since significant hyperglycaemia, either transient or permanent, contributes to the outcome. We take this opportunity to draw the attention of our colleagues to this phenomenon, which is not limited to Jordan but would appear to be widespread in both higher and lower income countries.

References

1. King H, Aubert AE, Herman W. Global burdens of diabetes, 1995–2025: prevalence, numerical estimates and projections. *Diabetes care*, 1998, 21:1414–31.
2. Ajlouni K, Jaddou H, Batieha A. Diabetes and impaired glucose tolerance in Jordan: prevalence and associated risk factors *Journal of internal medicine*, 1998, 244:317–23.
3. Donaldson C, Narayan KM. The cost of diabetes. A useful statistic? *Diabetes care*, 1998, 21:1370–1.
4. Larne AC, Pugh JA. Attitudes of primary care providers toward diabetes: barriers to guideline implementation. *Diabetes care*, 1998, 21:1391–6.
5. Lovetan CS et al. Unrecognized diabetes among hospitalized patients. *Diabetes care*, 1998, 21:246–9.
6. Rubin RJ, Altman WM, Mendolone DN. Health care expenditures for people with diabetes mellitus. *Journal of clinical endocrinology and metabolism*, 1994, 78: 809A–809F.
7. Aronson D, Rayfield EJ, Chesebro JH. Mechanisms determining course and outcome of diabetic patients who have had acute myocardial infarction. *Annals of internal medicine*, 1997, 126:296–306.
8. Jacoby RM, Nesto RW. Acute myocardial infarction in the diabetic patients: pathophysiology, clinical course and prognosis. *Journal of the American College of Cardiology*, 1992, 20:736–44
9. National diabetes data group: classification and diagnosis of diabetes mellitus and other categories of glucose intolerance. *Diabetes*, 1979, 28:1039–57.
10. The expert committee on the diagnosis and classification of diabetes mellitus: Report of the expert committee on the diagnosis and classification of diabetes mellitus. *Diabetes care*, 1997, 20:1183–97.

11. Croxson SC, Keir SL, Ibbs L. Admission plasma glucose and diabetes mellitus in elderly admissions to hospital. *Diabetic medicine*, 1997, 14:381-5.
12. Savage P.J. Cardiovascular complications of diabetes mellitus: what we know and what we need to know about their prevention. *Annals of internal medicine*, 1996, 124:123-6.
13. Laakso M. Glycemic control and the risk for coronary heart disease in patients with non-insulin-dependent diabetes mellitus. The Finnish studies. *Annals of internal medicine*, 1996, 124:127-30.
14. Stern MP. Glycemia and cardiovascular risk. *Diabetes care*, 1997, 20:1501-2.
15. Husband DJ, Alberti KG, Julian DG. "Stress" hyperglycaemia during acute myocardial infarction: an indicator of pre-existing diabetes? *Lancet*, 1983, 2 (8343):179-81.
16. Kemmer FW et al. Psychological stress and metabolic control in patients with type I diabetes mellitus. *New England journal of medicine*, 1986, 314:1078-84.
17. Fletcher J, Langman MJS, Kellock RK. Effect of surgery on blood-sugar levels in type II diabetes mellitus. *Lancet*, 1965, 2:52-5.
18. Khoury SA, Massad D, Fardous T. Mortality and causes of death in Jordan 1995-96: assessment by verbal autopsy. *Bulletin of the World Health Organization*, 1999, 77:641-50.

A call for contributions

The Egyptian International Society Against Addiction (E.I.S.A.A) is preparing a medical encyclopaedia on the dangers of all kinds of addiction (smoking, alcohols and drugs). Health and medical scientists and professionals are invited to contribute papers in their areas of interest in connection with any aspect of the problems of addiction. Contributions should be submitted to E.I.S.A.A. both in Arabic and English by 26 June 2002, the World Day Against Addiction. The society will then compile the papers received into an encyclopaedia publication for free distribution.

For further information, please contact Mr Hesham Abbas, Management Stabilizer, 22 El-Nozha Street, El-Zaher, Cairo, Egypt. Telephone: (202) 4820587, 6855314, 5889104; Fax: (202) 6855314.