

Hypoglycaemia in the Elderly

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ABSTRACT

Aim: To determine the prevalence, presentation, causes and consequences of hypoglycaemia in the elderly, and to make preventive recommendations.

Method: Retrospective review of case records.

Results: The definition of hypoglycaemia is defined as symptoms with a capillary blood sugar of less than 3 mmol/L measured on the Reflolux II or Accutrend glucometer. Out of 1,919 admissions to our department from November 1993 to January 1996, there were 45 cases of hypoglycaemia. The average age was 76.2 years (range 66 to 89 years); 32 were females, 13 males, 35 had diabetes mellitus and 10 were non-diabetics. Forty patients presented with neuroglycopenic symptoms and 5 patients presented with adrenergic symptoms. Thirteen patients presented were solely due to drugs (mainly glibenclamide); 9 cases were due only to disease (mainly psychiatric illnesses with poor intake); 23 cases were due to both drugs and diseases (mainly a combination of glibenclamide, tolbutamide and psychiatric illness with poor intake, renal failure, gastroenteritis and sepsis). All were easily reversed with an intravenous bolus of 50% glucose or continuous 10% glucose infusions. Forty-three patients did not suffer any morbidity, one suffered a stroke and another fell because of giddiness.

Conclusion: We recommend that: (1) the importance of having regular meals be emphasised to elderly patients and their carers, especially if they are taking hypoglycaemic agents; (2) regular home glucose monitoring for diabetic patients; (3) assessment and monitoring of renal function before prescribing hypoglycaemic agents; (4) avoidance of the use of long or medium acting sulphonylureas eg. chlorpropamide, glibenclamide in the elderly; (5) adjustment of hypoglycaemic agents (in consultation with a trained nurse/doctor) if the patient suffers from gastroenteritis and (6) less stringent blood glucose control in those with psychiatric illnesses who may have variable food intake.

Keywords: hypoglycaemia, elderly, drugs, diseases

INTRODUCTION

The occurrence of hypoglycaemia in the elderly usually occurs from an interaction of ageing factors,

drugs and diseases. Ageing causes a decline in the detoxifying capability of the liver and kidneys which alters the pharmacodynamics of hypoglycaemic drugs prolonging their half-life. Older people are predisposed, in addition, to an inadequate diet due to a variety of factors such as a lack of dentition, decreased taste or appetite, inaccessibility to food secondary to decreased mobility, environmental barriers, or limited finances. They also suffer from diseases that can impair swallowing, such as stroke, parkinsonism, dementia and depression. Many of the elderly also suffer from diseases that could impair gluconeogenesis eg. hepatic congestion due to heart failure. The older person is frequently on polypharmacy eg. non-steroidal anti-inflammatory agents, aspirin, warfarin, cimetidine and propranolol which can potentiate the effects of sulphonylureas. While usually less harmful in the younger patients, hypoglycaemia may result in stroke, brain damage, cardiac arrhythmias, myocardial ischaemia, vitreous haemorrhage, falls and hypothermia; all of these are potentially lethal to the elderly⁽¹⁾.

We embarked on this study with the purpose of studying the prevalence, presentation, causes and consequences of hypoglycaemia in the elderly to make recommendations to prevent its occurrence.

METHOD

Hypoglycaemia is defined in our study as a capillary blood sugar of less than 3 mmol/L (measured on the Reflolux II or Accutrend glucometer) with symptoms. The Reflolux II is calibrated to read capillary blood sugar from 0.5 to 27.7 mmol/L and the Accutrend, from 1.1 to 33.3 mmol/L. Out of 1,919 geriatric admissions (ie. 65 years or older) to our department (former Changi Hospital) from November 1993 to January 1996, there were 45 admissions for hypoglycaemia. These records were traced and analysed retrospectively with respect to the epidemiology, presentation, causes and consequences of hypoglycaemia.

RESULTS

Epidemiology

The prevalence of hypoglycaemia in our study was 2.3%. The average age was 76.2 years (range 66 to 89); 32 were females, 12 males; 35 had diabetes mellitus and 10 did not.

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hypoglycaemia, as seen in this study. This is because the glomerular filtration rate decreases by 8 mL/min/1.73m²/decade after the fourth decade of life. Creatinine is also not a good gauge of renal function in the elderly, due to loss of lean muscle mass⁽³⁾. Renal function is best assessed by the Cockcroft and Gault equation below⁽⁴⁾:

$$\text{Creatinine clearance (mL/min)} = (140 - \text{age}) \times \text{weight (kg)} / 72 \times \text{creatinine (mg/dL)}$$

(in females, multiply by 0.85)

In 7 of our patients with hypoglycaemia due only to drugs and who were on regular meals, their creatinine clearance was less than 55 mL/min despite a normal serum creatinine and liver function tests (Table III). All elderly patients should have their creatinine clearance assessed before being prescribed hypoglycaemic drugs and then only short acting ones eg. tolbutamide or glipizide should be used.

Table III - Serum creatinine versus calculated creatinine clearance

Patient	Serum creatinine (mg/dL)	Calculated creatinine clearance (mL/min)
1	1.07	48.5
2	1.3	31.2
3	0.78	49.4
4	1.2	38.2
5	1.1	35.4
6	0.89	51.3
7	0.59	51.1

Short acting sulphonylureas are generally safer in the elderly unless they have a concomitant illness such as renal failure, psychiatric illness with poor dietary intake or gastroenteritis. Any illness that impairs glucose intake, absorption or changes the pharmacokinetics of a hypoglycaemic agent, can increase the risk of hypoglycaemia⁽⁵⁾. The only case of tolbutamide-induced hypoglycaemia in this study was confounded by the fact that she was also taking some Chinese medicine, which could have potentiated the effect of the drug.

Metformin does not increase insulin secretion and does not cause definite hypoglycaemia⁽⁶⁾. However, it can cause lactic acidosis, if there is renal failure or hypoxia; hence, it is not recommended to the elderly, who have reduced creatinine clearance or hypoxia from whatever cause.

Psychiatric illness is a common cause of hypoglycaemia in our study. This may be due to selection bias, as our hospital received the majority of medical consultations from the Institute of Mental Health. Nonetheless, patients with dementia, depression or avolitional schizophrenia often have poor appetite and are at risk of hypoglycaemia. If these

patients have diabetes mellitus, it is best to be less strict in the blood glucose control.

The mode of presentation of hypoglycaemia can either be through neuroglycopenic or adrenergic symptoms. The fact that our elderly patients tend to present through neuroglycopenic rather than sympathetic symptoms may be due to their reduced end organ sensitivity to β -adrenergic stimulation despite higher levels of circulating catecholamines⁽⁷⁾. As elderly patients are more prone to cerebrovascular disease, hypoglycaemia can easily be misdiagnosed as vertebrobasilar insufficiency or a transient ischaemic attack. Hence, every elderly patient who is drowsy, comatose, confused, dizzy or weak should have their blood glucose tested.

CONCLUSION

We recommend the following measures in order to prevent hypoglycaemia in the elderly:

- 1) promote home glucose monitoring in elderly diabetic patients
- 2) educate the elderly diabetic and their carers on the need for regular meals if they are on medication for diabetes mellitus
- 3) advise them to consult their doctor or a trained diabetic nurse if they are unwell eg. having diarrhoea, vomiting, on the need to adjust their medicine
- 4) assess and monitor their creatinine clearance through the Cockcroft and Gault equation before starting on any hypoglycaemic agent
- 5) avoid using medium or long acting agents such as glibenclamide, chlorpropamide and use only short acting ones like tolbutamide or glipizide
- 6) observe less stringent glucose control for those with psychiatric disorders who have an erratic food intake.

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Table I - Categorical causes of hypoglycaemia

Drugs only			Disease only		Drugs & disease		
Name of drug	No.	Missed meal	Disease	No.	Drug	No.	Contributory disease (No. of cases)
Glibenclamide	7	4	Dementia	3	Chlorpropamide	1	Renal failure (1)
Chlorpropamide	1	0	Depression	2	Glibenclamide	10	Gastroenteritis (3), psychiatric illness (2), heart failure (2), sepsis (2), renal failure (1)
Tolbutamide	2	1	Mental retardation	1	Tolbutamide	5	Renal failure (3), gastroenteritis (1), psychiatric illness (1)
Insulin	1	1	Malnutrition	1	Glipizide	1	Gastroenteritis (1)
Unknown drug	1	0	Gastroenteritis	1	Insulin	2	Psychiatric illness (1), renal failure (1)
1,500 kcal diet	1	0	Unresolved	1	"BIDS" regime*	1	Psychiatric illness (1)
					Haloperidol	2	Sepsis (1), psychiatric illness (1)
					Chinese medicine	1	Sepsis (1)
Total	13	6		9		23	

* "BIDS" regime = insulin/tolbutamide/metformin

Presentation of hypoglycaemia

Forty patients (88.9%) presented with neuroglycopenia (29 with drowsiness/coma, 4 giddiness, 3 confusion, 2 fits, 1 weakness and 1 "stroke") whilst 11.1% (5) presented with adrenergic symptoms or signs (3 cold/clammy, 2 dyspnoea/angina). One patient who presented with a "stroke" recovered completely on correction of the hypoglycaemia with an intravenous bolus dose of 50% dextrose. Two patients presented with chest pain/breathlessness, which was attributed to the sympathetic discharge.

Causes of hypoglycaemia

Three broad categories of causes of hypoglycaemia were identified, namely, drugs only, medical illness only and drugs/medical illness (where both drugs and medical illness were thought to be contributory).

28.9% of cases (13) were due to drugs only (Table I). The major pharmacologic agent was glibenclamide. We were unable to identify the drug in one patient, who was only able to confirm that it was for diabetes mellitus. In one patient, the hypoglycaemia was attributed to a low calorie diet prescribed by his family doctor. He did not have diabetes mellitus. In 6 of these 13 cases, missing a meal was identified as a contributory factor.

Twenty percent (9) was due solely to a medical illness. Drugs were not implicated as the cause of hypoglycaemia (Table I). Eight out of these 9 patients did not have diabetes mellitus. The main diseases were psychiatric illnesses with poor dietary intake. One case was unresolved as she defaulted follow-up. Interestingly, her serum glucose was 0.1 mmol/L with a serum insulin of 90.1 mU/L and a serum C-peptide of 22.2 µg/L. The high insulin/glucose ratio suggests either an insulinoma or surreptitious sulphonylurea ingestion⁽²⁾. Attempts to trace the patient for further evaluation were in vain.

51.1% of cases (23) were due to both drugs and diseases (Table I). The commonest illness in this category was renal failure and psychiatric illness and the commonest drug implicated was glibenclamide.

Overall, the commonest drug implicated was glibenclamide, followed by tolbutamide (Table II) and the commonest illness was psychiatric illness followed by gastroenteritis and renal failure (Table II).

Consequences of hypoglycaemia

All 45 patients were easily reversed with either intravenous 50% dextrose or continuous dextrose infusions. All except 2 patients did not come to any harm from hypoglycaemia; one had an irreversible stroke and another suffered a fall with minor injury.

DISCUSSION

Our study shows that medium and long acting hypoglycaemic agents such as glibenclamide, chlorpropamide and insulin, are common causes of hypoglycaemia in the elderly. Often, the contributory cause is missing meals or an illness that impairs the metabolism of the hypoglycaemic agent (eg. renal failure) or reduces glucose availability (eg. gastroenteritis, hepatic congestion, inadequate carbohydrate intake secondary to psychiatric illness). It must be stressed to the elderly diabetic and their carers that meals must not be missed if they are on medication. If they are unwell, the dosage of the hypoglycaemic agent must be adjusted in consultation with their doctor. However, even in elderly patients with a normal serum creatinine, liver function tests and regular meal pattern, these drugs can still cause

Table II - Overall causes of hypoglycaemia

Drugs	No	Disease	No
Glibenclamide	17	Psychiatric illness	12
Tolbutamide	7	Gastroenteritis	6
Insulin	4	Renal failure	6
Chlorpropamide	2	Sepsis	4
Glipizide	1	Heart failure	2
Haloperidol	2	Malnutrition	1
Unknown drug	1	Unresolved	1
Chinese medicine	1		
Total	35	Total	32