

Diabetic Ketoacidosis in Type 2 Diabetes Mellitus Patients with a History of Hypertension: Case Report

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ABSTRACT

Diabetes Mellitus Type 2 is a chronic hyperglycemic disease due to insensitivity of cells to insulin. High glucose levels can cause metabolic problems that occur due to abnormalities in insulin secretion resulting in symptoms of decreased consciousness, a condition known as diabetic ketoacidosis. One of the complications of diabetes is stroke caused by hypertension. This report describes a 69-year-old male patient who was diagnosed with type 2 diabetes mellitus with a history of hypertension who had decreased consciousness. Type 2 Diabetes Mellitus is a hyperglycemic disease due to insensitivity of cells to insulin. Diabetic ketoacidosis (DKA) is an emergency in diabetes mellitus (DM). One of the symptoms that appear such as decreased consciousness, hyperglycemia, Kussmaul breathing. Management should require correction of dehydration, hyperglycemia, acidosis and electrolyte abnormalities, identification of comorbid precipitating factors, and most importantly, continuous patient monitoring.

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1. INTRODUCTION

Type 2 diabetes mellitus (DMT2) is a group of metabolic diseases characterized by hyperglycemia, resulting from defects in insulin secretion, insulin action or both (1). Hyperglycemia or increased blood sugar levels are a common effect in uncontrolled DM and if this persists for a long time (2).

Diabetic ketoacidosis (DKA) is an emergency in diabetes mellitus (DM) characterized by the triad of hyperglycemia, ketonemia and acidosis. The incidence is difficult to determine, ranging from 4-6 to 8 episodes per 1,000 DM sufferers. In a population-based study in the United States, diabetic ketoacidosis remains a life-threatening condition despite advances in the treatment of DM sufferers. DKA events can be experienced when a person experiences a relative or absolute decrease in insulin which is characterized by hyperglycemia, acidosis, ketosis, and blood glucose levels > 125 mg/dL. This condition is a serious acute complication and requires emergency management (3).

Risk factors for DKA include patients with newly diagnosed DM, non-compliance with insulin, infection, myocardial infarction, acute abdomen, trauma, thyrotoxicosis, cocaine, and antipsychotics. Clinical features of DKA include symptoms of hyperglycemia, Kussmaul's breath, and acetone-scented breath, loss of

extracellular fluid volume, nausea, vomiting, abdominal pain, and decreased consciousness (4).

Hypertension is a frequent complication in DM patients. The relationship with type 2 DM is very complex, hypertension can make cells insensitive to insulin (insulin resistance). Insulin plays a role in increasing glucose uptake in many cells and this hormone also regulates carbohydrate metabolism, so that if there is insulin resistance by cells, then blood sugar levels can also be disturbed (5).

People with DMT2 have a risk of heart disease and blood vessels two to four times higher than people without diabetes. Therefore DM patients have a higher risk of hypertension and dyslipidemia than normal people. Vascular abnormalities can occur before diabetes is diagnosed, due to insulin resistance during prediabetes (1).

Pharmacological management of type 2 diabetes mellitus patients can be given oral antidiabetic drugs such as glibenclamide, metformin and acarbose. For patients not controlled on diet or oral hypoglycemic agents, combinations of insulin and other drugs can be very effective. The insulins used in general are Novorapid and Levemir (6).

Non-pharmacological management of type 2 diabetes mellitus patients can include medical nutrition therapy, diabetes diet and regular physical exercise. Prevention can also be done to prevent the development of risk factors such as controlling weight, exercising and adopting a healthy lifestyle (7).

2. CASE REPORTS

A 69-year-old male patient came in with complaints of sudden unconsciousness while waiting in line at the Undata hospital. Before losing consciousness, the patient feels very heavy shortness. The patient experienced complaints 1 week before entering the hospital. The patient often experienced shortness of breath and fatigue when carrying out strenuous activities. Complaints have been felt to come and go since 2019. The patient's other complaints include headaches, chest pain, heart palpitations, excessive sweating, and difficulty moving the right side of his body.

In his previous medical history, the patient had a history of uncontrolled hypertension and type 2 diabetes mellitus. Meanwhile, no one had a history of the same disease in the family.

On blood pressure examination found an increase of 190/120 mmHg and rapid breathing 24 x/minute. During blood sugar examination, it increased by 265.4 mg/dl (N: <200 mg/dl), while on electrolyte examination, potassium levels in the blood decreased by 3.03 mmol/l (N: 3.5-5 mmol/l).

3. DISCUSSION

Patient Mr. S was diagnosed with Type 2 Diabetes Mellitus with a history of hypertension who experienced a decrease in consciousness, based on anamnesis, physical examination, and supporting examinations. Based on the history of the patient, it was found that there were symptoms of sudden unconsciousness, very severe shortness of breath, and easy fatigue. Other complaints of patients in the form of headaches, chest pain, heart palpitations, excessive sweating. History of therapy in type 2 diabetes mellitus and hypertension in uncontrolled patients. The most common trigger factors causing DKA are inadequate insulin therapy and infection. Other precipitating factors include myocardial infarction, acute cerebrovascular attack, pulmonary embolism, pancreatitis, and alcohol (8).

Diagnostic criteria for DKA include: (i) clinical: polyuria, polydipsia, nausea and/or vomiting, Kussmaul breathing (deep and fast), weakness, dehydration, hypotension to shock, impaired consciousness to coma; (ii) blood: hyperglycemia more than >125 mg/dL, (usually more than 500 mg/dL), bicarbonate less than 20 mEq/L, pH less than 7.35, ketonemia; and (iii) urine: glucosuria and ketonuria (9).

On supporting blood sugar while experiencing an increase of 265.4 mg/dl (normal levels: <200 mg/dl) is included in the interpretation of diabetes mellitus, while on electrolyte examination it was found that potassium levels in the blood decreased 3.03 mmol/l (N: 3.5-5 mmol/l) (9).

Changes in high blood sugar levels will stick to the walls of blood vessels. After that, an oxidation process occurs where blood sugar reacts with proteins from the vessel walls. This situation damages the inner walls of the blood vessels, and attracts saturated fat or cholesterol to stick to the walls of the blood vessels, so that an inflammatory reaction occurs and can become a clot of plaque (plaque), which makes the walls of the blood vessels hard, stiff and eventually a blockage occurs. Which results in changes in blood pressure called hypertension (10). So that related to the history of hypertension that this patient had, his blood pressure increased by 190/120 mmHg. If this problem is not handled properly, it will become a co-morbid condition that worsens the patient's condition to the point of causing complications.

The problems found in patients after treatment were a decrease in potassium levels after experiencing a decrease in consciousness and the presence of symptoms and difficulty moving the right side of their body. This is interrelated because disturbances in the balance of potassium levels are common in patients who are hospitalized. As many as 53% of the total acute stroke patients had dyselektrolithemia, of which 31% had impaired potassium levels (11). Post-stroke hypokalemia is common and may be associated with a poor prognosis (12).

There are two types of therapy for type 2 DM patients with hypertension complications, the first is to reduce and maintain blood glucose levels; the second is to control blood pressure close to the normal range.

In cases of hypertension arising as a complication of diabetes, ACE inhibitor and Angiotensin Renin Blocker (ARB) drugs are used as the first choice of therapy. ACE inhibitor class drugs are a suitable choice for patients to help control blood pressure because this class of drugs does not have a negative effect on glucose and fat metabolism and also lowers kidney blood pressure so that it can prevent further kidney abnormalities due to diabetes (13).

The emergency problem of diabetes mellitus patients with DKA is a top priority in the management of diabetic ketoacidosis. Treatment in the form of insulin therapy is only effective if fluids are given in the early stages of therapy and only with fluid therapy will lower blood sugar levels. One study showed that during the first four hours, more than 80% of the reduction in blood sugar levels was due to rehydration or administration of fluids (14).

ECG examination must be carried out for every patient, especially DM patients with cardiovascular risk. In addition, the American Diabetes Association (ADA) also recommends other tests in the form of checking blood glucose every few hours, electrolytes, BUN, creatinine, osmolality and venous acidity every 2-4 hours until a stable state is achieved. Other sources mention checking blood sugar every 1-2 hours. Frequent checks of blood sugar levels are essential to assess the efficacy of insulin administration and to change insulin doses when results are unsatisfactory. In conditions of blood sugar levels of 250 mg/dl, monitor blood sugar levels less frequently (every 4 hours). Serum electrolyte levels are checked at 2-hour intervals until 6 - 8 hours of therapy. The amount of potassium given according to potassium levels, phosphate therapy according to indications. The lowest point in potassium and phosphate levels at the time of therapy occurs 4-6 hours after the start of therapy (15).

4. CONCLUSION

Diabetes Mellitus Type 2 is a hyperglycemic disease due to cell insensitivity to insulin. Diabetic ketoacidosis (KAD) is an emergency in diabetes mellitus (DM). One of the symptoms that appear is decreased consciousness, hyperglycemia, Kussmaul breathing. Management that must require correction of dehydration, hyperglycemia, acidosis and electrolyte abnormalities, identification of comorbid precipitating factors, and most importantly continuous patient monitoring.

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