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Long Suffering Type 1 Diabetes Mellitus During Metabolic Acidosis on Positiveness of Ketones in Urine Patients

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Abstract: Examination of ketones in the patient's urine and measuring the patient's blood sugar level will determine whether there will be metabolic acidosis in patients with type 1 diabetes mellitus, which is a metabolic disorder that can be caused by various etiologies, such as chronic hyperglycemia due to impaired insulin secretion or impaired insulin action. alone. Diabetes Mellitus type 1 itself is more caused by reduced insulin secretion due to damage to pancreatic -cells. This study was conducted to examine ketones in urine on the duration of suffering from type 1 diabetes mellitus when metabolic acidosis occurs Data collection in this study was carried out by accidental sampling method by researchers to collect secondary and primary data on urine ketones in patients with metabolic acidosis. Based on research that has been done, data obtained from 34 patients with type 1 diabetes mellitus at the Sigerongan Health Center, as many as 8 patients with positive results of urine ketones with a prevalence of +2 totaling 3 people and +3 totaling 5 people. Judging from the high level of glucose (hyperglycemia) that is > 200 mg/dl and the positivity of ketone bodies in the patient's urine as a sign of metabolic acidosis. With a long-susceptibility to suffer from diabetes mellitus 1-5 years and above. The results of measuring ketone levels in the patient's urine show that there is no relationship with the duration of suffering from diabetes mellitus in the urine but blood sugar levels

Keywords: Diabetes Mellitus; Ketones; Urine; Metabolic Acidosis.

Introduction

Type 1 diabetes is a condition in which pancreatic beta cells produce little or no insulin. (Jean-François Yale, 2018) While type 2 diabetes mellitus produces insulin, a little insulin but does not function or the body refuses insulin (American Diabetes Association, 2014). the function of insulin itself is to help glucose enter the body so that not enough insulin will cause glucose to stay in the blood (hyperglycemia)and not reach body cells such as muscle and liver cells that will be converted into energy so that the process of gluconeogenesis occurs, namely insulin which functions to convert excess glucose into Energy reserves in the body in the form of glycogen is not available, the body will use other sources as a substitute (Anani, 2012; Fitria, 2016; Hariyanto, et.al., 2013).

Namely fat if continuously used as energy, it will increase the number of ketones in the body where ketones are acids resulting from fat metabolism in the body (Siregar 2014; Eka Fitria et.al., 2017). high ketone levels can cause uncontrolled acidity levels in the blood called metabolic acidosis, in this condition type 1 diabetes mellitus patients will experience many complications in Their body is caused by acidity levels in the blood by excessive production of ketone bodies (acids). This condition occurs when diabetes is not controlled (Adelita et.al., 2020; Esmatjes et.al., 2014).

Diabetes mellitus can be controlled (Firdaus, 2013; Karolina, 2018) so that serious complications can be carried out through ketone examination in urine using the dipstick or dipping method, dipping examination is a basic diagnostic tool used to determine pathological changes in urine (Pulungan et.al., 2021). This dipping examination is characterized by looking at the color

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changes that occur according to the actual state of urine (Yati & Trijaja, 2017).

Method

Data collection in this study was carried out by accidental sampling method by researchers to take secondary and primary data on urinary ketones of patients who experience metabolic acidosis (Dhatariya, & Joint British Diabetes Societies for Inpatient Care, 2022) Diabetes mellitus can be controlled so that serious complications can be carried out through ketone examination in urine using the dipstick or dipping method, dipping examination is a basic diagnostic tool used to determine pathological changes in urine. This dipping examination is characterized by looking at the color changes that occur according to the actual state of urine **(**Kahar, 2016)

Result and Discussion

In Table 4. of 34 samples of patients with type 1 diabetes mellitus at the Sigerongan Health Center, as many as 8 suffering from susceptible diabetes within 1-5 years experienced positive results of urinary ketones with a prevalence of +2 totaling 3 people and +3 totaling 5 people. Judging from the high levels of glucose (hyperglycemia) which is >200 mg/dl and the positivity of ketone objects in the patient's urine as a sign of metabolic acidosis while as many as 24 people with low sugar and also susceptible to 1-5 years negative urinary ketones (Widodo, et.al., 2016)

Table 1. Data on the results of long-suffering from type 1 diabetes mellitus when metabolic acidosis is positive for ketones in the urine of patients at the Sigerongan Health Center

Specimen number	Long-suffering from type 1 DM	Urine ketone positivity results	Glucose test results
05	1 Year	+++ (positive)	409 mg/dl
06	1 Year	++ (positive)	194 mg/dl
07	3 Years	++ (positive)	201 mg/dl
08	3 Years	+++ (positive)	257 mg/dl
01	3 Years	+++ (positive)	303 mg/dl
02	5 Years	++ (positive)	232 mg/dl
03	5 Years	+++ (Positive)	201 mg/dl
04	5 years	+++ (positive)	348 mg/dl

Hyperglycemia is treated by administering an intravenous bolus of insulin at a dose of 0.1 units/kg, followed by an hourly infusion of 0.1 units/kg in a 0.9% saline solution. Wait to administer insulin until the serum potassium level reaches 3.3 mEq/L (3.3 mmol/L) (Desnita, et.al., 2023). Preflushing intravenous (IV) tubing with insulin solution can reduce the likelihood of insulin adsorption and the resulting unpredictable consequences. Insulin dosages should be increased if there is no decrease in plasma glucose levels of 50 to 75 mg/dL (2.8 to 4.2 mmol/L) within the first hour. Insulin should be administered to children with a continuous intravenous infusion at a rate of 0.1 unit/kg/hour or higher, with or without a bolus (Syaftriani et.al., 2023; Rina et.al., 2022).

If enough insulin is administered, the ketones should start to dissolve within a few hours. A possible explanation for the apparent delay in ketones clearance is the conversion of beta-hydroxybutyrate to acetoacetate, the "ketone" detected in the majority of hospital laboratories, when acidosis resolves (Putri & Larasati, 2013).

It may take up to 24 hours for the serum bicarbonate level to return to normal, but the pH and bicarbonate levels in the blood should also recover rapidly (Hikmah & Oktaviani, 2022). Acute cerebral edema can arise from the regular administration of bicarbonate, which is why it should not be done so (especially in children). It is important to start using bicarbonate only if the pH is less than 7, and to try to modestly raise the pH with doses of 50 to 100 mEq (50 to 100 mmol) given over 2 hours, before measuring the arterial pH and serum potassium again (Bertalina & Aindyati, 2016; Bulu, et.al., 2019; Nursihhah, 2021).

In adults, the risk of hypoglycemia can be mitigated by adding 5% to 10% dextrose to intravenous fluids when plasma glucose levels drop below 200 mg/dL (< 11.1 mmol/L). Maintaining glucose levels between 150 and 200 mg/dL (8.3 and 11.1 mmol/L) can be achieved by adjusting the dextrose concentration and reducing the insulin dose (Nurhayati, 2020; Nursucita & Handayani, 2021; Dewi, 2013) . However, it is important to continue the continuous IV infusion of regular insulin until the anion gap has shrunk on two consecutive blood tests and both blood and urine consistently test negative for ketones. When treating diabetic ketoacidosis (DKA) caused by SGLT-2 inhibitors, insulin and dextrose may need to be administered for a longer period of time (Pratiwi et.al., 2023; Yunika, 2021; Alianatasya & Muflihatin, 2020).

The patient is often started on a basal-bolus insulin regimen after they are stable and able to eat. Two hours following the first basal subcutaneous insulin dosage, intravenous insulin should be maintained. Until subcutaneous insulin is started and the pH is more than 7.3, children should keep receiving an insulin infusion of

0.05 unit/kg/hour (Astutisari et.al., 2022; Masi & Mulyadi, 2017; Qodir, 2022).

Maintaining blood potassium levels between 4 and 5 mEq/L (4 and 5 mmol/L) is essential for preventing hypokalemia, which can be achieved by replacing 20 to 30 mEq (20 to 30 mmol) of potassium in each liter of intravenous fluid. Once serum potassium reaches 3.3 mEq/L (≥ 3.3 mmol/L), insulin should not be administered and 40 mEq/hour of potassium should be provided until serum potassium reaches 3.3 mEq/L (≥ 3.3 mmol/L). Potassium supplementation can be skipped if serum potassium is more than 5 mEq/L (> 5 mmol/L) (Rondonuwu et.al., 2016; Dewi et.al., 2022; Azitha et.al., 2018).

Serum potassium levels that seem normal or even increased at first glance may really be reflecting changes in intracellular storage caused by acidemia, masking the actual potassium deficiencies that nearly all DKA patients have (Anggraeni & Alfarisi,2028; Cicilia, et.al., 2018). Due to the fast potassium shift into cells caused by insulin replacement, levels should be monitored hourly or every other hour during the early phases of therapy (Supriati, et.al., 2017; Vina, et.al., 2021; Siregar, et.al., 2023)

Conclusion

Long-time patients suffering from type 1 diabetes mellitus with metabolic acidosis at the Sigerongan Health Center with a vulnerable time of 1-5 years and above. The positivity of urinary ketones against long suffering from diabetes mellitus at the Sigerongan Health Center was 8 people positive for ketone objects with hyperglycemia around >200 mg/dl with 26 negative people there were no ketone objects and normal blood sugar. Positive results of ketone objects in the patient's urine and the occurrence of hyperglycemia in patients with type 1 diabetes mellitus indicate the occurrence of metabolic acidosis in patients with Type 1 Diabetes Mellitus and There was no association between prolonged suffering from type 1 diabetes mellitus and urinary ketones but hyperglycemia

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The author declares no conflict of interes

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