


Alcohol Induced Hypoglycemia in Patient with Suspected Chronic Liver Dysfunction - A Case in Remote Area

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ABSTRACT

Alcohol has profound effects on glucose metabolism. Alcohol-induced hypoglycemia is rare in healthy individuals with good glycogen reserve, but may be life-threatening in individuals with silent chronic liver dysfunction, due to liver inability to manage glucose uptake. A 39-year-old male was admitted to the emergency room with sudden convulsion after taking local alcoholic beverages. A very low blood glucose level and significantly elevated liver enzyme levels were detected. The patient was stable after 3 days of intensive care without repeated phase of hypoglycemia.

Keywords: Alcoholic, hypoglycemia, liver failure.

ABSTRAK

Alkohol telah diketahui memiliki efek pada metabolisme glukosa. Kasus hipoglikemia diinduksi alkohol jarang terjadi pada pasien sehat dengan penyimpanan glikogen yang baik, namun pada individu dengan disfungsi hati, kondisi ini dapat mengancam nyawa karena ketidakmampuan hati untuk mengatur penyerapan glukosa. Laki-laki berusia 39 tahun, dibawa ke ruang gawat darurat karena kejang mendadak setelah minum alkohol produksi lokal. Ditemukan kadar gula darah sangat rendah dan peningkatan enzim hati yang tinggi. Pasien tersebut dapat pulih setelah perawatan intensif selama tiga hari tanpa episode hipoglikemia berulang. **Berlan Chandra, Widhyanto P. Adhy, Jeffren Bulan. Hipoglikemia Diinduksi Alkohol pada Pasien Diduga Disfungsi Hati Kronis –Kasus di Pedalaman.**

Kata Kunci: Alkohol, hipoglikemia, gagal hati.

Background

Hypoglycemia is a life-threatening condition which can lead to sudden death or brain damage.[1] It is uncommon in non-elderlies, especially without comorbidity or any history of major illness, but this condition can be triggered by alcohol consumption. Drugs and alcohol are reported as the most common causes of hypoglycemia in adults. About 20% adverse drug-related hospital admissions are hypoglycemia-related and has been reported to account for up to 1.7% hospital admissions.[1,2] Anti-diabetic drugs use is the most common drugs lead to hypoglycemia, followed by beta-blockers, anti-biotics, anti-arrhythmic medications, anti-malarial, and analgesics.[2] Mechanisms of hypoglycemia include one or more stimulation of insulin release, reduced insulin clearance, altered insulin sensitivity, interference with glucose metabolism, and effect of anti-diabetic medications.[2,3]

Alcohol affects many parts of the body, including the liver. Liver helps to control the body's blood sugar levels by storing and producing glucose. It is also responsible for alcohol detoxification.[3] When liver prioritize on alcohol metabolism, it may not release sufficient glucose to maintain blood sugar level. The harmful effects of alcohol, including alcohol-induced hypoglycemia (AIH), are well known. Yet alcohol is a part of beverages and food in many cultures and regions. AIH was first reported and defined about 80 years ago by Brown and Harvey in 1941. This phenomenon has been studied to understand the effect of alcohol on glucose metabolism.[2,3] Dysfunction of liver metabolism may affect plasma glucose level, causing hypoglycemia.[1,2] Prevalence of hypoglycemia in liver cirrhosis patient is reported about 58%.[4] Individual with both liver dysfunction and uncontrolled intake of alcohol may risk hypoglycemia.

Case

A 39-year-old male, freelancer, with no history of convulsion, diabetes, or major disease, was admitted to emergency after 45 minutes of unconsciousness. The patient was taking about one or two cups (200 mL) of local alcohol beverages before reported suffering from seizures for almost 5 minutes. At admission, the patient's Glasgow Coma Scale was 6 (eye 1, verbal 3, movement 3), had low blood pressure (80/50 mmHg) and increased pulse (112 times/minutes), and with a weight of 48 kg. Blood sugar level was 28 mg/dL which can initiate the seizure, corrected to 315 mg/dL after administration of 50 mL dextrose 40% IV.

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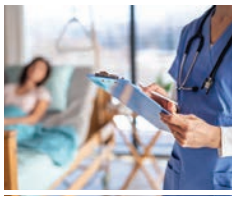

The patient regained consciousness and vital signs were stable 3 hours after intravenous rehydration and sugar booster.

The patient has been a heavy drinker since teenager, consumed 3 to 4 glasses of 200 mL alcohol, twice or more in a week, mostly local alcoholic beverages with no standard alcohol level. He is also a smoker with about 8 cigarettes/day with no history of major illness nor any seizures.

On physical examination, no neurological deficit or trauma sign were detected. Heart sound and respiratory rate were normal, no abdominal organ enlargement. Laboratory findings were increased aspartate aminotransferase (AST) level - 201 IU/L (5-50 IU/L), alanine aminotransferase (ALT) level - 114 IU/L (5-65 IU/L), positive hepatitis B serology test, and elevated s-leukocytes count - 35,400/uL (3,500-10,000/uL). Due to limited resources, an alcohol level test was not performed. No evidence of liver anomaly on ultrasound.

The treatments consist of intravenous ringer lactate rehydration 1,000 mL/day, intravenous omeprazole 40 mg/12 hours for 3 days, acetaminophen if fever occurs, and low protein diet for liver disease. After 4 days of care, no repeated episode of seizure and unconsciousness were observed, and the urine output was normal. The patient was discharged with specific education on diet and medication.

Discussion

This case was a non-elderly patient with unconsciousness and seizure episode preceded by the consumption of 350 to 400 mL of local alcoholic beverages. Examinations revealed hemodynamic disturbance and severe hypoglycemia with suspected chronic liver failure. The patient was a chronic heavy drinker with 3 to 4 glasses of 200 mL local alcohol with no standard of alcohol level[1] more than twice a week. He is also a smoker with about 8 cigarettes/day with no history of major illness nor any seizures before.

There is no specific data on alcohol level of East Nusa Tenggara local beverages due to its many variants and locally produced with no standard; a study by Edo in 2019 mentioned that "Sopi", a local alcohol beverage produced in Timor to Rote Ndao island, could have 40% to 53% alcohol level.[1]

Hypoglycemia symptoms commonly appear as tremulousness, headache, cold sweating, and confusion. Other additional symptoms include neurological condition, such as delirium, brainstem dysfunction, hypothermia, stroke-like illness, and seizures.[2,3] The neurological manifestations may progress to coma and death.[3,4] The mechanism is related to increase in both intracellular and extracellular water content in brain due to increased osmolality of brain cell when glucose level suddenly dropped. This process increase brain K+ and Na+ concentrations, leading to grand mal seizures and coma.[4]

Alcohol can inhibits gluconeogenesis and stimulate glycogenolysis which could contribute to hypoglycemia episode. Patient with alcoholism could have relatively low glycogen reserve.[5] Alcohol also can inhibits the shivering reflex which lead to poor body response to hypoglycemia state.[2] Its effect on blood glucose level depends on the amount consumed and also the underlying nutritional status; alcohol rarely cause hypoglycemia within 8–10 hours (on overnight fast) in a healthy individual with normal glycogen reserve.[5] However, rapid alcohol consumption after fasting for about 3 days, could induce severe hypoglycemia in otherwise healthy individuals.[5]

Alcohol Induced Hypoglycemia (AIH) is more common in malnourished patient, heavy or binge drinker, children after accidental ingestion, diabetic patient on insulin or OAD drug, Addison disease, pituitary deficiency and hyperthyroidism.[2] A study by Sporer on 378 nondiabetic intoxicated patients, found that only 1% had severe hypoglycaemia.[6] No correlation between AIH and epidemiological factors such as age, sex and race. This study then came with conclusion that AIH is a rare phenomenon for normal healthy subjects. Other factors is type of alcohol consumed or genetic factors.[5,6] Some studies reported alcohol may exacerbate insulin and sulfonylurea induced hypoglycaemia.[5] Diabetes, liver function impairment and poor nutritional status increase the risk of AIH.[5] Alcohol don't directly inhibit glycogenosis or prevent the release of glucose from the pre-existing glycogen stores but induces glycogenolysis. The major factors leads hypoglycemia in massive alcohol intake is its inhibitory effect on gluconeogenesis.[2]

Gluconeogenesis requires certain Nicotinamide adenine dinucleotides (NADH and NAD) ratio along the pathway. Elevation of NADH from alcohol liver metabolism can have a profound effect on certain dehydrogenases during the process of gluconeogenesis. Elevation of NADH level can lead to inhibition of gluconeogenesis process.[2,5] Another path that compromised reduction of NAD/NADH ratio is its effect on the conversion of malate to oxaloacetate which is another important step in gluconeogenesis.[2,5] Hepatic gluconeogenesis may be reduced up to 45% after consumption of moderate amount of alcohol.[2,4,5]

In inhibited gluconeogenesis state, hypoglycaemia can occur 8-10 hour later after the glycogen storage has been depleted.[2] Glycogenolysis accounts for 85% of initial hepatic glucose output; but gluconeogenesis progressively takes over the overall hepatic glucose output to prevent a greater degree of hypoglycaemia. In a person with impaired hepatic auto-regulation, moderate consumption of alcohol can induced reactive hypoglycaemia if it's consumed together with a simple carbohydrate food.[2,3] This hypoglycaemic predisposition is due to an exaggerated insulin response to carbohydrate.[2]

Our patient has no history of hypoglycaemia, and could not remember his last meal before the seizure, the assumption was that he took alcohol on an almost empty stomach or when the blood sugar is not in adequate level to tolerate the alcohol–depressing-glucose process. No neurological deficit or trauma sign was found in physical examinations. Laboratory result were increase of two liver enzymes: AST 201 IU/L (normal; 5-50 IU/L), ALT 114 IU/L (normal: 5-65 IU/L), positive Hepatitis B serology test and also increase of white blood cell count (35,400/uL, normal: 3,500-10,000/uL). Based on all discoveries and the previous history of lifestyle, the liver dysfunction is presumably chronic.[4]

The liver dysfunction in this case can worsen the hypoglycaemia state.[7] The liver dysfunction could be present for almost more than 3 to


6 months without specific symptoms until hypoglycaemia or any other life-threatening symptoms occured. This condition could lead to alcoholic liver cirrhosis which is one of the major cause of mortality.[5,7,8] Hepatitis C or B infection, substantial alcohol ingesting and nonalcoholic fatty liver disease (NAFLD) are the main risk factors of liver cirrhosis.[2,7,8] Liver cirrhosis can cause minor to moderate hyperinsulinemia due to reduction of insulin clearance.

The main treatment goals is to minimize liver dysfunction worsening and to prevent other organ complications by maintaining rehydration, nutrition, and education to begin a healthy life style with minimum alcohol consumption and drugs use. We educate the patient that the hypoglycaemia and liver dysfunction were mostly related to alcohol intake, especially when blood sugar's level is low. The hypoglycaemia induced seizure can recur if he maintain his drinking habits. After 4 days of care, there was no repeated episode of seizure and unconsciousness, the urine output were normal. The patient was discharged with specific education for life style improvement.

Summary

Alcohol-induced hypoglycemia is a condition that can be life-threatening in patients with special conditions such as liver disease. In areas with limited therapeutic and diagnostic modalities, this is a serious challenge, prevention is the main option in handling similar cases.

DATA AVAILABILITY STATEMENT

All data were collected from direct evaluation and medical record with responsible attendee / supervisors. Further inquiries can be directed to the corresponding author.

STUDY LIMITATION

Investigations such as Head Computed Tomography (CT) scan for the seizure, abdominal CT for confirm liver obstruction, or even blood alcohol level test and electrolyte cannot be executed due to limited facilities in a district hospital in remote area.

ETHICS STATEMENT

Ethical review and approval was not required for the study since it is a case report of a fully treated and discharged patient of licensed healthcare. Written informed consent was obtained from the patient for the publication of any potentially identifiable images or data included in this article.

AUTHOR CONTRIBUTIONS

BC and WPA participated mainly on patient follow-up during the patients care and serve as the main writer of the manuscript. JB focused on manuscript revision. All authors contributed to the article and approved the submitted version.

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