

A Case: Optimal Treatment of Hyperosmolar Hyperglycemic State (HHS)

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ABSTRACT

Introduction: The Hyperosmolar Hyperglycemic State (HHS) is rare case and the most serious acute hyperglycemic emergency in patients with type 2 diabetes, are characterized by severe hyperglycemia, hyperosmolality, and dehydration in the absence of ketoacidosis. Immediately treatment is necessary to reinstate hemodynamic stability, as mortality rates for HHS are exceptionally high and can have multiple complications.

Case Presentation: In this case report, a 63-year-old man with a chiefly complaint from the body became weaker. Patients present with compos mentis, blood pressure 100/70 mmHg, regular pulse rate 110 times per minute with sufficient content and respiration 20 times per minute, and temperature 37,90C. Physical examination shows signs of dehydration. Investigation found white blood cell 12.580 103/mm³, plasma glucose 741 mg / dL, and a negative urine ketone.

Conclusion: Case has been reported, a 63-year-old man with a diagnosis of HHS, the trigger factor for HHS in these patient are the discovery of infections as bronchopneumonia, elderly, and inadequate diabetes treatment. The importance of treatment in this case is because the patient is elderly, treatment must be promptly because where too rapid rehydration may precipitate heart failure but insufficient may fail to reverse acute kidney injury.

Keywords

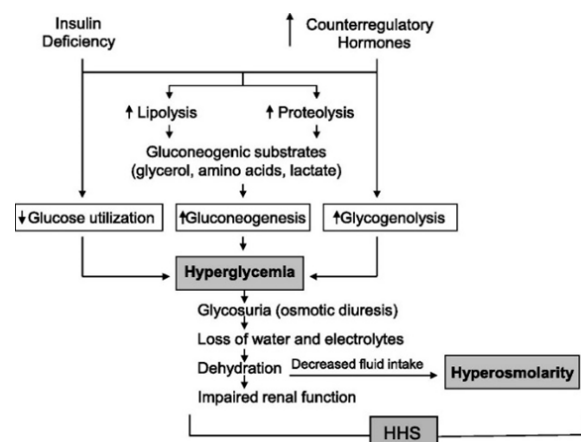
Diabetes Mellitus, Hyperosmolar Hyperglycemic State, Hyperglycemia.

Introduction

The incidence of Diabetes Mellitus increasing, data from the International Diabetes Federation shows that in 2015, 415 million adults suffer from DM in the world and increase to 642 million by 2040 [1], In 2015 Indonesia was ranked seventh highest in the world. Diabetes with complications are the third highest cause of death in Indonesia [2]. Acute complications of diabetes mellitus are Diabetic Ketoacidosis (KAD) and Hyperosmolar Hyperglycaemic State (HHS) [3]. HHS is a life-threatening diabetes emergency [4], often occurring in elderly patients [5]. The rate of death is estimated at 20%, which is about 10 times greater than Diabetic Ketosidosis (KAD). Prognosis is determined by the severity of dehydration, the presence of comorbidities, and advanced age [4].

HHS is an acute metabolic disorder characterized by hyperglycemia,

hyperosmolality, and dehydration without ketoasidos. The trigger factors for this hyperglycemia crisis include infections (pneumonia, urinary tract infections, sepsis), acute vascular disease, trauma, burns, subdural hematoma, gastrointestinal abnormalities, medications [6].



HHS begins with the presence of glucosuria diuresis, glucosuria causes failure of the kidney's ability to concentrate urine, more water loss than sodium causes hyperosmolar failure [7].

The goals of HHS therapy are to aggressively rehydrate intravenously, gradually decrease serum glucose levels, decrease plasma osmolality, correct electrolyte imbalance, monitor and intervene with impaired cardiovascular, pulmonary, kidney and central nervous system.

Case Report

A 63-year-old male patient reported to Raden Mattaher General Hospital, Jambi with a complaint of weakness for approximately a month before admission. The weakness was accompanied by lethargy and fatigue. The weakness was felt continuously every day, rest was ineffective, and the patient had decreased body weight since the last 2 years, from 70 kg to 57 kg with unknown cause, albeit feeling hungry and eating a lot. Furthermore, he often woke up at night to urinate with frequency of > 7 times and \pm 250 cc volume. The patient had regular meal of > 3x a day and often eat sweets. He had diabetes mellitus for the last 8 years and consumed metformin 3x500 mg and glibenclamide 1x5 mg daily, however the medication was not regularly consumed, only when symptoms of weakness appeared. The patient did not understand the risk of irregular medication consumption. Around a week before admission, the patient complained of blurred vision on both eyes, not accompanied by double vision, headache (-), cough (+) started from mild and dry, gradually turned to severe and phlegmatic cough. He also felt numbness and tingling on his feet, from the tip of his toe to the hip and did not improve with resting. Around a day before admission, the patient felt weaker and cannot perform daily activity and only rested in bed.

The general condition of the patient appeared to be moderately ill, with awareness of compost mentis, blood pressure: 100/70 mmHg, respiration 20 times / minute, pulse 110 times / minute, and temperature 37.9°C. Physical examination found anemic conjunctiva, moderate dehydration signs including sunken eyes, dry lips and thirst. Laboratory examination revealed a high random glucose level of 741 mg/dl and required blood glucose reduction to prevent further complication.

In this patient urine ketone (-), serum osmolality, blood ketone and blood gas analysis were not performed. Routine blood tests show increased leukocytes (leukocytosis), red blood cells and decreased hemoglobin (anemia), and an increase in platelets (thrombocytosis). Routine laboratory examination of urine, pH 6, protein and urine glucose (+3). Electrolyte examination showed low sodium (hyponatremia) 122 mmol / L.

Discussion

This case is rare with very high mortality risk, thus requires better management. A 63-year-old diabetic patient with infrequent medication consumption, i.e. only consumed medication if symptoms occurred and did not understand the risk of infrequent medication consumption. Furthermore, the patient also complained

persistent cough with mucoid sputum followed by chills, sore throat, muscle and joint ache. Physical examination showed smooth wet rhonchi. Leukocyte increased to 12,580 and chest x-ray revealed perihilar and pulmonary basal infiltrate, thus the diagnosis of bronchopneumonia was established.

This is consistent with the theory that HHS often occurs in elderly patients with type 2 diabetes. The most common predisposing factor for HHS is infection in 40-60% of patients, and the most frequent infection is bronchopneumonia, in addition these patients have a history of taking medication irregular [8].

The diagnosis of HHS in this patient was established from history of polyuria, polydipsia, and continuous weight loss. Physical examination showed anemic conjunctiva and dehydration signs. Adjunctive examination revealed a high plasma glucose of 741 mg/dL, and negative ketone bodies. Unfortunately, blood gas analysis was not performed to differentiate HHS and KAD. Although anamnesis and physical examination can establish HHS, blood gas analysis should at least be taken for adequate management [9].

The objective of fluid therapy on HHS is to extend intravascular and extravascular volume without causing cerebral edema due to rapid plasma osmolality decrease. The administration was 1 liter 0.9% NaCl within 0-60 minutes and 1 liter within 60 minutes-1 hour. Insulin therapy before adequate fluid replacement can cause cardiovascular collapse when water exited intravascular space, which causes intravascular volume decrease. The administration of 0-60 minutes insulin includes 50 IU insulin drip + 50 cc 0.9% NaCl, then blood glucose was assessed. Low dose insulin of 0.05 unit/kg/hour can only begin after blood glucose no longer reduced with only IV fluid or immediately if significant ketonemia was evident (capillary ketonemia > 1 mmol/L). Blood glucose was observed every hour [10].

Therapy on HHS are for replacement of circulating volume and tissue perfusion, a gradual decrease in serum glucose levels and plasma osmolality, correction of electrolyte imbalance, monitoring and interventions for impaired cardiovascular, pulmonary, kidney and central nervous systems.

In this patient, Nacl 0.9% loading 2 kol, 10 intraunit subcutaneous insulin injections, and 50iu drip aspart + 50cc Nacl 0.9% using a syringe pump starting 3 iu/hour, checking blood sugar if GDS 100-150mg/ dl: 1 iu/hour, 151-250 mg/dl: 2 iu/hour, 251-300 mg/dl: 3 iu/hour, 300-350 mg/dl: 4 iu/ hour and > 350 mg/dl: 5 iu/hour.

There was a difference between theory and management of this case. According to theory, intravenous rehydration was given 1 liter for 0-60 minutes to 6 hours of 1 liter 0.9% NaCl. The purpose was to prevent fluid overload. Early administration of insulin also used 0.05 unit/kg/hour. The patient was 57 kg in weight, thus the insulin needed was 3 units/hour. Rapid blood glucose decrease with insulin is not recommended because it can cause blood vessel collapse.

The triggering factor of HHS in this patient was bronchopneumonia, thus sputum culture was needed to determine the antibiotic of choice. However, culture was not performed in this patient, thus early medication used broad spectrum antibiotic such as ceftriaxone.

Diabetic neuropathy and retinopathy were suspected in this patient, observed from the patient's complaints of numbness and tingling on the legs, from the tip of the toe to the hip and did not improve with resting. An assessment should be performed on motoric reflex, vibration perception and pressure sensation, microfilament and electromyography, and gabapentin can be given if abnormal result showed [11]. The patient had blurred vision on both of his eyes, not accompanied by double vision, thus consultation to the ophthalmologist was needed for funduscopy.

Conclusion

Case has been reported, a 63-year-old man with a diagnosis of HHS, the trigger factor for HHS in these patient are the discovery of infections as bronchopneumonia, elderly, and irregular diabetes treatment. The importance of treatment in this case is because the patient is elderly, treatment must be right because where too rapid rehydration may precipitate heart failure but insufficient may fail to reverse acute kidney injury.

Suggestion

The importance of education to the patient regarding self-observation of blood glucose concentration, routine medication and healthy living promotion should be emphasized as an important part of holistic DM management. Even though the diagnosis of HHS can be established clinically, the examination of this case should be performed comprehensively. Confirmation with laboratory examination should be performed, i.e. blood gas analysis in this

case to prevent misdiagnosis. Furthermore, complete physical examination from head-to-toe related to DM complication should be conducted as comprehensive DM management.

References

1. Wenjun Fan. Epidemiology in diabetes mellitus and cardiovascular disease. *Cardiovascular Endocrinology & Metabolism*. 2017; 6: 8-18.
2. <http://www.p2ptm.kemkes.go.id/dokumen-ptm/fakta-dan-angka-diabetes>
3. Sudoyo AW, Setiyohadi B, Alwi I, et al. *Buku ajar ilmu penyakit dalam jilid II*. Edisi ke-6. Jakarta. Interna Publishing. 2014.
4. http://www.diabetologists-abcd.org.uk/JBDS/JBDS_IP_HHS_Adults.pdf
5. Harrison. *Principles of internal medicine*. Mcgraw-hill education. 2018; 1.
6. Semarawima G. Status hiperosmolar hiperglikemik. *MEDICINA*. 2017; 48: 49-53.
7. Setyoahadi B. *EIMED PAPDI Kegawatdaruratan penyakit dalam emergency in internal medicine*. Jakarta: Internal Publishing. 2012; 1.
8. American Diabetes Association. *Standards of medical care in diabetes*. 2018.
9. Francisco J, Guillermo E Umpierrez. Hyperosmolar Hyperglycemic State: A Historic Review of the Clinical Presentation, Diagnosis, and Treatment. *American Diabetes Association*. 2014; 37: 3124-3131.
10. https://www.aci.health.nsw.gov.au/__data/assets/pdf_file/0004/306463/liverpoolHyperosmolar_Hyperglycemic_State.pdf
11. <https://pbperkeni.or.id/wp-content/uploads/2019/01/4.-Konsensus-Pengelolaan-dan-Pencegahan-Diabetes-melitus-tipe-2-di-Indonesia-PERKENI-2015.pdf>