



## Hyperglycemic Crisis in a 37 Year Old Man with Multiple Substance Use and Depression

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### Authors' contributions

This work was carried out in collaboration between all authors. Authors IDE, POI and UEC were directly involved in the patient management, conceptualized and wrote the patient observation while author INO contribute to the literature search and write-up. All authors read and approved the final manuscript

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Case Study

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### ABSTRACT

Uncontrolled hyperglycemia termed hyperglycemic hyperosmolar syndrome (HHS) is a serious but relatively common presentation of new-onset diabetes mellitus. The diagnosis of the disorder itself is fairly straight forward, but the search for trigger factors can be challenging. Infections are the usual precipitating factor, but a variety of other stressors can be involved such as the abuse of substances like alcohol, cocaine, and cannabis. Available evidence suggests that depression is common among diabetic patients. When such patients are also dependent on substances, it becomes challenging to distinguish between diabetes-related depression and substance-related depression. Clinicians managing diabetic patients need to be aware of comorbid conditions that may negatively impact patient care. We report herein a patient presenting with hyperglycemic hyperosmolar state with two possible precipitating factors; infection and substance abuse.

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## 1. INTRODUCTION

Hyperosmolar hyperglycemic state is a serious complication of diabetes mellitus. Patients in diabetic hyperosmolar state present with an alteration of mental status and extreme hyperglycemia and dehydration. As opposed to diabetic ketoacidosis, there is a mild metabolic acidosis, if any. Ketones are usually absent, but the presence of minimal ketonaemia or ketonuria does not exclude the diagnosis [1]. The search for the precipitating event is usually an important and often very challenging aspect of the management of these patients [2,3]. Known precipitating factors include infections, ischaemic events (e.g. myocardial infarction or stroke), acute pancreatitis, and heat stroke. Other causes are insulin deficiency or resistance, nutritional indiscretion and certain medications such as phenytoin, glucocorticoids, thiazide diuretics, cimetidine or frusemide [4].

It has been reported that diabetic metabolic complications may be triggered by substance abuse, mainly cocaine, followed by cannabis and alcohol use [5]. Substance abuse among people with diabetes alters their perceptions and disrupts their normal diabetes routine, and the resultant poor blood glucose management increases the risk of severe hyperglycemia [6]. Depression is common among people with diabetes and interferes with patient management. In a review of literature on depression among diabetic patients and its relationship to glycemic control, Lustman and Clouse found that coexisting depression was associated with poor adherence to medication and diet regimens, and reduction in metabolic control and quality of life [7].

We hereby present a case of hyperglycemic hyperosmolar syndrome in a 37 years old male with depression and multiple substance dependence.

## 2. CASE REPORT

He was a 37 year old male admitted through the Accident and Emergency (A&E) unit of Niger Delta University Teaching Hospital (NDUTH) with a referral from a peripheral hospital where he was treated three days earlier. Patient was drowsy but was able to give history of progressive weakness, cough and breathlessness of four days duration, and history of polyuria, polydipsia, polyphagia, nocturia and

some weight loss for over three months before presentation. Further questioning revealed that he had about a month before this presentation been evaluated elsewhere and commenced on oral hypoglycemic agents. A couple of days after starting these medications, he discontinued them on his own without good reasons and opted for herbal medications. A week later, when symptoms became intolerable, he lapsed into an unconscious state and was taken by his wife to the peripheral hospital from where he was referred to NDUTH. He was not a known diabetic and had no family history of diabetes before he presented at the peripheral hospital. There was no past history of mental illness in the patient or in his family. He was a heavy user of alcohol, cannabis and cocaine and had used them for more than five years. His relative, who provided patient's history of drug use, also admitted to using cocaine.

Examination revealed a young male, who was conscious but lethargic. He had spontaneous eye opening and did answer questions and followed commands though sluggishly. He was dehydrated and his skin showed poor turgor. His axillary temperature was 37.4°C, pulse rate was 112/minute, respiration of 36/minutes, blood pressure 110/70 mmHg and pulse oximeter oxygen saturation was 95% on 100% oxygen by face mask. Patient was anicteric, not pale, his pupils were equal and responsive to light and extraocular movement was intact. His neck was supple. His trachea was central but he had dull percussion notes on the right mid zone of the lung, and auscultation revealed increased breath sounds and crepitations.

Random blood sugar using OneTouch UltraSmart™ blood glucose meter was unrecordably high – the glucometer states unrecordably high when blood glucose is greater than 50 mmol/L. Other laboratory results were as follows: urea 14.9 mmol/L (normal range 2.4-6.0 mmol/L), sodium 129 mmol/L (range 128-142 mmol/L), potassium 4.4 mmol/L (range 3.4-4.8 mmol/L), chloride 102 mmol/L (range 95-105 mmol/L), creatinine 299 mmol/L (normal range 60-120 mmol/L), and bicarbonate 22 mmol/L (normal range 24-30 mmol/L). The estimated anion gap was 5 mEq/L, and osmolality was estimated to be at least 331.7 mosmol/kg since the unrecordably high blood glucose suggested a value of at least 50 mmol/L. Urine pH was 5.5, ketone showed 2+ in the urine and glucose was 3+. A complete blood count yielded a white

cell count of  $13.7 \times 10^9/L$  (normal range  $2.5-11.0 \times 10^9/L$ ). The packed cell volume was 38% and platelet count was normal. The differential of the white cell count revealed a left shift of 79% neutrophils (normal range 40-75%). An ECG showed sinus tachycardia with no evidence of chamber enlargement. Sputum microscopy and culture yielded growth of streptococcus pneumoniae. A chest radiograph showed a right mid zone consolidation.

Initial management included admission and hydration with intravenous (IV) fluids, IV insulin and IV ceftriaxone for his right lung consolidation. On day two of admission, he was more awake and could communicate more. His white cell count went up to  $17.4 \times 10^9/L$  but the blood glucose had come down to 12.6 mmol/L and the anion gap remained same. Subcutaneous insulin was initiated and IV insulin was discontinued. On day three, he tolerated oral feedings well but was now communicating less. This continued into the tenth day of admission when he showed no interest to leave his bed despite encouragements. He was increasingly withdrawn and showed no interest in his welfare. Mental state examination revealed a sad mood, depressed affect, decreased appetite, lack of energy and poor sleep. Consult to psychiatry was made and an assessment of organic mood disorder with severe depression and multiple substance dependence was made and treatment was commenced. Two days later, patient was noticed to be moving around in the ward and later requested for discharge home. He has been regular with follow up visits and doing well. He received counselling about substance abuse.

### 3. DISCUSSION

HHS is one of the two life-threatening consequences of poorly controlled glucose in diabetic patients, the second being diabetic ketoacidosis. According to a consensus statement from the American Diabetes Association, HHS is characterized by altered mental status (stupor/coma), severe hyperglycemia (plasma glucose  $>600$  mg/dl), hyperosmolality ( $>320$  mOsm/kg), Anion gap  $<12$  mEq/L, and a range of other electrolyte derangements [3].

In our study of the index case, we observed from examination and laboratory investigations that the patient had a respiratory infection (pneumonia). This was in agreement with the existing literature regarding the role of infection as a precipitating factor for hyperglycemic crisis

among diabetics [3,8,9]. Given that the patient is a known substance abuser, it was not clear if the respiratory infection was an isolated incident or if it was related to how the patient consumed his substances. For example, persons who inject drugs could introduce bacteria and other pathogens into the body through the use of contaminated drugs and needles [10]. More so, smoking of illicit drugs such as cannabis and crack cocaine alters the function of alveolar macrophage thereby increasing susceptibility to infections [11].

Depression is frequently reported among diabetic patients and affects more than one quarter of the diabetic population [7]. Depression interferes with good glycemic control through behavioral mechanism (e.g. poor adherence to medication and diet regimens) and biochemical mechanism (e.g. cortisol abnormalities and other central nervous system regulatory changes) [7]. In turn, poor glycemic control may have adverse effect on mood and thus exacerbate depression [7]. Fisher et al. [12] suggested that the exhibition of high levels of depressive affect among diabetic patients might actually be related to diabetes-specific distress defined as "patient concerns about disease management, support, emotional burden, and access to care" [pp. 246]. They argued that diabetic distress is distinct from depression, and the distress stems from patient's diabetic condition and its management.

However, given that diabetes in the index case is a recent development, it is unlikely that his depression is due to diabetes. It is possible that his depressive affect may have more to do with substance abuse than diabetes itself. Having been on admission for several days, the hospital environment is not conducive for consuming illicit drugs and the patient could have been on "forced abstinence" from substances. Evidence from the literature shows that depressed mood, fatigue, and insomnia observed in the patient are common among substance abusers experiencing withdrawal from cocaine and cannabis [13,14]. Therefore, negative affect in a substance-abusing diabetic patient could pose diagnostic challenges, and treatment will be incomplete if clinicians do not address both the diabetes and the substance abuse.

### 4. CONCLUSION

Our findings have various implications and it is important that clinicians managing diabetic patients be familiar with factors that might adversely impact patient care. First, HHS is a

life-threatening condition, and clinicians should educate patients about HHS in order to prevent future recurrence. Second, it is important to screen for co-existing depression in diabetic patients and offer treatment accordingly. Third, clinicians should assess for diabetes-specific distress in their patients, identify which area of diabetes management that is causing distress to the patients and offer counselling as needed. Fourth, patients should be screened for substance abuse and if present, they should be offered brief advice and/or referral to substance abuse treatment.

### CONSENT

It is not applicable.

### ETHICAL APPROVAL

Ethical approval was obtained from the hospitals ethical committee.

### COMPETING INTERESTS

Authors have declared that no competing interests exist.

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