

Misdiagnosis of Diabetic Ketoacidosis as Pneumonia in a Ghanaian Teenager: A Case Report

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Abstract

Wrongly diagnosing diabetic ketoacidosis (DKA) among children and adolescents with diabetes, by doctors and other health workers, is often seen in clinical practice in Ghana although not much is reported in the literature. It occurs at primary, secondary and tertiary care settings and among all grades of health practitioners. This is due to low level of awareness among health care practitioners and the community. Besides, clinical features of DKA mimic many infections which are more frequently seen in hospitals in Ghana than diabetes. It is, therefore, paramount that every child or adolescent presenting to a health facility with any acute disease to warrant admission is investigated, as well, for diabetes irrespective of the working diagnosis.

Keywords: Pneumonia; Type 1 diabetes; Diabetic ketoacidosis; Misdiagnosis

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Introduction

Diabetic ketoacidosis (DKA) is prevalent among children with type 1 diabetes mellitus (T1D) in the Sub-Saharan Africa. This is due to inadequate knowledge and lack of support from the health system [1] for children and adolescents with diabetes mellitus in the African region. T1D is a heterogeneous disorder characterized by destruction of pancreatic beta cells, resulting in absolute insulin deficiency. Patients with T1D, therefore, require insulin to survive [2]. DKA occurs because of lack of insulin, mostly in T1D but to a lesser extent in type 2 diabetes (T2D). The lack of insulin results in intracellular starvation of insulin-dependent tissues such as muscle, liver and adipose tissues. This leads to release of the counter-regulatory hormones which are glucagon, catecholamines, cortisol, and growth hormone. This process leads to breakdown of fatty acids for energy production in the liver and the kidneys with resultant production of ketone bodies such as acetone, acetoacetate and beta hydroxybutyrate [3]. The ketone bodies accumulate and produce signs and symptoms seen in DKA such as weakness, nausea, vomiting, abdominal pain, fast respiration (Kussmaul breathing), decrease level of consciousness and coma [4,5]. These clinical features also mimic acute infections such as cerebral malaria, meningitis and pneumonia [6,7]. Therefore, misdiagnosis of DKA as infections is possible and probably more common in African than has been reported [1,8,9]. Rwiza et al. [8] reported misdiagnosis in Tanzania. Wrong diagnosis made instead of DKA included malaria,

urinary tract infection, diarrhoea and pneumonia [8]. In Ghana, Kratzer [1] found out that all grades of health practitioners made wrong diagnosis such as malaria and typhoid fever instead of diabetes. Ameyaw et al. [9] reported on a 19 year old female with undiagnosed T1D in DKA who was rather misdiagnosed as having pelvic inflammatory disease in hospital in Ghana. Missing diagnosis of DKA can have deleterious effect on the patient as the patient wrongly diagnosed would be mismanaged which could lead to further complications including mortality.

We report a 15 year old boy who presented with Kussmaul breathing of DKA to a hospital in Ghana but was rather misdiagnosed as pneumonia. No such case has, previously, been reported in the literature in Ghana.

Case Report

A 15 year old boy was brought to a hospital because of weakness and difficulty breathing but no cough, fever or vomiting. He had been diagnosed of T1D at the age of 13 years and was attendant at the Paediatric Endocrine Clinic (PEC) of Komfo Anokye Teaching

Hospital (KATH). The attending doctor diagnosed pneumonia because of difficulty in breathing and ordered for a chest X-ray. He became progressively weak and collapsed while waiting for chest X-ray to be taken. He was then rushed back to the ward and blood glucose checked was 28.2 mmol/L. The patient was immediately referred to Paediatric Emergency Unit (PEU) of KATH as DKA. At PEU, random blood glucose was 30.2 mmol/L and urine ketone was 4+. Further questioning revealed that he had stopped injecting insulin, because his insulin had finished two weeks to presentation. He also had polyuria, polydipsia, nausea, abdominal pain but no vomiting and no cough.

Physical examination revealed an adolescent in coma, deep sighing respiration (Kussmaul breathing), no fever, dehydrated, conscious but lethargic. Respiration was 40/minute (regular but laboured), chest was clear on auscultation, heart rate was 110 per minute (regular) and BP was 100/60 mmHg. His weight was 45 kg.

Final Diagnosis

DKA in a known type 1 diabetes patient.

Hospital course

Patient was managed based on ISPAD protocol for management of children with DKA [10].

Cannula was inserted and blood drawn for complete blood count, electrolytes, blood glucose, HbA1C and blood smear for malaria parasites.

Initial laboratory Report

Complete blood count

- Haemoglobin=10.9 g/dL, white blood count $7.2 \times 10^9/L$

Electrolytes

- Sodium 130mmol/L, Potassium 3.8 mmol/L, Chloride 108 mmol/L

Blood smear

- No malarial parasites seen
- Blood glucose 31.2 mmol/L
- HbA1C 13.8 mmol/L

Fluid resuscitation

- Assuming 10% dehydration, his fluid need was estimated to be 4.5L for deficit plus 4L maintenance (8.5L) in 48 hours. 450 mL of intravenous (IV) Normal saline (NS) was given as bolus over 60 minutes. After that, he was reviewed and respiration was 28/minute, regular, pulse was 90 beats/minute, regular, good volume, BP was 100/60 mmHg, temperature 36.2°C.
- He was then given NS at a rate of 60 drops/minute uniformly.
- After hydration for 90 minutes, soluble insulin was started at a rate of 4.5U/hour via infusion pump.
- After starting insulin, 40 mmol of 15% potassium chloride was introduced into 1L of NS.

- Patient was reviewed every hour for blood glucose, every 2 hours for urine ketones and 4-6 hours for electrolytes.
- When blood glucose level dropped to 14 mmol/L NS was changed to 5% dextrose at the same rate.
- 26 hours starting treatment patient was stable and could self-care.
- Review done revealed respiration 22/minute, pulse 86/minute, temperature 36.5°C, BP 108/65 mmHg, Blood glucose 13.6 mmol/L, urine ketones negative, potassium 4.5 mmol/L, sodium 135 mmol/L.
- IV fluid was stop and he was asked to drink liberally and subcutaneous (sc) insulin 7 units of humulin N and 7 units humulin R was started and iv regular insulin was stopped 6 hours after subcutaneous was begun. He was finally discharged on the 3rd day after admission on subcutaneous (sc) humulin N 9 units bd and sc humulin R 10 tid (30 minutes premeal).

Observations at discharged were: Blood glucose 8.9 mmol/L, Potassium 3.9 mmol/L, Sodium 139 mmol/L, urine ketones negative, respiration 20/minute, regular, pulse 88/minute, regular, BP 100/70 mmHg.

Discussion

A patient with DKA should be admitted to emergency ward for immediate treatment and monitoring [3]. Biochemical features of DKA include hyperglycaemia, ketonaemia and/or ketonuria and acidaemia and clinical features are polyuria, polydipsia, vomiting, abdominal pain, Kussmaul breathing, lethargy, loss of consciousness and coma [3,5]. The patient was wrongly diagnosed as pneumonia because of lethargy, flaring nares and laboured respiration. Increased ketone bodies production in DKA results in Kussmaul respiration [5] which mimics rapid respiration with flaring nares as seen in pneumonia [6,11]. However, in pneumonia, there is a history of cough, chest pain and on physical examination there may be reduced air entry, bronchial breath sounds and crackles on auscultation [6] which were absent in our patient.

Wrongly diagnosing DKA as pneumonia can be detrimental to the patient because the patient would be treated for pneumonia instead of DKA. Such a patient would develop further complications and may even end up in mortality [4,8,11]. Dextrose administration is part of supportive treatment for severe infections such as pneumonia [11] which can rather be detrimental to a patient with DKA.

DKA should be considered as a differential diagnosis in any child or adolescent with any acute medical condition on admission in a hospital. Simple bed side tests such as blood glucose and urine dipstick for ketonuria is enough to diagnose DKA in low income countries. Clinicians in resource limited countries, such as Ghana, should not rely on blood gases, serum ketones and bicarbonate. Although these investigations are important in diagnosis of DKA, they are virtually non available in hospitals in resource limited countries.

Conclusion

DKA among children in resource limited countries can easily be misdiagnosed as infections because clinical features can resemble those of infectious diseases [3,5-7,9,11]. High level of suspicion among doctors practicing in these regions is important with regard to diagnosing DKA.

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Conflict of interest

The Authors declare that there is no conflict of interest.