



COMPLICATED PRESENTATION OF DIABETIC KETOACIDOSIS (DKA) WITH CONCURRENT INFECTION

Dr Awais Manan¹, Dr Syed Nouman^{2*}, Dr Shagufta Naseer³, Dr humaira niaz⁴, Dr Arshad Ali⁵, Dr Muhammad Humayun Daftani⁶, Dr Sami Ullah⁷, Dr Adnan Shah⁸

¹Medical officer, Internal medicine ,Bangash Clinic doaba

²House officer, Internal medicine, Medical A ward, Lady reading Hospital Peshawar

³Senior Lecturer, Bahria University Karachi Campus, Humanities and Social Sciences

⁴General Practitioner, Hamad medical cooperation

⁵General/Internal medicine, Medical C unit , MTI, LRH Peshawar

⁶Senior house officer, Internal medicine, LRH

⁷Resident physician, internal medicine, Med A ward, LRH

⁸Senior house officer, Internal medicine, LRH

***Corresponding Author:** Dr Syed Nouman

*House officer, Internal medicine, Medical A ward, Lady reading Hospital Peshawar

Email Address: syednouman1513@gmail.com

Abstract

A 17-year-old male with a diagnosis of type-1 diabetes since the age of 7 was treated with insulin. This case report he had been referred from Abbottabad with severe vomiting, dehydration, and a generalized vesicular rash suggestive of chickenpox. He presented in a state of DKA, overlapping with chickenpox infection. DKA was managed with liberal fluid replacement, intravenous insulin therapy, and strict electrolyte management. Treatment of the chickenpox infection involved intravenous acyclovir and supportive care. An ongoing assessment was necessary, with the management plan altered to manage the metabolic derangements associated with DKA and respiratory support given co-existing viral infection. After various days, his metabolic parameters were stabilized, and you could see that he felt better, so we managed to discharge him with indications of outpatient follow-up. This case highlights the difficulties in treating DKA during concomitant infections and stresses the importance of a combined approach and close monitoring.

Introduction

Diabetic ketoacidosis (DKA) is a deadly complication of diabetes mellitus, manifested by hyperglycemia, ketosis, and metabolic acidosis. Mostly, this is secondary to a deficiency in insulin production and can be triggered by any stressor (infection, non-compliance with insulin therapy) (Puttanna, 2014). Furthermore, the continued elevation of relative glucose concentrations in the blood over a long period can bring about various side effects such as aggressive desiccation or imbalanced circulation (Hip Ogic Blood Clotting) and, at its most horrifying - an unbalanced neurological state leading to death otherwise known more commonly today by those who wear scrubs "DKA- Diabetic ketoacidosis. DKA management consists of prompt diagnosis and aggressive treatment with fluid replenishment, insulin infusion, and electrolyte correction (Eledrisi, 2020).

Additionally, simultaneous infections are hazardous in DKA control. Infections cause insulin resistance and the secretion of catabolic hormones Related to diabetes/ketosis SV3751, leading to exacerbation in cases of refractory hyperglycemia and ketogenesis or DKA (Sukkar, 2020). In particular, varicella-zoster virus (chickenpox) infection can trigger metabolic disturbances in diabetic individuals to evoke grave DKA. On top of this, sequelae such as other (bacterial) superinfections, which are accompanied by fever indistinguishable from TSS or pneumonia and encephalitis due to a varicella-zoster virus reactivation, can further complicate the clinical images (Kennedy, 2018)

The perception of this complex interaction between DKA and concomitant infections is essential for managing these cases efficiently. This case review describes the clinical features, difficulty in diagnosing, and everyday management of a 17-year-old male with known diabetes since age 7 years admitted to our hospital for chicken pox-related diabetic ketoacidosis. The importance of early recognition and management in such intricate cases is highlighted by the above patient, who was referred from Abbottabad. Introduction Diabetic ketoacidosis (DKA) is a life-threatening diabetes mellitus complication with three main features: hyperglycemia, ketosis, and metabolic acidosis. It typically occurs in response to absolute insulin deficiency and is precipitated by several factors, including infection, non-adherence to insulin therapy, and other stressors (Kes, 2020). Severe DKA will lead to hypovolemia, electrolyte imbalances, and, in refractory cases, cerebral edema and death . DKA management involves early detection and an energetic approach that immediately replaces fluids, administers insulin, and treats electrolyte derangements (Khanduker, 2017).

It also remains true that concurrent infection is a major impediment to managing DKA with or without agreed guidelines. This is usually due to the increased insulin resistance and secretion of catabolic hormones such as glucagon catecholamines (Beaupere, 2021), which worsen hyperglycemia and ketogenesis. Varicella-zoster virus (VZV) infection, particularly chickenpox, can lead to superimposed metabolic complications in patients with diabetes; this may enhance the chances of severe DKA. Chickenpox presents with fever and a vesicular rash that may cause complications such as bacterial superinfections (Singh, 2018), in the course of pneumonia or encephalitis, an even more complicated clinical phase. The intricate connection between DKA and concurrent infections is an essential story for patient wellness. A 17-year-old man with phenomenal type diabetes mellitus (DM) diagnosed at the age of the presented with diabetic ketoacidosis (DKA), rendered complex by an attack of chicken pox.

Case Presentation

Patient Information

Age: 17 years

Gender: Male

Past medications: Diet-controlled AODM since age 7 years, type I on insulin

Clinical Findings

First Visit and Physical Exam A 16-year-old girl had been suffering from the following three symptoms over 3 months: Syncope before bedtime x2, No cardiac arrest mentioned, or nocturnal seizures. The patient was admitted with severe vomiting and dehydration. The next day, he presented a fever and generalized vesicular rash typical of varicella. Secondary symptoms were signs of stomach pain, rapid breathing (Kussmaul breaths), and tiredness (Held-Warmkessel, 2023).

On physical examination at the time of admission

The patient was acutely ill-looking and dehydrated—vitals: Tachycardia, Hypotension, tachypnea, fever. Examination of the skin showed multiple vesicular lesions consistent with chickenpox. On abdominal examination, there was generalized tenderness with no guarding or rebound.

Diagnostic Assessment

Laboratory Results

- **Blood Glucose Level** - { High ++ } (= as high it can go) SCENARIO OF SEVERE HYPERGLYCEMIA
- **Ketones:** Blood & Urine Positive for ketosis
- **ABGs:** Metabolic acidosis with low bicarbonate and high anion gap.
- **Electrolytes:** initially hypokalemia due to tissue intracellular shift and predicted hyperkalemia after initiation of insulin therapy, hyponatremic due to any osmotic shiftsendregion SACRED SHIT CBC, Luekocyte count high - may be due to infection.
- **Liver enzymes (liver function tests):** sometimes, the liver enzymes will be elevated, presumably because of systemic stress from DKA.
- **Laboratory Findings:** High Blood urea creatinine denoting renal failure post hypovolemia

| | All 115 admissions n (%) | | |
|---------------------------------------|--------------------------|---------|---------|
| | Total | ICU | Ward |
| DKA precipitating factors | | | |
| Infection | 55 (48) | 13 (11) | 42 (37) |
| insufficient insulin therapy | 27 (24) | 6 (5) | 21 (18) |
| Unknown causes | 24 (21) | 1 (1) | 23 (20) |
| Other medical conditions ¹ | 9 (8) | 4 (3) | 5 (4) |
| Initial presentation | | | |
| Nausea±vomiting | 62 (54) | | |
| Abdominal pain | 54 (47) | | |
| Fatigue | 26 (23) | | |
| Dyspnea | 16 (14) | | |
| Lethargy or coma | 12 (10) | | |
| Polyuria±polydipsia | 12 (10) | | |
| Other symptoms ² | 13 (11) | | |

¹Other medical conditions include pancreatitis, MI, pregnancy, surgery. ²Other symptoms include fever, sore throat, chest pain, dizziness. DKA: Diabetic ketoacidosis, ICU: Intensive care unit, MI: Myocardial infarction

Imaging and Other Investigations

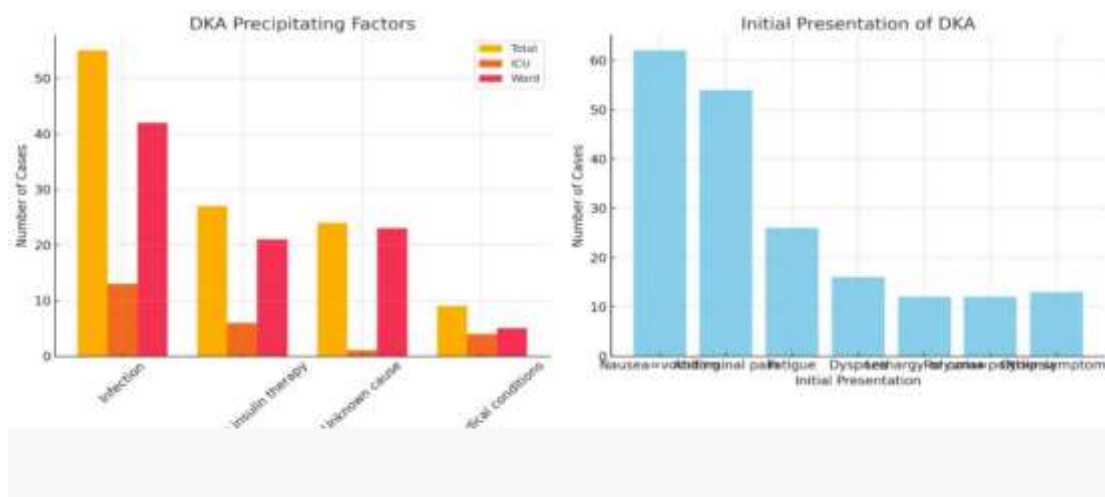
Any particular imaging need not confirm a diagnosis since the clinical and laboratory findings were adequate for its determination. Continuous monitoring was required for blood glucose and electrolytes.

Differential diagnosis issues:

Hyperosmolar Hyperglycemic State (HHS) Sepsis Due to Nausea and Vomiting Meningitis (due to fever, altered mental status)

Final Diagnosis:

DKA + chickenpox (-)



Management and Outcome

Treatment

Management of DKA

To replenish fluid status, the patient was given IV fluids (intravenously). The initial fluids administered were isotonic saline followed by half-normal saline when the patient started stabilizing.

- **Insulin Therapy:** started on regular IV insulin infusion to gradually decrease blood glucose and minimize rapid osmotic shifts. The hourly monitoring of blood glucose levels was performed.
- **Management of Electrolytes:** Adequate monitoring and replenishment of electrolyte levels, primarily potassium. Insulin therapy can precipitate hypokalemia, so potassium was given.

Clinical Course and Follow-Up

Monitoring & Proposed Alterations in Medicine

Initially, the patient was monitored in an intensive care unit (ICU) setting. Blood glucose, ketones, and electrolytes were measured every hour. The crucial factors were the continuous monitoring of vital signs, clinical status, and adaptations in fluids-insulin regimens based on the response to therapy.

1. Complications Faced While Treatment:

The patient developed mild hypokalemia, easily corrected with IV potassium supplementation. He had a mild renal impairment that resolved after adequate hydration and resolution of DKA.

The metabolic parameters of the patient stabilized over days and normalized, and thus, he improved with the resolution of DKA. Ketones were cleared, and blood glucose levels normalized. An outbreak of chickenpox lesions crusted and granulated in association with antiviral therapy, and the patient's fever also resolved. The patient was started on subcutaneous insulin, and the dose was adjusted based on the recovery phase. The patient was later discharged on close outpatient follow-up, education regarding diabetes management in illness, and to complete his course of antiviral therapy. The patient was to be followed up with endocrine and infectious disease colleagues for ongoing surveillance of long-term sequelae and optimization of glucose control in his clinic. This case highlights the need for complete multidisciplinary treatment and monitoring in complex cases of infection-EDKA.

Discussion

We highlight a problematic scenario where we managed the care of an adolescent with diabetic ketoacidosis (DKA) in the setting of acute infection, most notably varicella-zoster virus chickenpox. The burden of current evidence indicates that infections are a common trigger for DKA, given the presence of insulin resistance and counter-regulatory hormone release, which can exacerbate any

degree of hyperglycemia with resultant ketosis (Bonora, 2020). CME Questions: This case illustrates DKA diagnosis and treatment challenges when an acute viral infection remains undiagnosed.

The main difficulties we experienced in this case were due to the diagnosis and a combination of symptoms caused by DKA and those from the chickenpox infection. There is significant overlap between BV and trichomoniasis; common symptoms such as fever and dehydration are prevalent in the two conditions, making it difficult to make a clear clinical picture. In addition, management involved a delicate balance of fluid resuscitation and insulin therapy accompanied by treatment for the viral infection with antiviral agents. The need for such a multifaceted strategy is one reason additional monitoring was required to prevent complications (hypokalemia and fluid overload) effectively managed in this patient (Flythe, 2020).

There are several meaningful learnings from this case, such as interdisciplinary team management and close observation. Timely identification of associated infections in DKA patients allows the initiation of antiviral or antibacterial therapy as needed. This case also highlights the importance of alterations to treatment plans in response to specific concurrent conditions, as standard DKA protocols may need modification according to individual patient circumstances (Dhatariya, 2020). Including an infectious disease specialist in the management team can benefit holistic care and improve patient outcomes.

For clinical practice, it is well advised by clinicians to suspect the etiology of infection for any patients with a history and ongoing treatment for diabetes with poor glycemic control presenting as DKA. Prompt and aggressive infection therapy in conjunction with standard DKA management is paramount. Frequent assessment of metabolic variables and a willingness to adapt therapeutic regimes to changing patient clinical conditions are vital. Moreover, patients should be educated on controlling blood sugar and recognizing signs of infection early, which may diminish complicated presentations (Ergun-Longmire, 2021). Thus, the present case underscored that complex DKA cases require a personalized treatment strategy that can change over time. There is a need to educate healthcare providers further in identifying and addressing such intricate conditions.

Conclusion

This case reinforces the complexity and difficulty in managing DKA complicated by a concurrent infection, such as chicken pox, especially amongst the young patient population. BackgroundThe history of diabetes in the patient and severe chickenpox infection led to a challenging task where more than one specialist had to work together. Instead, the case highlights that infections in patients with DKA can worsen metabolic derangements and be a platform for treatment complexities. Takeaway points for clinical practice include the need to closely monitor metabolic parameters, be prepared to modify standard treatment protocols based on changes in clinical status, and provide multidisciplinary care with endocrinology and infectious disease specialists. Conversely, teaching patients the significance of well-controlled glycemia and symptoms indicative of infection is equally essential in evading such complicated cases. It is an important illustration of how customized and flexible treatment plans are necessary to improve patient outcomes in medically challenging situations.

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