ISSN: 2349-2678

Contents lists available at www.ijpba.in

International Journal of Pharmaceutical and Biological Science Archive

NLM (National Library of Medicine ID: 101738825)

Index Copernicus Value 2022: 72.79

Volume 10 Issue 2; March-April; 2022; Page No. 89-93

RESEARCH ARTICLE

CLINICAL AND BIOCHEMICAL CHARACTERISTICS OF DIABETIC KETOACIDOSIS: A CROSS-SECTIONAL STUDY IN A TERTIARY CARE SETTING

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Conflicts of Interest: Nil

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ABSTRACT

Background: Diabetic ketoacidosis (DKA) is a severe complication of diabetes mellitus characterized by hyperglycemia, ketosis, and metabolic acidosis. This study aims to explore the clinical and biochemical characteristics of DKA in patients to enhance understanding and management of the condition.

Methods: This cross-sectional study was conducted over six months at a tertiary care hospital. Adult patients (≥18 years) diagnosed with DKA were included. Clinical data and biochemical parameters, including blood glucose levels, serum ketones, arterial pH, bicarbonate levels, and electrolyte status, were collected and analyzed. The study also reviewed treatment approaches and outcomes.

Results: The study included 100 patients with a median age of 58 years. The majority were female (60%). Average blood glucose was 350 mg/dL, and serum ketones averaged 4.5 mmol/L. Arterial pH was 7.2, and bicarbonate levels were 12 mEq/L, indicating significant metabolic acidosis. Electrolyte imbalances were noted with median serum sodium at 135 mEq/L and potassium at 4.0 mEq/L. All patients received fluid resuscitation, 95% were administered insulin, and 80% received electrolyte replacement. The recovery rate was 85%, with a 5% mortality rate.

Conclusions: This study highlights the prevalence and clinical presentation of DKA, emphasizing the importance of timely and effective management. The findings reinforce the need for accurate biochemical monitoring and tailored treatment strategies to improve patient outcomes. The high recovery rate underscores the effectiveness of current treatment protocols, while the observed mortality rate indicates the necessity for ongoing vigilance and prompt intervention.

Keywords: Diabetic Ketoacidosis, Hyperglycemia, Metabolic Acidosis, Electrolyte Imbalance, Treatment Outcomes

Introduction

Diabetic ketoacidosis (DKA) is a severe and potentially life-threatening complication of diabetes mellitus characterized by hyperglycemia, ketosis, and metabolic acidosis. It predominantly occurs in individuals with type 1 diabetes but can also affect those with type 2 diabetes under certain conditions. The clinical and biochemical characteristics of DKA are crucial for diagnosis and management, and understanding these aspects can significantly impact patient outcomes [1,2].

DKA is often precipitated by factors such as infection, inadequate insulin therapy, or new-onset diabetes [3]. The condition is marked by elevated blood glucose levels, increased ketone bodies in the blood and urine, and metabolic acidosis with a high anion gap [4]. Clinically, patients may present with symptoms including nausea, vomiting, abdominal pain, and altered mental status, which can rapidly progress to more severe complications if not promptly addressed [5,6].

Biochemically, DKA is characterized by significant alterations in serum electrolytes. Hyperglycemia leads to osmotic diuresis, causing dehydration and electrolyte imbalances such as hypokalemia and hyponatremia. Despite normal or elevated serum potassium levels, total body potassium is often depleted, necessitating careful management of electrolyte replacement [7,8]. Additionally, the presence of metabolic acidosis is assessed through arterial blood gas analysis, showing a decreased bicarbonate level and an elevated anion gap [9].

The management of DKA involves a multifaceted approach including fluid resuscitation, insulin therapy, and electrolyte correction [10]. Recent advancements in understanding the pathophysiology of DKA have highlighted the importance of early and accurate biochemical monitoring to guide therapy and prevent complications [11,12]. Studies have shown that appropriate and timely treatment can reduce mortality rates and improve overall outcomes for patients with DKA [13,14].

Emerging research continues to explore the clinical and biochemical nuances of DKA, aiming to refine diagnostic criteria and treatment protocols. Improved understanding of these characteristics can lead to more effective management strategies and better patient care. This study aims to provide a comprehensive analysis of the clinical and biochemical profiles of patients with DKA, contributing to enhanced management practices and patient outcomes.

Aim:

To evaluate the clinical and biochemical characteristics of patients with diabetic ketoacidosis (DKA) to improve diagnosis and management strategies.

Objectives:

1. To assess the clinical presentation, including symptoms and comorbid conditions, of patients diagnosed with DKA.
2. To analyze biochemical parameters, such as glucose levels, ketone bodies, and electrolyte imbalances, to identify patterns and guide treatment.

Materials and Methods

This cross-sectional study was conducted at a tertiary care hospital over a six-month period to investigate the clinical and biochemical characteristics of patients with diabetic ketoacidosis (DKA). Adult patients (≥18 years) who presented with or were diagnosed with DKA based on clinical criteria and laboratory findings were included. The diagnosis of DKA was confirmed by the presence of hyperglycemia (blood glucose level >250 mg/dL), ketonemia, and metabolic acidosis (arterial pH <7.3 and bicarbonate <15 mEq/L) [1].

Inclusion Criteria:

Adults aged 18 years or older.

Diagnosis of DKA as defined by clinical and biochemical criteria.

Ability to provide informed consent or have consent provided by a legal guardian.

Exclusion Criteria:

Secondary causes of metabolic acidosis or hyperglycemia, such as lactic acidosis or renal failure.

Patients with significant comorbid conditions that could confound results, such as severe liver disease or malignancy.

Individuals who were unable to provide informed consent or had conditions precluding participation.

Data collection included a detailed review of patient records for demographic information, clinical presentation, and comorbid conditions. Biochemical parameters were analyzed, including blood glucose levels, serum ketones, arterial blood gases, and electrolytes. Treatment protocols and outcomes were documented to assess management strategies. Statistical analysis was performed to identify patterns and correlations among clinical and biochemical variables, aiming to enhance understanding and management of DKA.

Result:

Table 1

Variable	Findings
Total Patients	100
Median Age (years)	58
Gender Distribution	60% Female, 40% Male
Average Blood Glucose (mg/dL)	350
Serum Ketones (mmol/L)	4.5
Arterial pH	7.2
Bicarbonate (mEq/L)	12
Serum Sodium (mEq/L)	135
Serum Potassium (mEq/L)	4.0
Comorbid Conditions	Hypertension: 50%, Diabetes Mellitus: 70%
Treatment	Insulin: 95%, Fluid Resuscitation: 100%, Electrolyte Replacement: 80%
Outcome	Recovery: 85%, Mortality: 5%

The study included 100 patients diagnosed with DKA, with a median age of 58 years. The majority of the patients were female (60%). On presentation, the average blood glucose level was 350 mg/dL, and serum ketones averaged 4.5 mmol/L. Arterial pH levels indicated moderate acidosis with a median of 7.2, and bicarbonate levels were low at 12 mEq/L, reflecting significant metabolic acidosis. Electrolyte imbalances were noted, with median serum sodium at 135 mEq/L and potassium at 4.0 mEq/L. Common comorbid conditions included hypertension in 50% and diabetes mellitus in 70% of patients. Management primarily involved insulin therapy (95%), fluid resuscitation (100%), and electrolyte replacement (80%). The majority of patients (85%) recovered from DKA, while 5% experienced mortality.

Discussion:

This study provides a comprehensive overview of the clinical and biochemical characteristics of patients presenting with diabetic ketoacidosis (DKA) in a tertiary care setting. The findings highlight several key aspects of DKA management and outcomes, aligning with current literature on the condition.

The median age of 58 years among patients in this study reflects the trend of DKA being more common in adults, though it is traditionally associated with type 1 diabetes mellitus. However, an increasing incidence in type 2 diabetes has been documented, particularly in the context of insulin resistance and stress conditions such as infections or inadequate insulin therapy [3,7]. This demographic shift underscores the importance of considering DKA in the differential diagnosis for patients with type 2 diabetes, especially those presenting with severe hyperglycemia.

The average blood glucose level of 350 mg/dL and serum ketones of 4.5 mmol/L are consistent with typical biochemical findings in DKA. Hyperglycemia and ketosis are hallmarks of DKA, leading to metabolic acidosis characterized by a median arterial pH of 7.2 and bicarbonate levels of 12 mEq/L [4,10]. These findings emphasize the necessity of timely and accurate biochemical assessment for effective diagnosis and management. The presence of moderate acidosis and elevated ketone levels reflect the severity of the condition and guide the therapeutic approach.

Electrolyte imbalances, particularly the median serum sodium level of 135 mEq/L and potassium of 4.0 mEq/L, are common in DKA. Despite normal serum potassium levels at presentation, total body potassium is often depleted due to osmotic diuresis and should be monitored closely during treatment [9,12]. The management strategies employed—insulin therapy, fluid resuscitation, and electrolyte replacement—are consistent with established protocols for DKA treatment [7]. The fact that all patients received fluid resuscitation

underscores its critical role in correcting dehydration and restoring intravascular volume.

The study observed an 85% recovery rate, with a 5% mortality rate, which aligns with reported outcomes for DKA in tertiary care settings [13]. The recovery rate reflects the effectiveness of current treatment strategies, while the mortality rate, though relatively low, highlights the need for ongoing vigilance and rapid intervention to mitigate risks.

In conclusion, this study underscores the critical importance of prompt and comprehensive management of DKA, incorporating accurate biochemical monitoring and targeted treatment strategies. The findings contribute valuable insights into the clinical presentation and management of DKA, reinforcing the need for continued refinement of treatment protocols and patient care practices.

Conclusion:

This study provides valuable insights into the clinical and biochemical profiles of patients with diabetic ketoacidosis (DKA) and underscores the importance of effective management strategies. The findings reveal that DKA predominantly affects adults with significant comorbidities, such as hypertension and diabetes mellitus, and is characterized by marked hyperglycemia, ketosis, and metabolic acidosis. The average blood glucose and ketone levels, along with the arterial pH and bicarbonate measurements, align with the typical biochemical alterations seen in DKA, highlighting the severity and systemic impact of the condition.

The study emphasizes the critical role of timely and comprehensive treatment approaches, including insulin therapy, fluid resuscitation, and careful electrolyte management, in improving patient outcomes. The high recovery rate observed reflects the efficacy of these interventions, although the 5% mortality rate indicates that ongoing vigilance and prompt intervention are essential to manage severe cases effectively.

Overall, the study reinforces the need for accurate diagnosis and tailored treatment plans for DKA to enhance patient care and reduce complications. Continued research and adherence to updated clinical guidelines are crucial for optimizing management strategies and improving the prognosis for patients with DKA.

Reference:

1. Kitabchi AE, Umpierrez GE, Miles JM, Fisher JN. Hyperglycemic crises in adult patients with diabetes. Diabetes Care. 20 09;32(Suppl 1)
2. Sahu S, Mittal S, Patel S, Gupta S, Sahoo S. Diabetic ketoacidosis: An overview. J Pharmacol Pharmacother. 2013;4(1):60-64.
3. Umpierrez GE, Korytkowski MT. Diabetic ketoacidosis and hyperglycemic hyperosmolar state. Endocrinol Metab Clin North Am. 2016;45(4):765-779.
4. Hu X, Song Y, Huang J, et al. The clinical and biochemical characteristics of patients with diabetic ketoacidosis: A prospective study. Diabetes Metab J. 2021;45(4):512-52 0.
5. Dhatariya KK. Diabetic ketoacidosis and hyperglycemic hyperosmolar state. Endocrinol Metab Clin North Am. 2016;45 (4):779-794.
6. Korytkowski MT. Diabetic ketoacidosis: An update. Diabetes Metab Syndr Obes. 2012; 5:143-150.
7. Kitabchi AE, Nyenwe EA, Umpierrez GE. Management of diabetic ketoacidosis and hyperglycemic hyperosmolar state. Endocrinol Metab Clin North Am. 2019;48 (3):447-466.
8. Zeng Z, Zhang Y, Wu Z, et al. Electrolyte disturbances in diabetic ketoacidosis: A comprehensive analysis. Crit Care. 2020;24 (1):191.
9. Stentz FB. Diabetic ketoacidosis and hyperglycemic hyperosmolar syndrome. Endocrinol Metab Clin North Am. 2004;33 (3):847-862.
10. Dhatariya KK. Management of diabetic ketoacidosis and hyperglycemic hyperosmolar state. Diabetes Obes Metab. 2017;19(3):320-329.
11. Nyenwe EA, Kitabchi AE. Diabetic ketoacidosis and hyperglycemic hyperosmolar state. In: Diabetes Mellitus: A

Fundamental and Clinical Text. 2021;131-146.
12. Mikhail N. Diabetic ketoacidosis: Diagnostic and management strategies. Am J Med Sci. 2020;359(6):460-470.
13. Vella A, Lacy DB, McGregor K. Diabetic ketoacidosis and hyperglycemic hyperosmolar state. South Med J. 2020;113 (2):132-138.
14. Dell'Anna AM, Mastroianni C, Mosca A, et al. The evolving understanding of diabetic ketoacidosis: The need for continuous reevaluation of diagnostic and therapeutic protocols. Diabetes Ther. 2021;12(2):485-497.