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RESEARCH ARTICLE

CLINICAL AND BIOCHEMICAL CHARACTERISTICS OF DIABETIC KETOACIDOSIS: A RETROSPECTIVE ANALYSIS OF PATIENT PRESENTATION AND MANAGEMENT OUTCOMES"

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ABSTRACT

Background: Diabetic ketoacidosis (DKA) is a severe and potentially life-threatening complication of diabetes mellitus characterized by hyperglycemia, ketonemia, and metabolic acidosis. Understanding its clinical and biochemical features is crucial for effective management and improved patient outcomes.

Aim: This study aimed to evaluate the clinical presentation and biochemical characteristics of patients with DKA to enhance diagnostic accuracy and management strategies.

Methods: We conducted a retrospective analysis of 150 patients diagnosed with DKA at a tertiary care hospital over a one-year period. Data collected included patient demographics, presenting symptoms, blood glucose levels, serum ketone concentrations, arterial blood pH, bicarbonate levels, and electrolyte abnormalities. Inclusion criteria were a diagnosis of DKA based on clinical and laboratory findings, while exclusion criteria included hyperosmolar hyperglycemic state, significant metabolic or endocrine disorders, pregnancy, and incomplete records.

Results: The median age of patients was 45 years, with a gender distribution of 60% female and 40% male. The median blood glucose level was 320 mg/dL, and median serum ketones were 4.5 mmol/L. The median arterial pH was 7.2, and median bicarbonate level was 12 mEq/L. Electrolyte abnormalities were noted in 35% of patients with hypokalemia and 25% with hyperkalemia. Nausea (80%), vomiting (75%), and abdominal pain (65%) were the most common symptoms. Infections were identified as a trigger in 40% of cases. The average length of hospital stay was 5 days, with treatment outcomes showing 85% improvement, 10% stable, and 5% complicated cases.

Conclusion: The study highlights the prevalent clinical and biochemical abnormalities in DKA patients, with significant variations in presentation and management needs. Real-time monitoring of key parameters, including blood glucose, ketones, and electrolytes, is essential for effective treatment. The findings underscore the importance of early detection and tailored management strategies to improve patient outcomes in DKA.

Keywords: Diabetic ketoacidosis, blood glucose, serum ketones, arterial pH, bicarbonate, electrolyte imbalances, diabetes mellitus...

INTRODUCTION:

Diabetic ketoacidosis (DKA) is a life-threatening complication of diabetes mellitus characterized by hyperglycemia, ketonemia, and metabolic acidosis. It predominantly occurs in patients with type 1 diabetes mellitus (T1DM), although it can also be seen in those with type 2 diabetes mellitus (T2DM) under certain conditions [1,2]. DKA results from an absolute or relative insulin deficiency combined with increased counter-regulatory hormones, leading to hyperglycemia, ketone body production, and subsequent metabolic derangements [3].

The clinical presentation of DKA includes symptoms such as polyuria, polydipsia, nausea, vomiting, abdominal pain, and altered mental status [4]. Biochemically, DKA is marked by elevated blood glucose levels, increased anion gap metabolic acidosis, and elevated serum ketones [5]. The severity of DKA is commonly classified based on the level of blood glucose, bicarbonate concentration, pH, and ketone levels [6]. Accurate diagnosis and timely management are crucial to reducing morbidity and mortality associated with this condition.

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Several factors contribute to the development of DKA, including infections, inadequate insulin therapy, and emotional or physical stress [7]. Infections, particularly of the urinary tract and respiratory system, are frequently identified triggers [8]. Additionally, patient non-compliance with insulin therapy or insulin pump failures can precipitate DKA episodes [9].

Biochemical parameters play a critical role in the management and outcome prediction of DKA. Serum electrolytes, particularly potassium, require careful monitoring and correction, as DKA management involves insulin administration and fluid resuscitation, which can affect electrolyte balance [10]. Furthermore, the anion gap, calculated as the difference between measured cations and anions in serum, helps assess the severity of acidosis and the effectiveness of treatment [11]. The presence of underlying renal impairment or other comorbidities can further complicate the biochemical management of DKA.

Recent advancements in the understanding of DKA pathophysiology have emphasized the importance of early identification and correction of biochemical abnormalities. Novel biomarkers and improved diagnostic criteria are being explored to enhance the accuracy of DKA diagnosis and management [11]. This study aims to analyze the clinical and biochemical characteristics of patients with DKA, providing insights into the patterns of presentation, laboratory findings, and potential factors influencing outcomes. Understanding these characteristics is essential for optimizing treatment strategies and improving patient care in DKA.

Aim:

To investigate the clinical and biochemical characteristics of patients with diabetic ketoacidosis (DKA) to enhance understanding of its presentation and management.

Objectives:

1. To Analyze the symptoms and clinical signs of DKA in patients to identify common patterns and triggers.
2. To Evaluate the serum levels of glucose, ketones, electrolytes, and other key biomarkers to assess their roles in the diagnosis and management of DKA.

Materials and Methods:

This study was conducted as a retrospective analysis of patients diagnosed with diabetic ketoacidosis (DKA) at a tertiary care hospital over a one-year period. We included patients who met the following criteria: (1) a diagnosis of DKA based on clinical presentation and laboratory findings, including elevated blood glucose levels (≥250 mg/dL), ketonemia, and metabolic acidosis (arterial pH <7.3 or bicarbonate <15 mEq/L); (2) availability of complete clinical records and biochemical data; and (3) informed consent for the use of their medical data.

Patients were excluded if they had the following conditions: (1) a diagnosis of hyperosmolar hyperglycemic state (HHS) or other significant metabolic or endocrine disorders that could confound the diagnosis of DKA; (2) recent major surgery or trauma; (3) pregnancy; or (4) incomplete medical records or missing critical data.

Data collection involved reviewing patient charts to extract relevant clinical and biochemical parameters, including age, sex, presenting symptoms, blood glucose levels, serum ketone levels, bicarbonate levels, arterial blood pH, electrolyte levels, and treatment outcomes. Statistical analyses were performed to identify correlations between clinical presentation and biochemical markers, as well as to evaluate factors influencing the severity and management of DKA.

Result:

Parameter	Finding	Description
Number of Patients	150	Total number of patients diagnosed with DKA.
Median Age (Years)	45	Median age of patients with DKA.
Gender Distribution	60% Female, 40% Male	Percentage of female and male patients.
Median Blood Glucose (mg/dL)	320	Median blood glucose level at diagnosis.
Median Serum Ketones (mmol/L)	4.5	Median serum ketone concentration.
Median Arterial pH	7.2	Median arterial pH level, indicating the degree of acidosis.
Median Bicarbonate (mEq/L)	12	Median bicarbonate level, reflecting metabolic acidosis.
Electrolyte Abnormalities	35% Hypokalemia,	Percentage of patients with abnormal potassium

	25% Hyperkalemia	levels.
Common Symptoms	Nausea (80%), Vomiting (75%), Abdominal Pain (65%)	Most frequently reported symptoms among patients.
Infection as a Trigger	40%	Percentage of patients with an infection identified as a trigger.
Average Length of Hospital Stay (Days)	5	Average duration of hospitalization for DKA management.
Treatment Outcomes	85% Improved, 10% Stable, 5% Complicated	Percentage of patients with various outcomes post-treatment.

This table summarizes the key clinical and biochemical findings from the study of patients with DKA. The median age of patients was 45 years, with a slightly higher prevalence in females. Blood glucose levels at diagnosis averaged 320 mg/dL, and serum ketones were elevated at a median of 4.5 mmol/L. The median arterial pH and bicarbonate levels indicated significant metabolic acidosis. Hypokalemia and hyperkalemia were common electrolyte abnormalities. Symptoms such as nausea, vomiting, and abdominal pain were frequently reported, and infections were identified as a trigger in 40% of cases. The average hospital stay was 5 days, with the majority of patients showing improvement following treatment.

Discussion:

This study provides an in-depth analysis of the clinical and biochemical characteristics of patients with diabetic ketoacidosis (DKA). Our findings confirm the high prevalence of key clinical and biochemical markers associated with DKA and highlight several important aspects of its management.

The median blood glucose level of 320 mg/dL observed in this study is consistent with the characteristic hyperglycemia seen in DKA [1]. Elevated serum ketones (median of 4.5 mmol/L) and a median arterial pH of 7.2 underscore the significant metabolic acidosis that accompanies DKA]. These findings align with the pathophysiology of DKA, where insulin deficiency leads to hyperglycemia and ketone body production, resulting in an elevated anion gap metabolic acidosis [3]. The median bicarbonate level of 12 mEq/L reflects the severity of metabolic acidosis, which is a crucial marker for diagnosing and assessing DKA severity [4].

Electrolyte imbalances, notably hypokalemia and hyperkalemia, were present in 35% and 25% of patients, respectively. This is consistent with previous research, which emphasizes the importance of monitoring and managing potassium levels during DKA treatment. Insulin therapy and fluid resuscitation can lead to shifts in potassium, making careful monitoring essential to prevent complications [5,6].

Our study found that nausea, vomiting, and abdominal pain were the most common symptoms, which aligns with the typical clinical presentation of DKA [7]. The identification of infections as a trigger in 40% of patients highlights the need for prompt evaluation and management of potential infection sources, as infections are a common precipitant of DKA [8,9]. This underscores the importance of comprehensive patient assessment and the need for a multidisciplinary approach to address both the metabolic and infectious aspects of DKA.

The average hospital stay of 5 days reflects the intensive management required for DKA, including fluid resuscitation, insulin therapy, and monitoring for complications [10]. The treatment outcomes indicate that the majority of patients improved following management, which is consistent with the effectiveness of current DKA treatment protocols [11]. However, the presence of a small percentage of patients with complications suggests that ongoing vigilance and personalized management strategies are crucial for optimizing patient outcomes.

In conclusion, this study reaffirms the clinical and biochemical characteristics of DKA and emphasizes the importance of timely diagnosis, effective management, and vigilant monitoring. Future research should focus on optimizing treatment protocols and identifying additional factors that influence DKA outcomes to further improve patient care.

Conclusion:

This study provides a comprehensive overview of the clinical and biochemical characteristics of diabetic ketoacidosis (DKA) in a diverse patient cohort. Our findings highlight that DKA remains a significant and complex complication of diabetes mellitus, characterized by severe hyperglycemia, elevated serum

ketones, and metabolic acidosis. The median blood glucose level of 320 mg/dL and serum ketones of 4.5 mmol/L underscore the critical nature of glycemic control and ketone monitoring in managing DKA.

Electrolyte imbalances, particularly hypokalemia and hyperkalemia, were prevalent, reinforcing the necessity for meticulous electrolyte monitoring during treatment.

The common symptoms of nausea, vomiting, and abdominal pain align with established clinical presentations, emphasizing the importance of recognizing these signs for early diagnosis. The finding that infections were a common trigger for DKA highlights the need for thorough evaluation of potential infectious sources and timely intervention.

The average hospital stay of 5 days reflects the intensive nature of DKA management, which includes fluid resuscitation, insulin therapy, and ongoing monitoring. Despite the generally favorable outcomes, the presence of complications in a small percentage of patients suggests that individualized care and vigilance are essential for optimizing treatment efficacy.

In conclusion, real-time analysis of clinical and biochemical parameters provides valuable insights into DKA management, enhancing our understanding of its complexities and informing better treatment strategies. Future research should focus on improving early detection, refining treatment protocols, and exploring additional factors that impact patient outcomes to further enhance the care of individuals with DKA.

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