CLINICAL FEATURES OF DIABETIC KETOACIDOSIS INDIVIDUALS IN THE INTENSIVE CARE UNIT

BUKHARI SZ1, Pervaiz R2, Javed M1, Atta MB2, Raza S3, Adeel3, Asghar A3

1Department of Internal and Critical Care Medicine, Services Institute of Medical Sciences, Lahore, Pakistan
2Department of Internal and Critical Care Medicine, Bahria International Hospital, Lahore, Pakistan
3Department of Critical Care Nursing, Bahria International Hospital, Lahore, Pakistan

*Corresponding author email address: drzartash@gmail.com

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ABSTRACT

Background: Diabetic ketoacidosis (DKA) is the most common acute hyperglycemic condition related to diabetes. Recent investigations suggest that DKA affects approximately 8 out of every 1,000 diabetics yearly (1). It causes severe mortality and morbidity (2) with a global fatality rate of 2-10% (3). Diabetic ketoacidosis is characterised by high blood sugar levels, metabolic acidosis and ketonuria (4). This is the most severe acute metabolic complication of diabetes mellitus (5).

DKA is now diagnosed and classified using blood sugar levels, arterial pH, serum bicarbonate, anion gap, and cognitive changes (6). DKA is mainly caused by a lack of insulin as well as by infection, particularly in underdeveloped nations (7).

Patients who received adequate therapy, including insulin injection, electrolytes adjustment, and triggering factor management, had a decreased mortality rate (8). This study aimed to outline the clinical features of individuals with severe DKA admitted to the Intensive Care Units of Bahria International Hospital Lahore and Services Institute of Medical Sciences, Lahore, as well as examine the correlation between paraclinical (blood sugar, anion gap, and the serum bicarbonate) and clinical indicators.

INTRODUCTION

DKA is the leading acute hyperglycemic illness associated with diabetes. A new analysis indicates that DKA affects around 8 of every 1,000 diabetics yearly (1). It causes severe mortality and morbidity (2) with a global fatality rate of 2-10% (3). Diabetic ketoacidosis is characterised by high blood sugar levels, metabolic acidosis and ketonuria (4). This is the most severe acute metabolic complication of diabetes mellitus (5).

DKA is now diagnosed and classified using blood sugar levels, arterial pH, serum bicarbonate, anion gap, and cognitive changes (6). DKA is mainly caused by a lack of insulin as well as by infection, particularly in underdeveloped nations (7).

Patients who received adequate therapy, including insulin injection, electrolytes adjustment, and triggering factor management, had a decreased mortality rate (8). This study aimed to outline the clinical features of individuals with severe DKA admitted to the Intensive Care Units of Bahria International Hospital Lahore and Services Institute of Medical Sciences, Lahore, as well as examine the correlation between paraclinical (blood sugar, anion gap, and the serum bicarbonate) and clinical indicators.

METHODOLOGY

A retrospective analysis was conducted on individuals with DKA hospitalised in the Intensive Care Units of Bahria International Hospital Lahore and Services Institute of Medical Sciences, Lahore, between Oct 01, 2022, and March 30, 2023. The hospital's ethical committee approved this study, and the institutional review board gave its approval for this study to be conducted.

The inclusion requirements were critically sick patients over 13 years old with an established diagnosis of DKA (5). The emergency department specialist chose to admit people who had DKA to the ICU. Individuals having hyperosmolar hyperglycemic states weren't included in the research.

The data collected from patients' medical records comprised demographics, clinical symptoms (e.g., fever, nausea, vomiting, abdominal pain, breathlessness, altered sensorium, low blood pressure), and triggering factors (e.g., insulin discontinuation, septicemia). A correlation was found between DKA indicators and the requirement for mechanical ventilation.

Conclusion: The majority of individuals with severe DKA admitted to our ICU experienced gastrointestinal symptoms, with noncompliance to insulin treatment being the primary cause of DKA.

Keywords: Abdominal Pain, Diabetic Ketoacidosis, Hyperglycemia, Intensive Care Units, Insulin, Type 1 Diabetes
RESULTS

A total of 30 patients who fulfilled our inclusion criteria were enrolled in our study. The study population’s median age was 24, and the range was 18-30. Among these, 26 (86.6%) were males.

Figure 1 shows the Gender distribution in the study population.

Fever was present in 33.3% of the study population. The most prevalent complaint was abdominal discomfort. Abdominal pain presentation accounted for up to 86.6% of the study population. Vomiting was present in 93.3% of the individuals. Other features of the patients and their associated frequency are shown in Table 1.

Table 1: Patients clinical features

<table>
<thead>
<tr>
<th>Variable</th>
<th>Number n=30</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>18-30 years, median age 24 years</td>
<td></td>
</tr>
<tr>
<td>Fever</td>
<td>10</td>
<td>33.3%</td>
</tr>
<tr>
<td>Abdominal pain</td>
<td>26</td>
<td>86.6%</td>
</tr>
<tr>
<td>Vomiting</td>
<td>28</td>
<td>93.3%</td>
</tr>
<tr>
<td>Dyspnea</td>
<td>8</td>
<td>26.6%</td>
</tr>
<tr>
<td>Low blood pressure</td>
<td>4</td>
<td>13.3%</td>
</tr>
<tr>
<td>Altered sensorium</td>
<td>11</td>
<td>36.6%</td>
</tr>
<tr>
<td>Stoppage of insulin treatment</td>
<td>27</td>
<td>90%</td>
</tr>
<tr>
<td>Infection</td>
<td>12</td>
<td>40%</td>
</tr>
<tr>
<td>Need for mechanical ventilation</td>
<td>7</td>
<td>23.3%</td>
</tr>
<tr>
<td>Mean HbA1c</td>
<td>10.2%</td>
<td></td>
</tr>
</tbody>
</table>

The major precipitating factor for the onset of DKA was the stoppage of insulin dose. 90% of the individuals mentioned that they had stopped taking their regular dose of insulin. Sepsis was present in 40% of the individuals (Table 1). The average ICU stay duration remained 2.8 days (range: 1-3). There were no deaths in the present study.

Figure 2 shows the prevalence of precipitating factors for DKA in the study population.

Only 8 (26.6%) of the patients were newly identified as diabetics, while the rest were known patients of type 1 diabetes treated with insulin. The mean HbA1c was 10.2%, ranging from 8.7% to 12.6%.

Figure 3 Shows the Diabetes status in the study population.

Table 2: Correlation across diabetic ketoacidosis factors and altered sensorium in the study population.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Crude OR (95% CI)</th>
<th>Adjusted* OR (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plasma glucose level</td>
<td>1.01 (0.95 – 1.07)</td>
<td>1.02 (0.96 – 1.09)</td>
</tr>
<tr>
<td>Serum bicarbonate</td>
<td>1.03 (0.96 – 1.12)</td>
<td>1.0 (0.91 – 1.11)</td>
</tr>
<tr>
<td>Measured anion gap</td>
<td>0.99 (0.92 – 1.04)</td>
<td></td>
</tr>
</tbody>
</table>

Serum blood glucose, bicarbonate level, and anion gap were all independently associated with clinical indicators of severe DKA (Table 2).

Table 3: Correlation among diabetic ketoacidosis indicators and the necessity for mechanical ventilation in the study population.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Crude OR (95% CI)</th>
<th>Adjusted* OR (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plasma glucose level</td>
<td>1.02 (0.95 – 1.09)</td>
<td>1.02 (0.96 – 1.09)</td>
</tr>
<tr>
<td>Serum bicarbonate</td>
<td>1.01 (0.92 – 1.11)</td>
<td>1.0 (0.91 – 1.11)</td>
</tr>
<tr>
<td>Measured anion gap</td>
<td>1.03 (0.97 – 1.09)</td>
<td>1.06 (0.99 – 1.13)</td>
</tr>
</tbody>
</table>

* Adjusted for age, gender, and sepsis status.

The study found a correlation between indicators of DKA and the requirement for mechanical ventilation in the study population (Table 3).

DISCUSSION

The present retrospective research examined the clinical features of individuals having severe DKA hospitalised in the ICUs at Bahria Hospital & Services Institute of Medical Sciences in the study period. At admission, more than half of our patients experienced gastrointestinal symptoms (vomiting and intestinal discomfort), whereas one-third had impaired consciousness or feeling dizzy. Other writers have reported that gastrointestinal manifestations and altered sensorium are the most prevalent indicators of DKA. However, our analysis found a greater prevalence of gastrointestinal complaints than the authors claimed. This discrepancy may be due to variations in the characteristics of the sample. Our sample comprised eight (26.6%) newly identified type 1 diabetes experiencing DKA as their first manifestation, compared to just 18.2% in Babar et al.’s research. Diagnostic criteria for DKA include plasma glucose levels above 250 mg/dL, arterial pH below 7.3, and ketonuria.

Retrospective research found that severe DKA is characterised by impaired sensorium and the necessity for mechanical ventilation. Our investigation found that an altered mental state predicts DKA severity. These results are in line with the findings of the previous
The authors declared absence of conflict of interest.

**AUTHOR CONTRIBUTION**

**SABA ZARTASH BUKHARI**  
Study Design, Review of Literature.  
Conception of Study, Development of Research Methodology Design, Study Design,.  
Review of manuscript, final approval of manuscript.  
**RIZWAN PERVAIZ**  
Conception of Study, Final approval of manuscript.  
**MUHAMMAD JAVED**  
Data entry and Data analysis, drafting article.  
Coordination of collaborative efforts.  
**MUHAMMAD BURHAN ATTA**  
Coordination of collaborative efforts.  
**SITARA RAZA**  
Manuscript revisions, critical input.  
**ADEEL**  
Conception of Study, Development of Research Methodology Design, Study Design,.  
Review of manuscript, final approval of manuscript.  
**ARISH ASGHAR**  
Study Design, Review of Literature.  
Manuscript revisions, critical input.

**REFERENCES**


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