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Research Article

NECESSITY OF INSULIN AND INTRAVENOUS FLUID IN THE TREATMENT OF DIABETIC KETOACIDOSIS TO AVOID THE CRISIS

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Abstract:

Introduction: Diabetic ketoacidosis (DKA) is relatively common in acute metabolic decompensation state of diabetes. It is common in diabetic patients who have stopped taking insulin or have had an infection. Treatment consisted of correcting dehydration, hyperglycemia, electrolyte imbalance, acidosis, and antibiotics in patients with some infection or treating other causes, if any. The aim of this study was to determine the need of insulin and intravenous fluid in the treatment of diabetic ketoacidosis and to avoid any crisis

Methods: This cross-sectional study was conducted in the Medicine Unit-II of Services Hospital Lahore for one-year duration from 1st July 2019 to 30th 2020. Fifty adult patients with diabetic ketoacidosis who met inclusion and exclusion criteria to determine the total amount of intravenous fluid (saline) needed to treat diabetic ketoacidosis.

Results: DKA was more common in previously diagnosed (60%) diabetic patients, and the incidence was higher in poor rural residents, and there were no significant differences between the sexes. Together with polyuria (24%) and polydipsia (16%), nausea (32%), vomiting (48%), abdominal pain (28%) and the feature of infection were common. The main cause was infection (38%) and missed insulin doses (34%). In most cases, glycemic status was poor. The majority of patients had mild (32%) to moderate (60%) acidosis, and major electrolyte disturbances were less frequent. Leukocytosis (88%) was consistent even without infection. The result (90% survival) was comparable to the developing world. In the treatment of DKA, 40% of patients required 11 liters of fluid in whom increased diuresis occurred. 24% of patients required 91-100 units of insulin and most (32%) patients required 48 hours to correct their acidosis.

Conclusions: The diagnosis and treatment of diabetic ketoacidosis is not difficult if diagnosed early. Proper fluid replacement is important to prevent mortality.

Keywords: diabetes, diabetic ketoacidosis, insulin, intravenous fluid.

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INTRODUCTION:

Among the acute, metabolically decompensated states of diabetes, diabetic ketoacidosis is relatively common. It is common in diabetic patients who have stopped taking insulin or have had an infection. Previously undiagnosed patients also reported DKA. For this reason, we assessed fifty patients with DKA for treatment and outcome requirements for fluid I / V and insulin. Treatment consisted of correcting dehydration, acidosis and electrolyte imbalances, as well as treating the triggering factors, such as antibiotics, for an infection.

METHODS:

This was a cross-sectional study conducted at the Medicine Unit-II of Services Hospital Lahore for one-year duration from 1st July 2019 to 30th 2020. The Portland protocol was followed for the treatment of DKA. Blood sugar was measured every hour and the insulin rate was regulated in a syringe pump according to the Portland protocol. A consumption chart was kept to check that 50% of the administered fluid was stopped and also to prevent volume overload. Bicarbonate was not given. DKA was considered to have resolved when the bicarbonate level was above 18 meq / L and the pH > 7.3. Subsequently, the split mix regimen with

subcutaneous insulin was initiated, in which patients could take food orally (2/3 intermediate-acting NPH insulin and 1/3 regular insulin). 2/3 of the total daily dose was administered in the morning and 1/3 in the evening.

RESULTS:

The total number of patients was 50. 20 are newly diagnosed with diabetes, and 30 are known to have diabetes. Among the known cases, 50% of patients were on insulin, 25% on OHA, then insulin, and 22% on OHA. 20 cases were in men and 30 in women. (M: F = 2: 3). The main causes of DKA development were infections and skipped insulin doses. In most cases, glycemic status was poor. Most of the patients had mild to moderate acidosis. In the treatment of DKA, 40% of patients required 11 liters of fluid in whom increased diuresis occurred. Twenty-four of the current patients required 91-100 units of insulin, and the majority (32%) of patients required 48 hours to correct their acidosis. Table 1 shows the distribution of patients in the different age groups. 72% of patients were under 40 years of age and only 1 patient (2%) was over 50 years of age. More specifically, a maximum of 24% of patients were between 21 and 25 years of age.

Table-I**Age distribution of patients (total patients 50)**

Age (years)	Number of patients (%)
≤ 20	8 (16)
21-25	12 (24)
26-30	7 (14)
31-35	4 (8)
36-40	5 (10)
41-45	9 (18)
46-50	4 (8)
51-55	1 (2)
56-60	0 (0)
≥ 61	0 (0)

Table-II

Distribution of cases according to precipitating causes

Cause	Number of patients (old)	Number of cases (new)
Infection (38%)	10	9
Omission of insulin/ drug (34%)	17	
New case (20%)		10
Surgery (2%)	1	
Pancreatitis (6%)	2	1

Table-III

RBS levels at presentation

RBS mmol/l	Number of patients	Percentage
≤10	0	0
10-15	1	2
16-20	7	14
21-25	19	19
26-30	9	18
31-35	6	12
>35	8	16

Table-IV

Degree of acidosis of patients

pH	Number of patients	Percentage
<7	4	8
7-7.24	27	54
7.25-7.30	19	38

Table-V
Requirement of fluid for correction of acidosis

Amount of (NS) fluid (L)	Number of patient
5	9
6	4
7	1
8	4
9	2
10	5
11	20
12	2
13	2
14	2
16	2

Table-VI
Requirement of insulin for correction of acidosis

Amount (unit)	Number of patient
< 80	10
81-90	8
91-100	12 (24%)
101-110	3
111-120	4
121-130	4
131-140	6
141-150	1
151-160	2

Table-VII
Time taken for correction of acidosis

Time	Number of patients
24 hrs	10
48 hrs	16 (32%)
72 hrs	8
4days	2
5 days	2
6 days	1
7 days	1

DISCUSSION:

This study was designed to test the need for IV fluid and insulin in the treatment of DKA in order to overcome the crisis that occurred at the specialist BIRDEM hospital. The ratio of women to men in Denmark was 7.2: 5.7. A recent study in Pakistan found that 67% of patients with DKA are women. In a small series in India, the male to female ratio was 2: 1. Patients with mild to moderate acidosis were treated in the general ward as recommended in a study conducted at the Karachi, Pakistan. Infection was the most common (36%) cause in this study. Of the 20 new cases, 9 had a documented infection. They probably had previously undiagnosed hyperglycemia and the infection caused DKA⁹⁻¹¹. The remaining 10 patients had a history of relatively short polyuria, polydipsia, weight loss, and rapid breathing, and 1 patient had acute pancreatitis. Of the 30 cases diagnosed, 17 (34%) patients missed insulin and developed DKA within 1-18 days. 10 cases had an infection, 2 cases had acute pancreatitis. In one case, DKA was induced by omitting insulin after gynecological surgery. Most of the patients had normal or slightly low Na⁺ levels, high normal or slightly elevated K⁺ levels. Similar results were obtained in a study in Pakistan and Atlanta. Four patients had severe hyponatremia, hypokalemia and severe acidosis. Hypokalemia requiring intravenous correction was developed in almost all patients after initiation of fluid and insulin therapy¹²⁻¹³. A similar observation emerged in the Danish national survey. Most of the patients had significantly elevated blood sugar and ++ or more ketonuria in the urine ketones test¹⁴. Patients had ketonuria for a longer time compared to clinical and biochemical improvement confirmed by pH and HCO₃ levels. A similar observation was recently reported in a small study in India. Most patients (24%) required 48 hours to correct the acidosis, and the maximum duration of treatment was 7 days. In a study at Karachi, the duration was 11 to 14 hours. The result was quite satisfactory and comparable with developed countries. (10%) of the patients died and these patients had severe acidosis. Mortality in a developing country was 6-24%. In our study, most patients needed 91-100 units of insulin, similar to the study from Emory University School of Medicine, 82-110 units of insulin¹⁵. During the first 24 hours of inpatient treatment, each patient required an average of 4.12 liters of intravenous fluid, 60 mmol of potassium and 72 units of insulin.

CONCLUSIONS:

DKA was more common in known diabetic patients who missed insulin or had an infection. New cases are not uncommon. Polyuria, polydipsia, vomiting,

abdominal pain, and infections are common features. Glycemic control in these patients is poor. Severe acidosis is less common. In mild to moderate acidosis, major electrolyte disturbances are rare, but hypokalemia develops after initiation of therapy. Leukocytosis is common, even in the absence of infection, and ketonuria may persist or even worsen during treatment despite clinical and biochemical improvement. The overall result is good and the mortality rate is 10%.

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