ORIGINAL ARTICLE

Role of Insulin and Intravenous Fluid in the Treatment of Diabetic Ketoacidosis to overt the Diabetic Ketoacidosis crisis

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ABSTRACT

Background: Diabetic ketoacidosis (DKA) is relatively common in acute metabolic decompensation among diabetic patients. It usually happens among patients of diabetes mellitus who have stopped captivating insulin or have any type of infection. The management of DKA includes correcting dehydration, hyperglycemia, electrolyte disturbances, acidosis, and antibiotics or treating another triggering cause, as appropriate, in patients with one type of infection.

Objective: To study the role of Insulin and Intravenous Fluid in the treatment of Diabetic Ketoacidosis to overt the Diabetic Ketoacidosis crisis

Methods: This was across-sectional study conducted in the Medicine department of KGN Teaching hospital Bannu and District Headquarter Teaching hospital Bannu for duration of six months from 15 February 2020 to 15 August 2020, which enrolled 70 patients with diabetic ketoacidosis who met exclusion and inclusion criteria for the total volume of I.V fluid (saline) required for diabetic ketoacidosis treatment.

Results: DKA was more common in formerly detected diabetic patients (52.85%), more often in the low-income population and who live in village population and there was no significant gender difference. Vomiting (51.42%), nausea (28.57infections (35.71), abdominal pain (30%) as well as polyuria (25.7%) and polydipsia (18.57%) were common. In most cases, there was poor glycemic control. The missed doses of insulin and Infection were the chief reasons for development of DKA. In most cases, there was poor glycemic control. Maximum number of the subjects had acidosis of mild to moderate level and severe electrolyte disturbances were rare. The results (87.88% survival) were comparable to the result in developing countries. Eleven liters of fluid was needed in 35.71% of patients to treat DKA, which increased the amount of urine excreted. 25.71% of patients required 91–100 units of insulin to be treated for acidosis.

Conclusion: The treatment and diagnosis of diabetic ketoacidosis is not tough if detected initially. To avoid any mortality; it is necessary to replace adequate fluid.

Key words: Diabetic ketoacidosis, Diabetes, intravenous fluid and insulin.

INTRODUCTION

In hyperglycemic state of diabetes mellitus, there is acute metabolic decompensation and relatively common in this state is diabetic ketoacidosis[1-2]. It usually happens among patients of diabetes mellitus who have stopped captivating insulin or have any type of infection. DKA also occurred in previously undiagnosed patients. Therefore, we studied seventy DKA patients to determine their treatment needs and ultimately need of fluids and I / V insulin[3-4]. Treatment comprised of correcting acidosis, electrolyte imbalance, dehydration and treating the causative agent i.e., antibiotic for infection[5].

The chief triggers or causes of DKA in recently detected diabetics are missed doses of insulin, and infections in patients identified with diabetes. The main mechanism underlying this is insulin deficiency. Insulin doses were neglected because insulin was not available or available to low-income individuals in rural regions[6-7]. The knowledge among low-income individuals found to be below level and responsible for hospital admissions in all patients who are diabetic and established DKA. During the period of illness, when patients with type I and II advance vomiting and anorexia, patients generally need to monitor their urine ketone levels and blood sugar. They must increase their fluid intake. Insulin administration should not be stopped during this period and doses should be adjusted[8-9]. Crystalloid is the ideal I.V fluid to correct dehydration compared to colloid, and maintains hydration. Maximum of the subjects require eleven liters of fluid to correct DKA and 48 hours are needed to correct DKA. In seven days; The maximum patients recover[10-11]. Throughout the 1st twenty-four hours of inpatient management, every subject needs an average of 4.12 liters IV fluid, 72 insulin units and 60 moles of potassium. The Bicarbonate is recommended in severe acidosis. In developing countries, it was 6% as treatment is part of general services. Patients who report severe acidosis late have the worst prognosis[12]. Mortality in the intensive care unit ranges from 2% to 5%. It has now dropped to <1% in many centers.

METHODS

This was a cross-sectional study conducted in the Medicine department of KGN Teaching hospital Bannu and District Headquarter Teaching hospital Bannu for duration of six months from 15 February 2020 to 15 August 2020, which

enrolled 70 patients with diabetic ketoacidosis who met exclusion and inclusion criteria for the total volume of IV fluid (saline) required for diabetic ketoacidosis treatment. The Portland protocol was used to treat DKA. Blood glucose was evaluated on hourly basis and the insulin ratio was accustomed with a syringe pump rendering to the protocol given by Portland. The Intake-output chart was kept to verify that 50% of the liquid given was retained and also to prevent volumetric overload. Baking powder has not been applied. DKA was considered dissolved when the level of bicarbonate was more than 18 meq / L and the pH was above 7.3. Later, when the patients were able to take food orally, they were started on split-mix subcutaneous insulin (2/3 of NPH intermediate-acting and 1/3rd of normal insulin). In the morning; 2/3rd of the over-all every day dosage was administered and remaining was given in the evening which encompass a total of 1/3rd of total dose.

RESULTS

70 total patients were included in the study. From all the selected patients; 33were newly diagnosed cases of diabetes and 37already diagnosed diabetic patients. Of the confirmed cases, 60% of patients used insulin, 20% used OHA and insulin, and 20% used only OHA. 42 cases concerned men and 28women. (M: F = 3: 2). The missed doses of insulin and Infection were the chief reasons for development of DKA. In most cases, there was poor glycemic control. Maximum number of the subjects had acidosis of mild to moderate level and severe electrolyte disturbances were rare. The results (90% survival) were comparable to the result in developing countries. Eleven liters of fluid was needed in 35.71% of patients to treat DKA, which increased the amount of urine excreted. 25.71% of patients required 91–100 units of insulin to be treated for acidosis.

Age (years)	Number of patients (%)
≤ 20	18 (25.74)
20-30	28 (40)
30-40	9(12.85)
40-50	10 (14.28)
50-60	3 (4.28)
≥ 61	2 (2.85)

Table-II: Distribution of cases rendering to triggering causes

Cause	Number of patients (old)	Number of cases (new)
Infection (35.71%)	10	15
Omission of insulin/ drug (52.85%)	24	13
New case (10%)	2	5
Pancreatitis (1.42%)	1	

RBS levels at presentation are given in Table-III

RBS mmol/l	Number of patients	Percentage
≤10	1	1.42
10-15	6	8.57
16-20	12	17.14
21-25	25	35.71
26-30	9	12.85
31-35	9	12.85
>35	8	11.42

Table I explains the patient's distribution in the various age groups. While 78.60% of patients were under 40, 3 patients (4.28%) were over 50 years of age. More specifically, a maximum of 40% of patients are between the ages of 20 and 30.

The acidosis Degree of among patients are given in Table-IV

pH	Number of patients	Percentage
<7	10	14.28
7-7.24	35	50
7.25-7.30	25	35.72

Table-V Prerequisite of fluid for acidosis correction

Amount of (NS) Fluid (L)	Number of patients
Five	16
Six	7
Seven	4
Eight	3
Nine	4
Ten	6
Eleven	25
Twelve	2
Thirteen	1
Fourteen	1
Fifteen	1

Prerequisite of insulin for acidosis correction given in Table-VI

Quantity (unit)	Number of patients
Less than 80	15
81-90	5
91-100	18
101-110	3
111-120	8
121-130	7
131-140	8
141-150	2
151-160	4

DISCUSSION

This analysis was conducted to realize the need for insulin and intravenous fluids in the treatment of DKA to overwhelm crisis. In Denmark, the proportion of women to men was 7.2: 5.7. A recent Taipei study institute that 68% of patients with DKA are women. In a case series from India, the 2: 1 was the M:F ratio among DKA patients[13]. The individuals with acidosis of mild to moderate level were managed as general services as suggested by Emory University School of Medicine study held in Atlanta. In this study, the most common trigger was infection (35.71%). Infection was documented in 15 out of 33 new cases. They probably had previously undiagnosed hyperglycemia and the infection caused DKA. The residual subjects had a brief history of polyuria, polydipsia, rapid breathing and weight loss, and 1 patient had acute pancreatitis[14-15]. Infection occurred in 25 cases; Acute pancreatitis was diagnosed in 1 case. In one case, DKA accelerated due to insulin neglect following gynecological surgery. Most of the patients had slightly low or normal levels of Na +, slightly elevated or high levels of K +. Comparable outcomes were obtained in an analysis in Atlanta and Pakistan[16-17]. Six of the cases had severe hypokalemia, severe acidosis and hyponatremia. Hypokalemia requiring intravenous correction occurred in almost all patients afterward start of insulin and fluid therapy. A similar observation appeared in

a Danish national survey. Most of the patients had ketonuriaor very high blood sugar ++ in the ketostix urine test. Patients have ketonuria longer than their biochemical and clinical recovery as evidenced by HCO3 and pH levels[18-19]. A comparable suggestion was recently testified in a small study in Pakistan[20]. Most of the patients lasted 48 hours. The maximum time needed to correct the acidosis was one-week. In Emroy University School of Medicine study, this duration was 12 to 15 hours[21-22]. The results were comparable and satisfactory with that of established countries. Eleven of the patients died and these patients had severe acidosis. In developed countries; Mortality ranges from 6 to 24%[23]. In our study, as in the Emroy University Medical School study, most individuals needed 91-100 units of insulin and 82-110 units of insulin. Throughout the first twenty-four hours of treatment in the hospital, every patient needs 4.12 liters of IV fluid approximately, 72 insulin units and 60 mmol of potassium[24].

CONCLUSION

DKA was more common in diagnosed patients of diabetes mellitus who had infections or had missed insulin. Common symptoms include polydipsia, polyuria, abdominal pain, vomiting, and infections. These patients have poor glycemic control. There are few cases of severe acidosis. The electrolyte instabilities are rare in mild to moderate acidosis, significant, but hypokalemia progresses after start of therapy. Leukocytosis is communal even in the absenteeism of infection, and despite biochemical and clinical improvement; ketonuria may worsen or persist with treatment. The general results are good and the 10% was the mortality rate.

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