

# Requirement of Intravenous Fluid and Insulin in the Management of Diabetic Ketoacidosis to Overcome the Crisis

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## ABSTRACT

**Objective:** The aim of this study is to determine the requirement of intravenous fluid and insulin in the treatment of diabetic ketoacidosis to overcome the crisis.

**Study Design:** Cross-sectional

**Place and Duration:** Study was conducted at Medicine department of King Abdullah Teaching Hospital Mansehra and Nishtar Medical University Hospital Multan for six months duration from 15<sup>th</sup> December, 2020 to 15<sup>th</sup> June, 2020.

**Methods:** Total seventy patients of both genders were presented in this study. Patients were aged between 18-65 years. Patients details demographics age, sex and body mass index were recorded after taking written consent. Patients had diabetic ketoacidosis were presented in this study. Frequency of intravenous fluid and insulin were assessed to overcome the crisis of diabetic ketoacidosis by using portland protocol. Complete data was analyzed by SPSS 22.0 version.

**Results:** Mean age of the patients was 30.51±7.41 years with mean BMI 25.18±3.48 kg/m<sup>2</sup>. 38(54.3%) cases were females and 32 (45.7%) patients were males. 42 (60%) cases had previous history of diabetes and the rest 28 (40%) were newly diagnosed. Prevalence of DKA was more common in low socio-economic status found in 39 (55.7%) cases. Vomiting was the most common symptom found in 35 (50%) cases, followed by infection of insulin doses 18 (25.7%) cases, abdominal pain found in 15 (21.43%) patients. 32 (45.7%) patients who had increased diuresis received 11L of fluid in the treatment of DKA, 91-100 units of insulin were given to 18 (25.71%) cases, and for management of acidosis 24 (34.3%) patients took 2-days. There was no any mortality found in this study.

**Conclusion:** We concluded in this study that early diagnosed of diabetic ketoacidosis is necessary for treatment. Removal of adequate fluid was necessary to avoid mortality.

**Keywords:** Intravenous fluid, Insulin, Diabetic ketoacidosis, Diabetes

## INTRODUCTION

In hyperglycemic state of diabetes mellitus, there is acute metabolic decompensation and very prevalent in this state is diabetic ketoacidosis [1-2]. It frequently happens among people of diabetes mellitus who have stopped capturing insulin or have any form of infection. DKA also developed in previously undiagnosed patients. Therefore, we evaluated seventy DKA patients to determine their treatment needs and eventually required of fluids and I / V insulin [3-4]. Treatment comprised of addressing acidosis, electrolyte imbalance, dehydration and treating the causal agent i.e., antibiotic for infection. [5]

The major triggers or causes of DKA in recently found diabetics are missed doses of insulin, and infections in people identified with diabetes. The basic mechanism driving this is insulin insufficiency. Insulin doses were disregarded 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 diabetes and established DKA. During the period of illness, when patients with type I and II progress vomiting and anorexia, patients generally need to check

their urine ketone levels and blood sugar. They must boost their fluid intake. Insulin therapy should not be interrupted during this interval and doses should be adjusted [8-9]. Crystalloid is the optimal I.V fluid to treat dehydration compared to colloid, and retains hydration. Maximum of the participants require eleven liters of fluid to correct DKA and 48 hours are needed to correct DKA. In seven days; The maximum patients recovered [10-11]. Every participant needs an average of 4,12 liters of fluid IV, 72 insulin units and 60 moles of potassium during 1st 24 hours of hospitalization. In severe acidosis, bicarbonate is suggested. In poor nations, treatment forms part of general services were 6 percent. Mortality in the intensive care unit ranges from 2 percent to 5 percent in the late reporting of severe acidosis. In several centers, it has now fallen to <1%.

## MATERIAL AND METHODS

This cross-sectional study was conducted at Medicine department of King Abdullah Teaching Hospital Mansehra and Nishtar Medical University Hospital Multan for six months duration from 15<sup>th</sup> December, 2020 to 15<sup>th</sup> June, 2020 and comprised of 70 diabetic patients. Patients

details demographics were recorded after taking informed written consent. Patients had cardiac disease, less than 18 years of age and those did not give any written consent were excluded from this study.

Patients had diabetic ketoacidosis were presented in this study. Frequency of intravenous fluid and insulin were assessed to overcome the crisis of diabetic ketoacidosis by using portland protocol in the syringe pump in accordance with the Portland protocol, blood sugar was tested every hour, and insulin rate was adjusted. The intake-output chart shows whether 50 percent of the infused fluid has been maintained and also avoids overloading volumes. When bicarbonate exceeded 18 meq/l and pH >7.3, DKA was considered resolving. Then, when patients could take food orally (2/3 of intermediate NPH insulin and 1/3 of conventional insulin) split mixing schedule for subcutaneous insulin began. Two thirds of the entire daily dose in the morning and one third in the evening were provided. Complete data was analyzed by SPSS 22.0 version.

### RESULTS

Mean age of the patients was 30.51±7.41 years with mean BMI 25.18±3.48 kg/m<sup>2</sup>. 38(54.3%) cases were females and 32 (45.7%) patients were males. 42 (60%) cases had previous history of diabetes and the rest 28 (40%) were newly diagnosed. Prevalence of DKA was more common in low socio-economic status found in 39 (55.7%) cases. (table 1)

Table 1: Baseline details demographics of enrolled cases

Variables	Frequency	%age
Mean age	30.51±7.41	
Mean BMI	25.18±3.48	
Gender		
Male	32	45.7
Female	38	54.3
History of diabetes		
Newly	28	40
Old	42	60
Socio-economic status		
Low	39	55.7
High	31	44.3

Vomiting was the most common symptom found in 35 (50%) cases, followed by infection of insulin doses 18 (25.7%) cases, abdominal pain found in 15 (21.43%) patients, polyuria 12 (17.14%) and polydipsia found in 11 (15.7%).(table 2)

Table 1: Association of

Variables	Frequency	%age
Symptoms		
Vomiting	35	50
Infection of insulin doses	18	25.7
Abdominal pain	15	21.43
Polyuria	23	17.14
Polydipsia	11	15.7

Majority 32 (45.7%) patients who had increased diuresis received 11L of fluid in the treatment of DKA, 5 liters fluid were given to 14 (20%) cases and maximum fluid

was 16 liters which was given to rare cases 2 (2.9%). (table 3)

Table 3: Amount of fluid for improvement of acidosis

Variables	Frequency (n=70)	%age
Amount of (NS) fluid (L)		
5	14	20
6	5	7.14
7	3	4.3
8	6	10
9	3	4.3
10	5	7.14
11	32	45.7
16	2	2.9

91-100 units of insulin were given to majority 18 (25.71%) cases and 141-150 units were given to 3 (4.3%).(table 4)

Table 4: Units of insulin for treatment of acidosis

Variables	Frequency (n=70)	%age
Amount of (unit)		
71-80	13	18.6
81-90	10	14.3
91-100	18	25.71
101-110	5	7.14
111-120	6	8.6
121-130	5	7.14
131-140	6	8.6
141-150	3	4.3
151-160	4	5.7%

Majority of the patients 24 (34.3%) took 2-days for recovery of acidosis, followed by 1-day in which 14 (20%) cases were recovered and least 12 (8.6%) cases were recovered within the duration of 5-days. (table 5)

Table 5: Association of time in recovery of acidosis

Variables	Frequency	%age
Time		
Day	15	21.43
2-days	24	34.3
3-days	15	21.43
4-days	14	20
>5days	12	17.14

There was no any mortality found in this study.

### DISCUSSION

This study was done to assess the need for intravenous liquid and insulin to overcome the crisis in the management of DKA. In this cross-sectional study total 70 patients were presented. Majority of the patients were females 54.3%. In a previous study in Taipei, it was found that 67% DKA patients were female. Mean age of the patients was 30.51±7.41 years with mean BMI 25.18±3.48 kg/m<sup>2</sup>. This was comparable to the previous study.

In present study 42 (60%) cases had previous history of diabetes and the rest 28 (40%) were newly diagnosed. Prevalence of DKA was more common in low socio-economic status found in 39 (55.7%) cases. Hussain et al in 2020 presented the same outcomes. [15] Vomiting was the most common symptom found in 35 (50%) cases, followed by infection of insulin doses 18 (25.7%) cases. The analysis in Atlanta and Pakistan produced comparable results. [16,17] Most patients showed normal or slightly low

levels of Na<sup>+</sup>, high levels of normal or significantly higher K<sup>+</sup>.

It took 48 hours for most patients. The acidosis correction took 2 days for the maximum. In prior investigations, this time was 12 to 15 hours. [18,19] In our study most cases 25.71% needed 91-100 units of insulin. Each patient needs roughly 4.12 liters of IV fluid in developing countries, 72 insulin units and 60 mmol of potassium during the first 24 hours of hospital therapy. [20] The results were slightly satisfactory and similar to those of industrialized countries. 5 (10 percent) individuals were expired with serious acidity.[21] Mortality was 6 -24% in developing country but in our study there was no mortality found. No previous research compared clinic results with and without priming insulin bolus in pediatric DKA patients. Therefore, it is not suggested to utilize priming bolus in pediatric DKA treatment. An initial bolus could help to correct the relative resistance to insulin DKA, based on the study in individuals suffering from hyperosmolar hyperglycemia nonchaetotic diabetes. [22] Therefore, patient factors, such lack of ketosis or the presence of severe hyperglycemia, could have led to conflicting outcomes. In our perspective, with administration of intravenous fluids and alleviation of hyperglycemia the majority of patients with DKA can quickly become insulin sensitive. Therefore, the greater rates of insulin infusion should be reserved for obese and insulin-resistant DKA patients in order to prevent hypoglycemia and fast shifts in glucose and water between extracellular and intracellular compartments.

The early studies on optimal insulin dosages and the route of treatment of DKA showed that regular insulin subcutaneous application is successful, albeit lower than intravenous insulin infusion.[23]

## CONCLUSION

We concluded in this study that early diagnosed of diabetic ketoacidosis is necessary for treatment. Removal of adequate fluid was necessary to avoid mortality.

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