A Study Of Clinical Profile Of Patients With Diabetic Ketoacidosis and Special Reference to Its Management And Outcome.

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Abstract: Introduction: Diabetic ketoacidosis (DKA) is a metabolic derangement consisting of high blood glucose concentration, measurable ketone bodies in blood and /or urine and metabolic acidosis. DKA mainly occurs in patients with type 1 diabetes, but it is not uncommon in patients with type 2 diabetes. DKA is a Medical emergency, responsible for significant amount of admissions in Medical Emergency Ward. It is the most common serious and life threatening acute complication of diabetes. Materials and Methods: The present study was carried out on 60 patients who are k/c/o Diabetes Mellitus (Type 1/Type 2) or newly detected above the age of 12 years presented with DKA and have RBS >250 mg/dl, positive serum and urine ketone test, PH < 7.35, HCO3 level < 18 mmol/L, Respiratory rate < 30 per min, Systolic BP >90 mm of Hg and informed written consent given. Results: Infection and insulin therapy discontinuation being the most common causes of DKA. Incidence of DKA is more common in type 1 DM. DKA, most common presenting symptoms were Nausea/Vomiting. DKA is more common in female as compared to male. The mean blood glucose level at presentation higher in type 1 DM patients as compared to type 2 DM. Type 2 DM patients are less dehydrated than type 1 patients. Conclusion: Infection and insulin therapy discontinuation being the most common causes of DKA. Mortality in patients with DKA can be greatly reduced with early recognition of symptoms and precipitating factors and timely administration of insulin therapy. Proper insulin dosage and administration and prevention from infection can decrease incidence of admission in emergency medical ward. [Prajapati B Natl J Integr Res Med, 2019; 10(2):12-15]

Key Words: Arterial Blood Gas Analysis, Anion Gap, Blood Pressure, Diabetic Ketoacidosis, Diabetes Mellitus, Emergency Ward, ketonemia

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Introduction: Diabetic ketoacidosis (DKA) is a metabolic derangement consisting of high blood glucose concentration, measurable ketone bodies in blood and /or urine, and metabolic acidosis. DKA mainly occurs in patients with type 1 diabetes, but it is not uncommon in patients with type 2 diabetes. Most patients with DKA have autoimmune type 1 diabetes; however, patients with type 2 diabetes are also at risk during the catabolic stress of acute illness such as trauma, surgery, or infections[1,2].

DKA is a Medical emergency, responsible for significant amount of admissions in Medical Emergency Ward (EW). It is the most common serious and life threatening acute complication of diabetes. The mortality rate is currently estimated at 2 % to 10 % for patients hospitalized with DKA. DKA is defined as an increase in the serum concentration of ketones greater than 5 mEq/L, a blood glucose level greater than 250 mg/dl (although it is usually much higher), and a blood (usually arterial) pH less than 7.3. Ketonemia and ketonuria are characteristic, as is a serum bicarbonate level of 18 mEq/L or less (less than 10 mEq/L is indicative of severe DKA). These biochemical changes are frequently associated with increased anion gap, increased serum osmolarity and increased serum uric acid. Arterial blood gas analysis (ABGA) is indicated for identification of respiratory, metabolic, and mixed acid-base disorders, with or without physiologic compensation, by means of pH, Pco2 level, pO2 level, and HCO3 level [3].

Determination of arterial blood gas (ABG) values is currently considered essential for evaluation of patients with suspected DKA. This study was conducted to study various risk factors for development and progression of the disease in both the type 1 and type 2 diabetes mellitus and Strengthen theoretical basis for treatment of this complication. The mortality from DKA varies from 3-13%, therefore it is important to recognize DKA at an earlier stage as early recognition of DKA, leads to less complications and is associated with increased incidence of successful recovery.

Materials and Methods: The present study was carried out on 60 patients above the age of 12 years presenting with Diabetic ketoacidosis admitted in Emergency Ward (EW) of Medical department at B.J.Medical College, civil hospital, Ahmedabad from August 2018 to March 2019. The patients were selected randomly and both males and females were included in the present

study. A detailed clinical history and detailed clinical examination was done. Patients were suspected to have DKA on basis of detailed history, clinical symptoms/signs; and then patient's bedside finger stick Random blood sugar (RBS) test was done with glucometer, and if it was >250 mg/dl, patient's samples for serum acetone test, Urine for ketones, and ABGA, were taken. A sample of arterial blood (0.5 to 1.0 mL) for ABGA was obtained from the radial artery of the patient.

Inclusion Criteria: Patients with k/c/o Diabetes Mellitus (Type 1/Type 2) or newly detected DM fulfilling following criteria were included in the study:

- Patient's age >12 years
- RBS >250 mg/dl
- S.Acetone test - positive
- Urinary ketone bodies test – positive
- HCO3 level < 18 mmol/L
- PH < 7.35
- Respiratory rate < 30 per min.
- Systolic BP >90 mm of Hg.
- Informed written consent given

Results : In present study, maximum number of patients 26 (43.3%) belong to age group 31-40 years, 11 (18.3%) patients were in age group 41 - 50 years,4 (6.67%) patients were in age group 12-20 years; 10 (16.6%) patients in age group 21-30 years, 5 (8.3%) patients in age group 51 -60 years, 4(6.67%) patients in age group 61-70 years, while none of patients belong to age group >70 years.

Out of 60 (100%) patients, 25 (41.7%) patients were male and 35 (58.3%) patients were female.

In present study, out of 60 (100%) patients, 37 (61.6%) patients were having Type 1 DM, and 23 (38.3%) patients were having Type 2 DM.Out of 60 (100%) patients, 14 (23.3%) patients were newly detected cases of DM, and 12 (20%) patients were having Type 1 DM and 2 (3.33%) patients were having Type 2 DM. while 46 (76.6%) patients were k/c/o DM, out of which 25 (41.7%) were having Type 1 DM and 21 (35 %) patients were having Type 2 DM.26 (43.3%) patients had history of diabetes between 5 to 10 years. 10(16.6%) patients had history of diabetes more than 10 years. 10(16.6%) patients had history of diabetes less than 5 years and 14(23.3 %) patients were newly diagnosed. In present study, most common symptom was Nausea/Vomiting in 42 (70%) patients; followed by abdominal pain in 34 (56.6%), breathlessness in 28 (46.6%) and fever in 22 (36.6%) patients.In present study, most common precipitating factor for DKA was infection in 29 (48.33%) patients, followed by insulin discontinuation in 24 (40%) patients, psychological stress in 4 (6.66%) patients and vascular accidents in 3 (5%) patients. (Table 1 to 4)

Table 1: Severity of DKA

Severity of DKA	Patients
Mild(pH 7.25-7.30; HCO3 15-18)	5 (8.33%)
Moderate(pH 7.0-7.24 ;HCO310-15)	52(86.66%)
Severe (pH <7.0 ; HCO3 <10)	3(5%)

Table 2: Level of Glucose On admission

Blood glucose (mg/dl)	Type 1 DM	Type 2 DM	Total
250-350	6 (10%)	6 (6.66%)	12 (20%)
351-450	10 (16.6%)	4 (6.66%)	14 (23.3%)
451-550	10 (16.6%)	6 (10%)	16 (26.6%)
>550	11 18.33%)	7 (15%)	18 (30%)
Total	37 (61.66%)	23 (38.33%)	60 (100%)
Mean Glucose	467.29	452.5	461.63

Table 3: Fluid Requirement on First Day

Fluid requirement(litre)	Type 1 DM	Type 2 DM	Total
< 3	5 (8.33%)	12 (20%)	17 (28.3%)
3 – 4	20 (33.33%)	7 (11.6%)	27 (45%)
>4	12 (20%)	4 (6.66%)	16 (26.66%)
Total	37 (61.66%)	23(38.33%)	60 (100%)
Mean Fluid requirement(litres)	3.86	3.30	3.65

Table 4: Insulin requirement For Clearance of ketones

Insulin (units)	Type 1 DM	Type 2 DM	Total
<100	4 (6.66%)	7 (11.6%)	11 (18.3%)
101-150	22 (36.66%)	11 (18.33%)	33 (55 %)
151-200	8 (13.3%)	4 (6.66%)	12 (20%)
>200	3 (5%)	1 (1.6%)	4 (6.66%)
Total	37 (61.66%)	23 (38.33%)	60 (100%)
Mean Insulin	142.16	118	133.16

In present study, 5 (8.33%) patients were diagnosed with Mild DKA, 52 (86.66%) patients with Moderate DKA, and 3 (5%) patients with Severe DKA. Arterial pH between 7.0-7.24 in majority of patients with DKA. Mean blood glucose value for the total DKA study population was 461.63 mg/dl.The mean fluid requirement of the first day of therapy in majority of DKA patients was 3.65 liters.

The mean insulin dosage required for clearance of plasma ketones was 133.16 units. Majority of the patients required insulin dosage between 101-150 units.Mean time taken for clearance of plasma ketone was 39.82 hours. In present study, total mortality in 60 patients of DKA is 7 (11.66%) patients out of which 4 (6.66%) patients were of type 1 DM and 3 (5%) patients were of type 2 DM. Total 53 (88.3%) patients were recovered with treatment with insulin, out of which 33 (55%) patients were of type 1 DM and 20 (33.3%) patients were of type 2 DM patients.

Discussion: Out of 60 (100%) patients, 25 (41.7%) patients were male and 35 (58.3%) patients were female. In the study of A.Ranjan et al [4], out of total 42 patients, 24 (57.14%) patients were female and 18(42.85%) Patients were male and in Atif et al [5], out of 130 patients 82(62.39%) patients were female and 48 (37.61 %) were male.. In the study of Rajendra et al [5] out of 52 patients of DKA Mean age of patient was 40 ± 8 years and in study of Christopher et al [10] Mean age of patients of DKA was 35 ±12.1 years. So DKA is more common in age between 20 to 50 years. In the present study, most common symptom was Nausea/Vomiting which was present in 42 (70%) patients; followed by Abdominal pain in 34 (56.66%), breathlessness 28 (46.6%) and fever in 22 (36.6%) patients.

Pankajseth et al [7], Munro et al [8], rajendra et al found nausea and vomiting in 63.33%, 86% and 69% of patients respectively. Adhikari et al [9] noticed abdominal pain 34.9 % patients as second most common clinical feature and breathlessness in 28% of patients. In this study, the most common precipitating factor for DKA was infection in 29 patients and Second most common cause was insulin discontinuation in 24 patients. Out of 60 patients of DKA, 37 (61.6 %) patients were having type 1 DM out of which 21 (35%) patients developed DKA due to infection, 14 (23.3%) patients developed DKA due to Insulin Discontinuation. Christopher et al [10] studied 150 patients of DKA in type 1 and type 2 DM and found infection as a precipitating factor in 40% patients of type 2 DM and in 22 % of patients in type 1 DM. In the study of Pankaj Seth et al [7], infection was the most common precipitating factor for DKA in 73.33% patients. Matoo et al [11] found that incidence of noncompliance to treatment was 20% which was second common precipitating factor for DKA.

Westphal et al [12] also found noncompliance as a common cause for DKA in almost 18 %. In the present study, 52 (86.66%) patients were found to have Moderate DKA, 5(8.33%) patients were having Mild DKA and 3 (5%) patients were having Severe DKA. The mean arterial pH at the time of admission in patients withDKA in our study was 7.16. HCO3 at time of admission of all patients with DKA in our study was 13.04.

Westphal et al [12] observed that Mean pH was 7.18 and Matoo et al [11] found mean pH of 7.15. The mean value of blood glucose on admission in patients with DKA was 467.29 mg/dl for type 1 diabetic and 452.50 mg/dl for type 2 diabetic patients. Adhikari et al [9] which showed mean blood glucose value of 612 mg/dl in type 1 and 416 mg/dl in type 2 diabetic patients with DKA. Matoo et al [11] found mean blood glucose value 342 mg/dl. The mean fluid requirement on first day for type 1 Diabetes mellitus is about 3.86 liters and for type 2 diabetes mellitus it is 3.30 liters. The mean fluid requirement on the first day in total DKA patients in our study was 3.65 liters. Adhikari et al [9] found mean fluid on the first day of therapy for type 1 diabetes mellitus was 4.8 liters and 2.7 liters for type 2 diabetes mellitus patients with DKA revealing that the patients with type 2 diabetes mellitus with DKA are not severely dehydrated.

The Mean insulin requirement for clearance of serum ketones was 133.16 units in total 60 patients of DKA in our study. The Mean insulin requirement for type 1 Diabetes mellitus was 142.16 units and for type 2 Diabetes Mellitus was 118. Adhikari et al [9] noted that on an average 144 units and 128 units were required in type 1 and type 2 diabetic patients with DKA respectively. The mean time for clearance of serum ketones was 39.82 hours. Out of 60 patients in this study, mortality was seen in total 7(11.6%) patients. Out of this 7 patients, 4 patients had type 1 DM and 3 patients had type 2 DM. 53(88.3%) patients with DKA out of 60 patients recovered completely

with proper treatment with no residual problems. Rajendra et al [6] who found mortality of 11.5% in his study and adhikari et al [9] found 16.3 % mortality in his study.

Conclusion: DKA is characterized by triad of hyperglycemia, high anion gap metabolic acidosis and ketonemia. Infection and insulin therapy discontinuation being the most common causes of DKA. Incidence of DKA is more common in type 1 DM. DKA, most common presenting symptoms were Nausea/Vomiting; followed by abdominal pain, breathlessness. DKA is more common in female as compared to male. The mean blood glucose level at presentation higher in type 1 diabetic patients as compared to type 2 diabetics. Type 2 diabetic patients are less dehydrated than type 1 patients. So type 2 diabetic patients require less replacement of fluid. Most patients have DKA with moderate degree of severity. Mortality in patients with DKA can be greatly reduced with early recognition of symptoms and precipitating factors and timely administration of insulin therapy

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