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Original Research Article

# A Study on Risk Factors and Clinical Profile of DKA in Type II Diabetes Mellitus in a Teaching Hospital, Telangana

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**Conflict of interest: Nil**

## Abstract

Diabetic ketoacidosis (DKA) is a potentially life-threatening complication of diabetes mellitus. Together with hyperglycemic coma, diabetic ketoacidosis (DKA) is the most severe acute metabolic complication of diabetes mellitus (DM).Defined by the triad hyperglycemia, acidosis, and ketonuria, DKA can be inaugural or complicate known diabetes.Although DKA is evidence of poor metabolic control and usually indicates an absolute or relative imbalance between the patient's requirements and the treatment, **Materials and Methods:** Prospective study was conducted in the department of general medicine atMamata academy of medical sciences ,Bachupally on 120 DKA patients for duration of 1 years from March 2022 to April 2023. .Diagnosis of DKA was made by the presence of (1) Plasma glucose level of 250mg/dl or higher (2) Serum bicarbonate level of 15mEq/lt or lower (3) Arterial blood pH of 7.3 or lower or a venous blood pH of 7.25 or lower (4) Presence of moderate or large urine ketones. **Results:** In this study, the minimum age of presentation was 40 years and the maximum age of presentation was 75 years .The maximum number of cases was found in the age group 51 – 60 years (46.6%) and the minimum number of cases was found in the age group up to 50 years (27.7%). The Overall mean age of presentation is 56.6 years.58.3% were Males and 41.6% were females Most common comorbid condition was HTN accounting 50% (60/120) , 8.3% ( 10/120) had CKD ,CAD and hypothyroidism .No comorbidities in 25% (30/120) patients. **Conclusion:** A significant proportion of DKA occurs in patients with type 2 diabetes and many of these cases can be prevented with proper patient education and effective communication with a health care provider.

**Keywords:** DKA, type-2 diabetes mellitus.



## Introduction

Diabetic ketoacidosis (DKA) is a well-known, life-threatening acute complication of type 1 diabetes. For a long time it has been considered the hallmark of type 1 diabetes; however, recently, its presence has been increasingly recognised in patients with type 2 diabetes and a newer entity called ketosis prone diabetes is also commonly recognised .Diabetic ketoacidosis is a condition characterised by ketonemia, acidaemia and raised blood glucose levels – i.e. hyperglycaemia, though hyperglycaemia may not always be present. [1]

There have been many cases and studies looking at ketoacidosis and its presence in patients with type 2 diabetes. There have been cases documenting DKA in patients with type 2 diabetes as predominantly found in ethnic minorities and specifically Afro-Caribbean populations or indigenous populations of America. [2, 3] However, studies have also analysed DKA admissions in Chinese, [4] Pakistani [5] and Indian [6] populations, and further recent studies have also looked at DKA in Caucasian patients with type 2 diabetes. [7, 8, 9]

The occurrence of DKA in type 2 diabetes has been thought to be due to the presence of co-existing stressors, predominantly infections. Other reported causes include myocardial infarction, cerebrovascular accidents, antipsychotic usage and malignancy, such as pancreatic adenocarcinoma. [10, 11]

DKA is classified as mild, moderate, and severe as per the American Diabetic Association. However, there are limited data on the correlation between the severity of DKA and its outcomes using this classification.

Studies of Vignati et al [12] emphasized the importance of infection as a precipitating cause occurring in up to 50% of patients Matoo et al [13] and Westphal [8] found an incidence of infection in 30% and 40% of patients respectively. Adhikari et al., found infection as a precipitating factor for DKA in 58% of patients. [14]

Noncompliance is also one major precipitating factor for DKA. Matoo et al., found that incidence of non-compliance to treatment was 20% and while Westphal found it 16% [13]

Often more than factors may be present in a patient or rarely no obvious factor can be identified. A study conducted by Umpierrz et al., found no obvious factor of DKA in 2-10% of cases [15]

DKA is diagnosed when diagnosed of hyperglycemia, anion gap and ketonemia .Metabolic acidosis often major finding.The serum glucose concentration is usually less than 800mg/dl (44mmol/L) and generally between 350-500 mg.dl .

DKA usually eveolvs rapidly over a 24 hour period .in contrast symptoms of hyperosmolar hyperglycemia state develop more insidiously with polyuria, polydyspsia and weight loss.

As the degree of duration of hyperglycemia progresses, neurologic symptoms including lethargy, focal signs and obtundation can develop .this can progress to coma in later stages .nuerologic symptoms are the most common in hyperosmolar hyperglycemia state,while hyperventilation and abdominal pain are primarily limited to patients with DKA.

Aim of the study: a study on “risk factors and clinical profile of diabetic Ketoacidosis in type 2 diabetes mellitus”

**Materials and methods:**

After obtaining the Institutional Ethical Committee approval and written informed consents from all the patients, this prospective study was conducted in the department of general medicine in Mamata academy of medical sciences ,Bachupally on 120 DKA patients for duration of one year ie, from March 2022 to April 2023

Inclusion criteria:

Diabetic Ketoacidosis in Type 2 Diabetes Mellitus patients.

Exclusion criteria:

1) Type 1 diabetes mellitus.
2) Late Onset Diabetes in Adult
3) Starvation Ketoacidosis
4) Alcoholic Ketoacidosis

Descriptive data like age, name,gender, religion, personal history,medical and medication history were taken after interviewing the patients. Patient history and details were recorded on predesigned proforma.

Following lab investigation were done in all the patients included in this study:

1) Blood Sugar Levels
2) Urine Ketones.
3) Serum electrolytes

Diagnosing criteria for diabetic ketoacidosis:

1) High Blood glucose levels: >250mg/dl

2) Urine Ketones: Positive
3) pH < 7.5,
4) Serum Bicarbonate <15

Statistical analysis

Continuous variables were presented as mean ± SD whereas categorical variables were expressed in frequency and percentages. Multivariate logistic regression was performed to determine independent predictors of diabetes. Adjusted odds ratio and 95% confidence intervals were calculated to find the association of different factors associated with mortality. P < 0.05 was considered as statistical significance. Statistical software STATA version 14.0 was used for statistical analysis.

**Results and observation**

In this study, the minimum age of presentation was 40 years and the maximum age of presentation was 75 years .The maximum number of cases was found in the age group 51 – 60 years (46.6%) and the minimum number of cases was found in the age group up to 50 years (27.7%). The Overall mean age of presentation is 56.6 years.58.3% were Males and 41.6% were female. Among, Diabetic status was known in 66.6% of patients and diabetic status was not known in 33.3% of patients. 54.2% patients were taking treatment for diabetes (65/120) and 45.8% patients were not on any treatment (55/120). The minimum duration of diabetes is 1 year and the maximum duration of diabetes is 20 years. The maximum number of patients, 66.6% (80/120) were diabetic for more than 5 years.23.3% (28/120) about 2 to 5 years. And less than one year duration in 10% (12/120) cases. 8.3% (10/120) had history of alcohol, 31.6% (38/120) had history of both alcohol and smoking .18.3% (22/120) had history of smoking and absent in 41.6% (50/120) cases.

Most common comorbid condition was HTN accounting 50% (60/120), 8.3% (10/120) had CKD, CAD and hypothyroidism .No comorbidities in 25% (30/120) patients.

In our study most of the patients presented with vomiting constituting 55.8% (67/120), 50% of patients presented with breathlessness (60/120) and 33.3 %( 40/120) presented with abdominal pain. Altered sensorium in 8.6% (10//120), chest pain 12.5% (15//120), cough in 15.8% (19//120), fever 17.5(21/120), giddiness in 25% (30/120), Orbitals welling and seizures in 2.5% (03/120), weakness in 25% (30/120) patients.

Among complications Neuropathy& Retinopathy noted in 16.6% (20/120), nephropathy and Neuropathy in in 8.6% (10/120),

UTI is most common precipitation factor 54.1 % (65/120) ,Followed by diabetic foot 15.6% (25/120),Pneumonia and GIT infection in 8.6% (10/120) an TB in 4.1 % ( 05/120)

**Table 1: Mean of investigations:**

| Investigation | Mean |
|---|---|
| RBS | 360.4mg/dl |
| PH | 6.53 |
| HCO3 | 12.7 mmol/l |
| POTASSIUM | 8.6 mEq/l |

In our study mean blood glucose at admission was 360.4 mg/dl, Mean serum potassium (8.66 mEq/l), arterial pH (6.53) & bicarbonate level (8.6mmol/l) were calculated.

**Table 2: Correlation matrix of various parameters among all the subjects**

| | | RBS | pH | HCO3 | K+ |
|---|---|---|---|---|---|
| RBS | r Value | | -0.71 | -0.66 | 2.94e-003 |
| | p Value | | 5.927e-020 | 2.002e-016 | 0.975 |

| | | | | | |
|---|---|---|---|---|---|
| pH | r Value | -0.71 | | 0.56 | 0.02 |
| | p Value | 5.927e-020 | | 3.730e-011 | 0.816 |
| HCO3 | r Value | -0.66 | 0.56 | -0.03 | -0.03 |
| | p Value | 2.002e-016 | 3.730e-011 | | 0.739 |
| K+ | r Value | 2.94e-003 | 0.02 | | |
| | p Value | 0.975 | 0.816 | 0.739 | |

r value= Pearson's correlation

**Table 3: Pain abdomen distribution among Diabetic known and unknown status**

| Abdominal Pain | Diabetic status | | P value |
|---|---|---|---|
| | Known | Unknown | |
| Present | 15 | 30 | 0.0038 ** |
| Absent | 65 | 10 | |
| Total | 80 | 40 | |

Fisher's exact test, P<0.05, *** = significant, ns= not significant

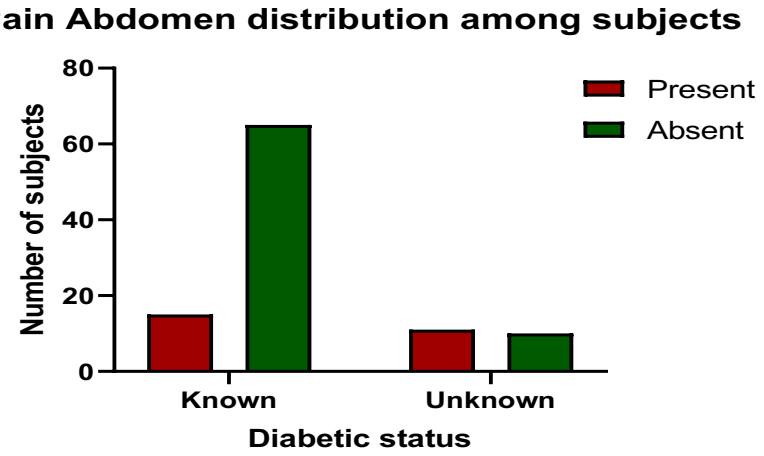



**Table 4: Altered sensorium distribution among Diabetic known and unknown status.**

| Altered sensorium | Diabetic status | | P value |
|---|---|---|---|
| | Known | Unknown | |
| Present | 8 | 22 | <0.0001 **** |
| Absent | 72 | 18 | |
| Total | 80 | 40 | |

Fisher's exact test, P<0.05, *** = significant, ns= not significant

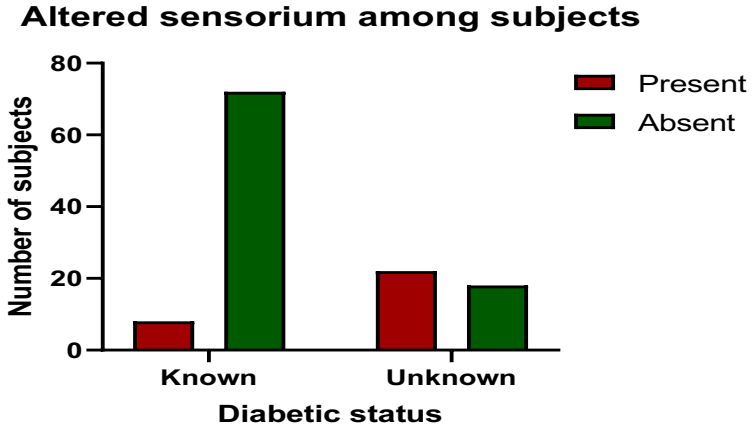


**Table 5: Breathlessness distribution among Diabetic known and unknown status**

| Breathlessness | Diabetic status | | P value |
|---|---|---|---|
| | Known | Unknown | |
| Present | 25 | 28 | <0.0001 **** |
| Absent | 55 | 12 | |
| Total | 80 | 40 | |

Fisher's exact test, P<0.05, *** = significant, ns= not significant

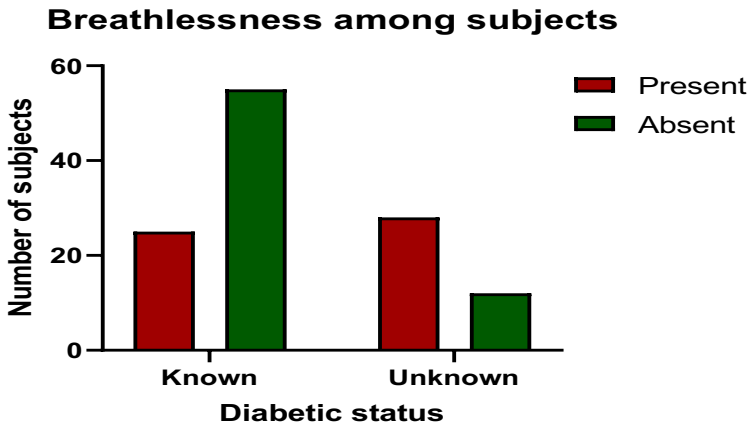



**Table 6: Seizures distribution among Diabetic known and unknown status**

| Seizures | Diabetic status | | P value |
|---|---|---|---|
| | Known | Unknown | |
| Present | 3 | 3 | 0.3990 ns |
| Absent | 77 | 37 | |
| Total | 80 | 40 | |

Fisher's exact test, P<0.05, *** = significant, ns= not significant

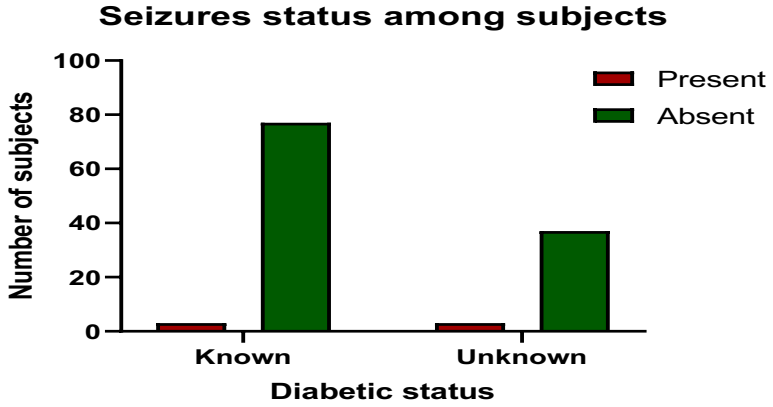
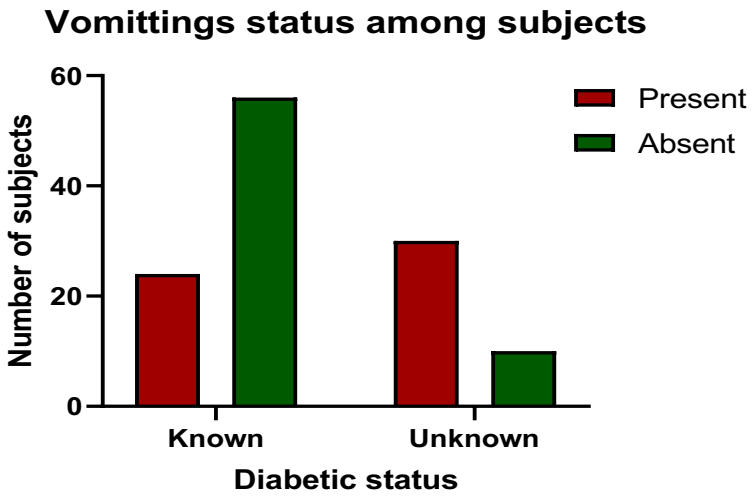



**Table 7: Vomittings distribution among Diabetic known and unknown status.**

| Vomittings | Diabetic status | | P value |
|---|---|---|---|
| | Known | Unknown | |
| Present | 24 | 30 | <0.0001 **** |
| Absent | 56 | 10 | |
| Total | 80 | 40 | |

Fisher's exact test, P<0.05, *** = significant, ns= not significant




## Discussion

In our study, the minimum age of presentation was 40 years and the maximum age of presentation was 75 years .The maximum number of cases was found in the age group 51 – 60 years (46.6%) and the minimum number of cases was found in the age group up to 50 years (27.7%). The Overall mean age of presentation is 56.6 Years. In Rao et al 16 study age of the patients was ranged between 18 to 70 years, with an average of 45.3 years. The maximum number of cases was found between 40 to 50 years (45%) in case of type 2 diabetes. Only 4.5% of the type 2 diabetic patients were < 30 years old whereas more than 50% were older than 50 years. Mangala et al study17 50% patients were in 45-64 years age group, 33% patients were more than 65 and 17% were below 45 year of age. Pankaj et al 18study noted most common age group among 20-40 years constituting 36.6% and mean age is 51/4 years.

In this Study group, 58.3% were Males and 41.6% were female. In Rao et a 1610 were females (37%) and 17 males (63%). This reflects the male dominance of the disease and the current epidemiology of DKA .The female to male ratio is 1: 1.7. In Mangala 17 et al study Overall, 69% females and 31% were males. In Pankaj et al study 1834 (56.66%) were males and 26 (43.33%) were females. The male: female ratio was 1.3:1. In Sachin et al 19the frequency of DKA was more in males than females 1.87:1

In our study most of the patients presented with vomiting constituting 55.8% (67/120), 50% of patients presented with breathlessness (60/120) and 33.3 %( 40/120) presented with abdominal pain. altered sensorium in 8.6% (10//120), chest pain 12.5% (15//120), cough in 15.8% (19//120),fever 17.5(21/120) , giddiness in 25% (30/120),Orbitals welling and seizures in 2.5% (03/120), weakness in 25% (30/120) patients .In Pankaj 18Pain abdomen was present in (43.33%) of patients, while altered sensorium and polyuria/ polydipsia were present in 30% and 26.66% of cases respectively. Twenty (33.33%) patients were dehydrated. Weakness was present in ten (16.66%) of patients. Kussmaul breathing was present in ten (16.66%) patients. Only eight (13.33%) patients had hypotension .In Sachin et al19 breathlessness, fever, and vomiting were common in Type 2 DM.

In our study UTI is most common precipitation factor 54.1 % (65/120) ,Followed by diabetic foot 15.6% (25/120),Pneumonia ns GIT infection in 8.6% (10/120) an TB in 4.1 % ( 05/120).In Rao et al16 study the major precipitating factors of total episodes included infection (43%), chronic kidney disease (25%) and acute myocardial infection (12.5%).

Among the infections, urinary tract infections were most common, followed by septicemia and pneumonia. In Mangal et al study 1728% patients had addictions. 17% of these patients were tobacco chewers, 6% were smokers¸ 5% were alcoholics 72% were non-addicted. Pankaj 18et al study the most common precipitating factor was found to be infection (73.33%), followed by non-compliance to treatment (66.66%), and followed by stressful conditions (26.66%). Sachin et al 19Among Type 2 DM with DKA group, lower respiratory tract infection (LRTI) was observed as the most common precipitating factor that is, 20/77 cases. The next common factor was non-compliance for the treatment of DM in 13/77 cases. Stroke and IHD were seen in 07/77 and 06/77 cases, respectively

In our study mean blood glucose at admission was 360.4 mg/dl ,Mean serum potassium (8.66 mEq/l), arterial pH (6.53) & bicarbonate level (8.6mmol/l) .Pankaj et al 18study noted mean blood glucose as 380.07 mg/. Mean serum potassium (4.55 mEq/l), arterial pH (7.23) & bicarbonate level (12.46 mmol/l).

In our study most common comorbid condition was HTN accounting 50% (60/120), 8.3% (10/120) had CKD, CAD and hypothyroidism. Neuropathy& Retinopathy was more common .Similar findings were observed in Sachin et al study19 where he also found hypertension as the most common comorbidity in 31/77 (40.25%) cases followed by ischaemic heart disease 8/77 (10.38%) cases. Nephropathy was the most common complication in Type 2 DM in 14/77(18.18%) cases In Mangal et al study17 Hypertension was observed in 35% patients and , neuropathy was seen in 19% patients, nephropathy in 14%.

## Conclusion

DKA is commonly observed in Type 2 DM also. Infection is the most common precipitating factor for DKA. UTI is most common precipitation factor 54.1 %, Followed by diabetic foot 15.6% Hypertension was observed as a risk factor in 50% patients which shows association of T2DM with it. The findings of this study also provide an early indication for development of complications of T2DM. The present study concludes the profile of T2DM from a tertiary care hospital with special emphasis on risk factors and complications associated with it.

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