

# Diabetic Ketoacidosis and Its Complications among Children

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**Abstract-** In order to recognize of DKA and its complications among children with DM type I, we conducted a descriptive study and all of the children with the final diagnosis of DKA. Data regarding their demographics, disease characteristics, treatment features and outcome derived from patients' medical files and registered in a data sheet. Data were analyzed using SPSS 11.0 and exhibited in the form of frequency tables and charts. There were 33 females and 30 males (53.1% and 46.9%, respectively). They were involved with ketoacidosis most commonly in summer (42.2%). Autumn, winter and spring seasons were in the next turns (29.7%, 15.6%, and 12.5%, respectively). Data analysis showed a clear improvement in the time taken to correct the acidosis with respect to the date of admission (more than 40 hours in the initial year to less than 28 hours at the final year). It seems that the management of diabetic ketoacidosis has improved during recent years. We concluded to consider ketoacidosis even in the first admission of a diabetic child.

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**Keywords:** Ketoacidosis; Children; Complication

## Introduction

Diabetes Mellitus (DM) is a common metabolic syndrome with hyperglycemia as its main biochemical manifestation. DM is divided to two main categories consist of DM type I which is due to pancreatic  $\beta$ -cells destruction leading to insulin deficiency and DM type II which is due to resistance to insulin (1).

DM type I is the most common endocrine metabolic disorder in children and juveniles which has significant side effects on somatic and emotional development. Diabetic ketoacidosis (DKA) is an acute complication of DM type I which is really life threatening (2). It was reported that 20-40% of children with newly diagnosed DM type I and those who do not use insulin regularly, were affected by DKA. Wolfsdor et al reported that the incidence of DKA was higher among children younger than 5 years old. They also demonstrated that DKA occurs more frequently among children with lower socioeconomic level (3). Classer et al expressed that cerebral edema occurs in 0.5-1% of DKA crisis and is associated with a high rate of mortality (21-24%) (4). Similarly; Inward et al (5) and Flener et al (6) concluded that the main and the most fetal complication of DKA is cerebral edema. With respect to the fact of frequent life

threatening DKA and since there is no study about the epidemiology of DKA and its complications, according to the authors' researches, we prepared this study for recognition of DKA and its complications among children with DM type I.

## Patients and Methods

We conducted a descriptive study and all of the children with the final diagnosis of DKA referred to Rasht 17-Shahrivar Hospital in a 10-year period from 1996 to 2005 were included.

Data regarding their demographics, disease characteristics, treatment features and outcome derived from patients' medical files and registered in a data sheet. Data were analyzed using SPSS 11.0 and exhibited in the form of frequency tables and charts.

## Results

Sixty three children with diabetic ketoacidosis included in this study. The patients' mean age ( $\pm$  SD) was 8.32 ( $\pm$ 3.54) years. There were 33 females and 30 males (53.1% and 46.9%, respectively). They were involved with ketoacidosis most commonly in summer (42.2%).

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**Table 1.** Frequency of complications

Complications; n (%)	
Hypoglycemia	4 (6.3)
ARF*	3 (4.7)
Seizure	2 (3.1)
Cardiac Arrest	1 (1.6)

\* ARF: Acute Renal Failure

Autumn, winter and spring seasons were in the next turns (29.7%, 15.6%, and 12.5%, respectively). Positive familial history of DM reported in 29 patients (45.3%).

The frequency of diabetic ketoacidosis complications was abstracted in table 1. Associated infection including upper respiratory tract and candida infection was observed in 13 and 2 patients, respectively. In addition, pneumonia, diarrhea and tuberculosis was reported; each one from independent patient. Different signs and symptoms of studied patients were indicated in table 2.

The duration between the onset of clinical manifestation and admission was more than a week in 12 patients (18.8%) and other 51 patients admitted in hospital in less than a week from the beginning of ketoacidosis signs and symptoms. They admitted in hospital for 5.53 days, averagely. Data analysis showed a clear improvement in the time taken to correct the acidosis with respect to the date of admission (more than 40 hours in the initial year to less than 28 hours at the final year). Table 3 exhibited patients' BS and serum pH level at the time of admission.

**Table 2.** Frequency of signs and symptoms

Signs & Symptoms; n (%)	
Polydipsia & Polyuria	63 (100)
Nausea & Vomiting	28 (43.8)
Dyspnea	23 (35.9)
Abdominal Pain	17 (26.6)
Fatigue & Malaise	17 (26.6)
Loss of Consciousness	7 (10.9)
Miscellaneous	4 (6.3)

**Table 3.** BS and serum pH level

Serum pH Level; n (%)	
<6.90	5 (7.8)
7.00-7.05	6 (9.4)
7.05-7.10	8 (12.5)
7.10-7.15	7 (10.9)
7.15-7.20	7 (10.9)
7.20-7.25	9 (14)
7.25-7.30	15 (23.4)
7.30-7.35	3 (6.2)
BS in mg/dL; n (%)	
< 300	6 (10.9)
300-599	49 (76.5)
> 599	8 (12.5)

## Discussion

Diabetic ketoacidosis involved both sex with an approximately similar frequency in our study. In addition, we did not observe significant difference of involvement in patients with different age group.

Polydipsia and polyuria was the most common clinical manifestation in our population, similar to Al-magamsi MS et al (7).

Although, we overemphasized the significance of attention to other symptoms such as nausea and vomiting.

URTI was the most common associated infectious disease. Summer was the most common season of disease onset. However, infectious diseases (e.g. URTI) as a cause of ketoacidosis occurrence are common in cold seasons including autumn and winter and we expected to achieve the same results as Elamin A (8).

It seems that the management of diabetic ketoacidosis has improved during recent years. We concluded to consider ketoacidosis even in the first admission of a diabetic child.

## References

1. Alemzadeh R, Wyatt D. Diabetes mellitus in children. In: Behrman RE, Kliegman RM, Jensen HB, editors. *Nelson Textbook of Pediatrics*. 17<sup>th</sup> ed. Philadelphia, PA: WB Saunders; 2004. p. 1947-72.
2. Sperling MA. Diabetes mellitus. In: Kaplan SA, editor. *Clinical Pediatric Endocrinology*. Philadelphia, Pa: WB Saunders; 2000. p. 137-43.
3. Wolfsdorf J, Glaser N, Sperling MA; American Diabetes Association. Diabetic ketoacidosis in infants, children, and adolescents: A consensus statement from the American Diabetes Association. *Diabetes Care* 2006;29(5):1150-9.
4. Glaser N, Bosch GA. Risk factors for cerebral edema in children with diabetic ketoacidosis. *N Engl J Med* 2001;344(4):263-9.
5. Inward CD, Chambers TL. Fluid management in diabetic ketoacidosis. *Arch Dis Child* 2002;86(6):443-4.
6. Felner EI, White PC. Improving management of diabetic ketoacidosis in children. *Pediatrics* 2001;108(3):735-40.
7. Al-Magamsi MS, Habib HS. Clinical presentation of childhood type 1 diabetes mellitus in the Al-Madina region of Saudi Arabia. *Pediatr Diabetes* 2004;5(2):95-8.
8. Elamin A, Ghalib M, Eltayeb B, Tuvemo T. High incidence of type 1 diabetes mellitus in Sudanese children, 1991-1995. *Ann Saudi Med* 1997;17(4):478-80.