# NEW-ONSET SEVERE DIABETIC KETOACIDOSIS IN A 13-MONTHS OLD NEPALI TODDLER: A CASE REPORT

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## ABSTRACT

Diabetes mellitus (DM) is a glucose metabolism disorder with diabetic ketoacidosis (DKA) being the most common complication associated with significant morbidity and mortality. Unlike other patients with typical symptoms of abdominal discomfort, pain, nausea and emesis of DKA, our patient presented with atypical symptoms such as cough, runny nose and fast breathing. This symptoms would have initially misled with diagnosis of respiratory tract infection, which would have caused delay in the treatment of DKA. In our patient DKA was treated with intravenous fluid replacement followed by intravenous insulin infusion, along with monitoring of blood glucose and electrolyte levels. We would like to emphasize that DKA can be precipitated by simple upper respiratory tract infection in toddlers with undiagnosed type 1 DM. Hence, random blood sugar measurement and urine for ketone bodies test should be performed if feasible in sick patients presenting with respiratory tract illness-like symptoms.

## KEYWORDS

Diabetes, diabetic ketoacidosis, random blood sugar, urine ketone bodies

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## INTRODUCTION

Type 1 diabetes in children is a disorder of glucose metabolism occurring as a result of insulin deficiency.[1] Diabetic ketoacidosis (DKA) is a common and severe complication of type 1 DM causing mortality and morbidity in a child.[2] It requires prompt treatment but mortality and morbidity are still associated significantly even after treatment.[3] Mortality in children in developing countries like Pakistan and Bangladesh ranges from 3.4 to 13.4%.[4,5] Here we report the case of a toddler diagnosed with new-onset severe diabetic ketoacidosis at the Nepal Medical College Teaching Hospital (NMCTH), Attarkhel, Gokarneshwor Municipality-8, Kathmandu.

## CASE REPORT

A 13-month-old toddler accompanied by a mother presented to Pediatric OPD, NMCTH with a complaint of cough for five days, runny nose for five days, and fast breathing for three days. She had no past history of hospital visits and no family history of diabetes. She feeds breast milk along with household foods.

On examination, the patient was ill looking and lethargic with deep and shallow respiration. Her temperature was 97.8$^0$F, pulse rate 160 beats per minute (weak volume), and BP was within normal limits for the age, and weight of 7.5 kg. No abnormalities were detected on a systemic examination. Laboratory investigations revealed a random blood glucose level of 618 mg/dl, increased total leukocyte count (differential count N: 76%, L: 15%), positive C-reactive protein (CRP) level, and HbA1c 10.5 g/dl. The results of liver function test, renal function test, serum electrolyte levels ($Na^+$ 138 meqv/l) and serum lipid profile were within normal limits. Urine RE/ME showed: glucose+, urine for acetone++, and albumin+. arterial blood gas analysis revealed a pH of 6.95. A diagnosis of new onset T1 DM complicated by severe ketoacidosis precipitated by upper respiratory tract illness (URTI) was made. The patient was admitted and treated with an isotonic saline 0.9% initial bolus (10 ml/kg) and maintenance fluid administered over 48 hour. Human insulin was administered via an intravenous infusion at the rate of 0.1IU/kg/hr. Blood glucose levels were normalized with 37 units of insulin within 48 hours, followed by complete eradication of ketone bodies in the urine. She was maintained on intravenous insulin infusion with isotonic saline and dextrose to prevent hypoglycemia. She was later started on pre-mixed insulin 3 units in the morning and 2 units in the evening (Total 5U) and antibiotic ceftriaxone.

## DISCUSSION

Diabetic ketoacidosis in type 1 diabetes occurs due to low level of insulin along with excess secretion of counterregulatory hormones like cortisol, glucagon, catecholamines etc increasing the insulin resistance in tissues which leads to ketone body cascade and dehydration.[6] Laboratory criteria to diagnose DKA in child are blood sugar level more than 200 mg/dl,with pH of <7.3, ketonemia and ketonuria with or without bicarbonate level of <15 mmol/L. Urine ketone 2+ levels are also indicative of DKA. Severity of DKA can be graded as “mild” (pH<7.0 to 7.2, HCO3 10 to <15), “moderate’ (<7.2 to 7.1, HCO3 5 to 9), and “severe” (pH<7.1, HCO3<5).[7] In a study done by Muktan *et al.*[8] in eastern Nepal found that 48% of children presented with DKA at first diagnosis and they suggested unawareness of parents about clinical symptoms and delayed presentation to health centre as cause for it. Incidence of DKA in child less than 2 years is double than that of aged between 2-14 years.[9] Ninety percent of child with DKA patients presents with polydipsia and polyuria, 77% presents with fatigue, 50% with polyphagia and few presents with fast breathing, Kussmaul breathing, abdominal pain, fever, and headache.[10] Unlike the common symptoms as above, our patient presented with fast breathing, lethargy, runny nose, cough, and which were simply suggestive of any kind of respiratory illness especially in patient of similar age group. However, laboratory reports were suggestive of severe DKA with new-onset diabetes. The odds of developing DKA at the first onset of diabetes with antecedent infection 1-2 week prior to onset was 3.45 times higher than that in patients without infection.[11] Our patient probably had upper respiratory tract infection as her symptoms were intermittent cough, runny nose and fast breathing that started five days back from the day of presentation, which lead to precipitation of new onset DKA. However, plasma CRP levels can increase in severe DKA with or without the presence of infection.[12] DKA should be promptly treated with an initial 10 ml/kg intravenous bolus of normal saline administered over 30 min, and a further 10 ml/kg bolus can be given if tissue perfusion is still inadequate or based on the clinical assessment. Total fluid requirement in 48 hours in severe DKA can be calculated assuming fluid required for 10% dehydration in addition to full maintenance from Holiday-Segar formula. IV insulin infusion is to be started 1-2 hr after IV fluid as 0.1 U/kg/hr.[13] Our patient

was started immediately with fluid replacement therapy followed by insulin infusion along with antibiotics as the mainstay of treatment leading to resolution of DKA in 48 hours.In our patient as there were predominant respiratory symptoms chances of initiating treatment of DKA would have been delayed, if random blood sugar had not been sent which would have led to morbidity and mortality. Hence, we would like to emphasize that DKA not necessarily always present with typical symptoms of abdominal discomfort,pain,nausea,emesis. Despite all advancements in all medical sciences in our country with low-resource settings, diagnosis of DKA in toddlers is still challenging. It is very thoughtful to know DKA can be precipitated by simple URTI in patients with undiagnosed T1 DM and simple tests such as random blood sugar measurement and urine for ketone bodies can play a vital role in the diagnosis of DKA in primary-level care with low resources.

**Conflict of Interest:** None

**Source of research fund:** None

**Consent:** Case report consent form was signed by the patient and the original article is attached with the patient's chart.

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