

Editor's key points

▶ Type 1 diabetes remains the most common form of diabetes in children. Common presenting symptoms include polyuria, polydipsia, polyphagia, and weight loss.

▶ Although recommendations for adults with suspected diabetes often include obtaining a fasting glucose measurement, this is unnecessary and potentially dangerous in a child with symptomatic type 1 diabetes.

▶ In children with suspected diabetes, clinic- or office-based point-of-care testing (ie, urine glucose or blood glucose measurements) should be performed. If hyperglycemia or glycosuria is present, immediately refer them to an appropriate centre before sending them home in order to prevent a delay in diagnosis and the potential for acute complications related to this delay.

Points de repère du rédacteur

▶ Le diabète de type 1 est la forme la plus courante du diabète chez les enfants. Parmi les symptômes habituels figurent la polyurie, la polydipsie, la polyphagie et la perte pondérale.

▶ Même si les recommandations pour les adultes chez qui on soupçonne le diabète préconisent la mesure du glucose à jeun, cela est inutile et potentiellement dangereux chez un enfant qui présente les symptômes d'un diabète de type 1.

▶ Chez les enfants soupçonnés de souffrir du diabète, une analyse au point de service en clinique ou au bureau (p. ex. mesures du glucose dans l'urine ou le sang) devrait être effectuée. En présence d'hyperglycémie ou de glycosurie, il faut les référer immédiatement à un centre approprié avant de les renvoyer à la maison, de manière à prévenir un retard dans le diagnostic et les complications aiguës potentielles associées à ce retard.

When you suspect diabetes in a child

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Case 1

A 2-year-old boy presented to the local emergency department (ED) with diabetic ketoacidosis (DKA). Findings of a physical examination showed tachycardia, dry mucus membranes, and pallor. He had appreciable wasting of his proximal muscles. His mother reported that he had lost almost 3 kg in the preceding 3 months. Earlier on the day of presentation, he had drunk 70 oz of fluid, and he had had in excess of 12 wet diapers in the previous 24 hours. One week before presentation, his mother had taken him to a physician reporting increased thirst and voiding, and that she was worried about diabetes. Her concerns were not validated, but she was provided with a laboratory requisition form to check glucose levels. The bloodwork was not done until he presented with DKA in the ED 1 week later. The patient was treated according to the local pediatric DKA protocol and recovered well.

Case 2

A 12-year-old boy presented to the local ED with DKA. He had a 1-month history of polyuria and polydipsia and had lost almost 14 kg. He also reported nausea for 3 days before presentation. Before the day of diagnosis, he had visited a walk-in clinic where he received a laboratory requisition form to measure serum blood glucose levels. That afternoon, laboratory results revealed a serum blood glucose level of 39.5 mmol/L; however, these results were not seen by the physician, as the office had closed for the day. The following day, his parents sought advice from their own family physician who checked the laboratory results and sent them to the ED. At initial presentation, the boy had moderate DKA and there were concerns about his level of consciousness. He was treated as per the pediatric DKA protocol and recovered well.

Case 3

A 19-month-old girl was diagnosed with type 1 diabetes after referral by her primary care physician. Her parents reported a 2-week history of progressive increase in voiding and thirst. She was soaking through all her diapers and had stopped napping owing to the thirst. Four days before diagnosis, a physician had seen her for a follow-up after she had taken antibiotics for acute otitis media. At that visit, her mother reported symptoms of increased thirst and voiding. At a follow-up with the same physician 2 days later, she reported specific complaints of increased voiding and thirst. Although a laboratory requisition form was provided, the blood-collection clinic was closed that day. The following day bloodwork results revealed hyperglycemia and not DKA. The patient was referred to the pediatric diabetes clinic but was ultimately hospitalized because the required education could not be completed owing to late-day presentation to the diabetes clinic.

Discussion

The MEDLINE database was searched for English-language articles related to the diagnosis of diabetes in children and the potential risks of DKA. The Canadian Diabetes Association and International Society for Pediatric and Adolescent Diabetes guidelines were used to outline the approach to diagnosis of diabetes in children.^{1,2} Cases that are known to us are used to illustrate the potential risks of delaying a diagnosis of diabetes.

In each of the cases presented, the diagnosis of diabetes was preceded by contact with a physician 1 to 7 days before the diagnosis of type 1 diabetes was made. In all 3 cases, patients were sent home with requisition forms for bloodwork. In the first 2 cases the delay in diagnosis might have contributed to the development of DKA, while in the third case the delay resulted in hospitalization for initiation of diabetes education. In 2015, our centre, a tertiary care pediatric hospital, saw 55 new cases of diabetes. Of those, 45 (82%) had type 1 diabetes. Of the remaining cases, 5 (9%) had type 2 diabetes, 3 (5%) had steroid-induced diabetes, and 2 (4%) had confirmed monogenic diabetes. One-third of patients presented with DKA. Most of the cases with DKA occurred in patients with type 1 diabetes, while 1 patient with type 2 diabetes presented with DKA.

Type 1 diabetes remains the most common form of diabetes in children; however, there is increasing recognition of other forms such as type 2 diabetes or monogenic forms (neonatal diabetes or maturity-onset diabetes of the young) being diagnosed in the pediatric population.³ Canada ranks within the top 10 countries worldwide, with an incidence of type 1 diabetes of 25.9 per 100 000 children aged 15 or younger. The incidence worldwide is rising by 3.6% each year,⁴ and children younger than age 5 are the fastest growing segment of the population with type 1 diabetes.⁵

Classic symptoms of type 1 diabetes include polyuria, polydipsia, polyphagia, and weight loss. Parents might report new onset of bed-wetting in a previously “dry” child, occurring long before the diagnosis is made.⁶ In the context of these symptoms, a child should have an immediate point-of-care test, either by capillary glucose measurement (using a glucose meter) or a urine dip for glucose.⁶ Although the measurement of a single elevated blood glucose level or the presence of glycosuria might not confirm the diagnosis of type 1 diabetes, it will initiate the treatment and diagnostic process.²

Diabetic ketoacidosis is a common manifestation of diabetes in children and results from an absolute deficiency of insulin.⁷ It occurs in 15% to 70% of new-onset pediatric type 1 diabetes⁷ and 6% to 25% of new-onset pediatric type 2 diabetes.³ The risk of DKA in pediatric type 2 diabetes highlights the importance of rapid diagnosis even when type 2 diabetes is suspected in a child. Clinical manifestations of DKA include dehydration, nausea, vomiting and abdominal pain, progressive obtundation, and loss of consciousness. Kussmaul respirations (deep, sighing respirations), caused by respiratory compensation for the metabolic acidosis, should not be mistaken for a primary respiratory condition. The biochemical criteria for diagnosis of DKA are hyperglycemia (blood glucose level of >11 mmol/L), metabolic acidosis (venous pH of <7.3 and bicarbonate level of <15 mmol/L), and ketonemia or ketonuria.⁷

A UK survey of children with newly diagnosed type 1 diabetes identified a delay in diagnosis in 24% of cases.⁸

Among those for whom there was a delay, 46% of delays were the result of advice to have additional investigations.⁸ Younger children are particularly at risk of presenting with DKA on initial diagnosis of type 1 diabetes,⁹ often following multiple physician visits and alternate diagnoses.^{8,9} In Italy, a DKA prevention initiative introduced an information program for teachers, students, parents, and pediatricians, and provided pediatricians with point-of-care devices to measure capillary and urine glucose levels. The incidence of DKA fell from 78% to 12.5% in newly diagnosed diabetes in the intervention population.⁶

Diabetic ketoacidosis is not a benign entity. Children presenting with DKA are at risk of complications including cerebral edema (CE), which accounts for high morbidity and mortality associated with DKA. A Canada-wide prospective surveillance program for CE in DKA between 1999 and 2001 found that CE was associated with more severe DKA, including lower pH levels, higher blood urea nitrogen levels, and higher serum blood glucose levels.¹⁰ The results of this study suggest that in order to reduce the incidence of morbidity and mortality associated with DKA, both prevention of DKA and lessening severity of DKA, where possible, by earlier recognition are important.

Routine practice in the diagnosis of diabetes mellitus in adults is to measure fasting plasma glucose or glycated hemoglobin A_{1c} levels.¹ In children with classic symptoms, delaying the diagnosis by waiting for laboratory glucose measurements, either with a fasting, random, or oral glucose tolerance test, might be dangerous in allowing DKA to evolve.² If diabetes is suspected, do not send the child home without performing point-of-care testing for either blood or urine glucose levels. If hyperglycemia or glycosuria is present, the child will require immediate referral to confirm the diagnosis, rule out DKA, and initiate treatment. When in doubt, speak to your local pediatric ED, pediatrician, or pediatric endocrinologist.

Conclusion

Delays in the diagnosis of diabetes in children can have consequences, which include DKA or the need for otherwise unnecessary hospitalization in a child without DKA. It is important to consider the diagnosis of diabetes in a child presenting with polyuria, polydipsia, fatigue, weight loss, Kussmaul respirations, or new-onset bed-wetting when having been “dry” previously. In children with suspected diabetes, a clinic- or office-based point-of-care test (ie, dipstick test for glucose in urine or capillary glucose meter) is sufficient to initiate an immediate referral for further testing and treatment. 

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Competing interests

None declared

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