ASK EXPERT: Managing high and low blood glucose levels in children with diabetes

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Type 1 diabetes is a chronic, autoimmune disorder that affects children of all ages and in almost every community. A child diagnosed with type 1 diabetes need to take insulin injections for life-time and require daily monitoring and lifestyle changes to keep blood glucose levels as near normal as possible. For a child, it is sometimes a difficult balancing act. In spite of taking care, on an average a person with type 1 diabetes suffers two episodes of low blood glucose per week and one episode of severe low blood glucose per year[1]. On the other hand, even after taking best precautions people with type 1 diabetes often develop high blood glucose.

Understanding Hyperglycaemia and Hypoglycaemia

Hyperglycaemia - The term hyperglycaemia is a technical term when blood glucose level is high i.e. above 126 mg/dL at fasting and above 200mg/dL at any point of time. The signs and symptoms include frequent urination, increased thirst, increased hunger, tiredness and frequent infections.

Hypoglycaemia - The term hypoglycaemia is a technical term when blood glucose level is low i.e. below 70 mg/dL. Common symptoms of hypoglycemia include weakness, drowsiness, confusion, hunger, dizziness or light-headedness, sleepiness, paleness, headache, irritability, trembling, nervousness, sweating, rapid heartbeat, and a cold, clammy feeling.

Effects of high and low blood glucose levels

It has been confirmed that glucose extremes have deleterious effects on a child's health as well as life. These effects of acute glucose extremes on motor function and cognition are well documented.[2,3]

Hyperglycaemia - It is well known that increased exposure to hyperglycaemia results in early appearance of almost all diabetes complications. Extreme episodes of high blood glucose levels also tend to reduce verbal intelligence and slow mental efficiency in children with diabetes[4]. Correcting high blood glucose is therefore essential for a child's long-term health and learning needs.

Hypoglycaemia - When blood glucose levels fall, body usually gives signs and symptoms that one is running low on energy and need a sugary snack. It is very important that a hypo is treated quickly. If it is left untreated, the blood glucose level continues to fall and the child could become unconscious or can have a convulsion (fit) associated with low blood sugar levels. In severe circumstances, hypoglycaemia can be fatal. Repeated hypoglycaemia has been found to reduce spatial intelligence and delayed recall in children with type 1 diabetes[3,4].

Why such variation happens?

There are multiple reasons for high and low blood sugar levels. Let's try to understand reasons of high blood glucose. A number of things can cause hyperglycaemia in a person with type 1 diabetes:

- Taken less insulin than required or taking at inappropriate time or skipping insulin
- Not following diet
- Exercised less than planned
- Any physical or mental stress
- Stress from an acute illness such as a cold or flu
- Adolescence/ Growth hormones/ Ovulation or menstruation changes
- Fear of hypoglycaemia
- Somogyi Phenomenon (Rebound high blood glucose levels)
- Taking steroidal medication for some ailment
- Concomitant illness - coeliac diseases and thyroid disorders

A hypo happens when your blood glucose level falls too low. It needs to be treated by some rapid acting carbohydrates like a glass of sugar drink containing 2-3 teaspoons of sugar or glucose, fruit juice or 3-5 hard candies. This happens in children with diabetes because of various reasons. Let's try to understand the reasons of low blood glucose levels

- Too much insulin: dose error
- Wrong Insulin: short acting instead of long acting
- A delayed or missed meal or snack
- Insufficient food, especially carbohydrates
- Unplanned or strenuous exercise - like walking while shopping or too much playing
- Illness especially gastrointestinal infection, meningitis
- Alcohol consumption

Ultimate goal for treatment

Optimal management of type 1 diabetes should result in near normal blood glucose levels which are achieved by taking appropriate food and insulin and confirming it with timely monitoring. If individual needs are accommodated, and good blood glucose control is maintained then young children, who have the greater number of years to live with diabetes can live longer, healthier lives.

Current Indian Scenario

Extremely high or low blood glucose levels are hard on body, and can cause unwanted complications. If blood glucose levels are constantly high or constantly low then a review with doctor is needed to maintain most of the blood glucose levels near normal. This review needs to be done periodically as insulin needs change as the child grows and with changing physical and mental environment. Almost all the burden of treatment falls on the family of the child with type 1 diabetes. Huge financial burden and lack of proper diabetes education because of scare resources results in suboptimal treatment and thus suboptimal outcomes for the child.

Changing Diabetes in Children (CDiC) program

Novo Nordisk Education Foundation along with 21 specialized centres across India has tried to address this critical gap in the management of type 1 diabetes through its CDiC program. The 4000 children registered in the program are provided with comprehensive care which includes free human insulin, glucose monitoring (both self - monitoring and HbA_{1c}) and diabetes education. Each child gets a free consultation and diabetes education from the specialist every four months. CDiC is striving to support normal and healthy childhood in these children with type 1 diabetes.

If you would like to have more information on type 1 diabetes you can write to us at -

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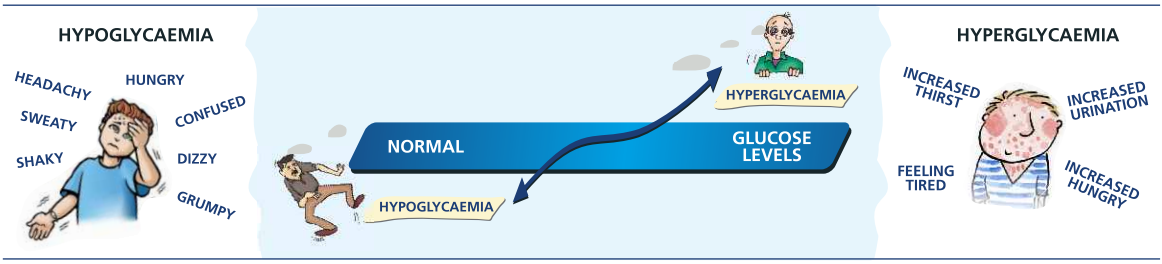

1. Cryer PE: Hypoglycemia in Diabetes: Pathophysiology, Prevalence, and Prevention. Alexandria, Va., American Diabetes Association, 2009, p. **2.** Cox D, Gonder-Frederick L, McCall A, *et al.* The effects of glucose fluctuation on cognitive function and QOL: The functional costs of hypoglycemia and hyperglycaemia among adults with type 1 or type 2 diabetes. *Int J Clin Pract Suppl* 2002;129:20-26. **3.** Gonder-Frederick L, Zrebiec J, Bauchowitz A, *et al.* Cognitive function is disrupted by both hypo- and hyperglycemia in school-aged children with type 1 diabetes: A field study. *Diabetes Care* 2009;32:1001-1006. **4.** Perantie D, Lim A, Wu J, *et al.* Effects of prior hypoglycemia and hyperglycemia on cognition in children with type 1 diabetes mellitus. *Pediatr Diabetes* 2008;9:87-95.

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