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Low Detection Rates Prevent Proper Treatment of Hypoglycemia in Young Children

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In young children with type 1 diabetes, hypoglycemia is a continuous threat. Repeat episodes of mild hypoglycemia can not only disrupt learning and impair cognition, but can lead to seizures, unconsciousness and hospitalization. For young children who are not mature enough to understand and recognize the danger signs, it is harder for them and their parents to identify, and therefore treat, hypoglycemic events. A study by Sundberg F and Forsander G examined how often hypoglycemia is detected in these young children, and how effective the ways in which parents and caregivers treat it are.

Twenty-three children under age 7 having T1DM for at least 3 months participated in the study. Seventeen of the children had an insulin pump. These children underwent blinded continuous glucose monitoring (CGM) to track their BG values throughout the day. Data was recorded for symptoms and treatment of hypoglycemia and was entered into a logbook. Plasma glucose levels obtained through self-monitoring of BG were also entered in the logbook, whereas the CGM data on the glucometer was uploaded to a computer software program. This data was collected over 1 week in the fall and 1 week in the springtime.

The results found that only 32% of all hypoglycemic events were detected by parents or caregivers, despite glucose being self-monitored 10 times per day. Most of the events were asymptomatic, and therefore would only have been detected by BG values. These untreated hypoglycemic events were also seen to cause a relapse into hypoglycemia within 3 hours in many cases. Ten total events of severe hypoglycemia were reported, and for all children reporting these events, plasma glucose levels were reported less than 10 times per day. For those cases of hypoglycemia that were treated, treatment with a mixed meal resulted in much higher glucose values 1-2 hours later than those that were treated with a defined dose of simple carbohydrates.

The detection rate of hypoglycemic events was very low in this study. This is concerning because proper detection is necessary to providing treatment. Because so many of the episodes were asymptomatic, detection is dependent on testing plasma glucose frequently throughout the day. It has been shown that young children injecting insulin the conventional way and using a lower testing frequency spend longer periods of time hypoglycemic or hyperglycemic. While increasing the amount of times the glucose is tested per day from 4-6 to 10 may improve detection of hypoglycemia, it is very difficult and somewhat impractical to test this many times a day. A real-time CGM device can be used successfully in these young patients and may be useful in providing constant updates as to the child's glycemic status. Technology such as CGM that can help to detect hypoglycemia and treatment methods that can maintain more stable glucose levels therefore need to be made accessible to these young patients to help reduce risk of hypoglycemia.

Practice Pearls:

- Many hypoglycemic episodes go undetected in this age group because they are asymptomatic or the child is unable to recognize their body's responses.
- Hypoglycemia should be treated with a defined dose of simple carbohydrates rather than a mixed meal to prevent highly elevated glucose levels 1-2 hours later.

Sundber F, Forsander G. "Detection and treatment efficacy of hypoglycemic events in the everyday life of children younger than 7yr" *Pediatric Diabetes*.2014; 15:34-40.

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