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Opinion

Continuous Glucose Monitoring in Pediatric Diabetes During COVID-19 Pandemic: When Nighttime Matters Most

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Opinion

In recent years, continuous glucose monitoring (CGM) systems have demonstrated their clinical benefits regardless of the insulin delivery method being used. CGM has the ability to depict daily profiles of glucose levels, facilitating timely and fine adjustments towards euglycemia [1]. The basic metric index of CGM, time in range (TIR) (70-180 mg/dl) has been well correlated with HbA1c levels and has the superiority of presenting the magnitude and variations of glycemic excursions [2]. Every age group has its own specific characteristics and challenges in the management of diabetes. For example, in preschool children, diverse developmental behavioral patterns, affect either the timings of meals or the amount of carbohydrates ingested, creating issues with the accuracy of mealtime insulin administration. Similar attitudes of a lesser degree sometimes persist into the school-age group and while these issues extinct in adolescence, other matters may come up, regarding mostly to the compliance to insulin therapy. However, a major difference in the daily routine between childhood and adulthood is the amount of sleep time. Preschool-age children (3-5y) usually need between 10 and 13 hours of sleep, school-age children (6-12y) between 9 and 12 hours, while older children and adolescents may approach the sleeping time of adults (8-10 hours of sleep) [3].

Night sleep has always been a source of fear for the parents of children with diabetes as well as for physicians, because of a possible hypoglycemic episode and its management in the nightly hours. First, a nocturnal hypoglycemia of an asleep child may be not easily perceptible by the patient due to decreased alertness. To this may contribute, an impaired response of the autonomic nervous system to hypoglycemia, which is related to sleep and has been primarily described in adults [4]. Second, parents may not be alerted to detect a hypoglycemic episode in its early phase, creating a lot of stress to them and reducing substantially their quality of life. In addition, a just aroused child having a hypoglycemic episode may not promptly respond correctly to the given instructions (drink carbohydrates) and thus delay its management. Given the above issues during nighttime, clinicians are much more elastic regarding the acceptable glycemic ranges and generally allow for higher glucose values during the night. Considering that sleep time is over 50% of the daytime in preschool and school ages respectively and almost 50% of the daytime and older children, then it can be easily deduced that this part of the day it's going to have an impact on the total TIR as well as the HbA1c.

Placing the above situation into a modeled perspective, based on the elegant paper of Beck et al, an increase of 10 to 20% in TIR,

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corresponding to the extra sleep time, might lead to a reduction in HbA1c of 0.42 to 0.6%. If the baseline HbA1c is below 7%, then the above benefit could be even greater, leading to reduction of HbA1c from 0.57 to 0.9% [5]. The limitation of the above hypotheses is that these data come from studies in adults, but there is no reason why there shouldn't be any parallel benefit in the childhood population even with variations in the numbers of HbA1c reduction. CGM allow us to extend TIR and pursue glucose levels to lie consistently at or below the median of the euglycemic range during the night. The above approach obtains important value during this pandemic period, when we are trying to remotely manage pediatric diabetes using the medical teleservices. By controlling the nightly levels of glucose efficiently we may equilibrate for the daily glycemic excursions that may be far more difficulty controllable, due to the factors we stated above. This obtains an extra value in a limited resource setting environment for support as imposed by the coronavirus pandemic. What is equally important, is the reassurance and the relief of the parents that their child is going through well, during the pandemic, even with the inherent restrictions of remote management from the diabetic team. In this context, the effort to maintain the Hb1Ac into the acceptable levels for age, could be significantly reduced by focusing on the night control of glucose levels, conferring compensation for the daytime glucose-variation, and reducing parental stress in managing pediatric diabetes.

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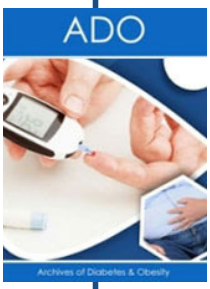

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