

## Melatonin Use in a School-aged Boy with Obesity Born to a Mother with Type 2 Diabetes

Akihiro Nakamura. Treatment Efficacy and Safety: Melatonin

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### Abstract

Intrauterine exposure to maternal hyperglycemia increases the risk of pediatric obesity. While lifestyle modifications are standard interventions, they are often insufficient, particularly when accompanied by sleep disturbances. An 11-year-old boy, born to a mother with type 2 diabetes, presented with rapid weight gain and severe overeating starting at age 10. Despite strict dietary guidance and physical activity, his weight increased to 62 kg (BMI z-score: 2.44) within one month. Endocrine evaluations were normal, but severe sleep disturbances were observed. Suspecting that sleep dysregulation exacerbated his appetite control, melatonin (1 mg/day) was initiated to target sleep quality. Following treatment, parental reports noted marked improvements in sleep posture and nighttime awakenings, alongside a secondary reduction in overeating episodes and gradual weight reduction without adverse events. Melatonin improves sleep quality and circadian alignment, which may favorably influence energy balance and metabolic regulation. Melatonin administration may serve as a useful adjunct in managing pediatric obesity by optimizing sleep behavior, especially in children with prenatal vulnerabilities and secondary appetite dysregulation. Further studies are required to confirm these observations.

**Keywords:** Appropriate-for-gestational-age, Childhood obesity, Maternal type 2 diabetes, Melatonin, Sleep-wake cycle

### What is already known on this topic?

Childhood obesity is increasing in Japan. Maternal diabetes and intrauterine hyperglycemia exposure increase the risk of fetal hyperinsulinemia and subsequent pediatric obesity. Lifestyle modification, the first-line treatment, is often limited by sleep disturbances or circadian misalignment. Sleep dysregulation negatively affects circadian rhythms, appetite control, and metabolic processes, hindering weight management.

### What this study adds?

This report suggested that improving sleep behavior through low-dose melatonin administration can secondarily facilitate better appetite regulation and weight management in a child unresponsive to lifestyle changes alone. Melatonin as a safe, supportive option to optimize sleep parameters, which may indirectly yield positive outcomes in pediatric obesity therapy.

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To the Editor,

Childhood obesity is a major public health concern, with approximately 11% of upper elementary students in Japan classified as obese (1). Intrauterine exposure to maternal hyperglycemia promotes fetal hyperinsulinemia, predisposing offspring to pediatric obesity and metabolic disorders (2). Here, we report a pediatric case of severe obesity that was successfully managed after initiating melatonin.

The patient was an 11-year-old boy born to a mother with type 2 diabetes (maternal HbA1c: 7.2%, pre-pregnancy; 7.7%, during pregnancy) who developed severe obesity. He experienced normal growth until age 10, when he exhibited a rapid increase in appetite and weight. Despite supervised dietary control and physical activity, overeating persisted. At his initial visit, his weight, height, body mass index (BMI), and BMI z-score were 59.0 kg, 147.0 cm, 27.3 kg/m<sup>2</sup>, and 2.44, respectively. Over the following month, he gained an additional 3 kg. Endocrine evaluations (TSH, FT4, cortisol) and glucose metabolism markers (HbA1c 5.5%, HOMA-IR 1.4) were normal, ruling out secondary causes. Notably, the patient exhibited significant sleep disturbances, including restless sleep and poor sleep posture. Given the link between circadian dysregulation and appetite control, off-label treatment with melatonin (1 mg daily) was initiated. After 1 month, parental reports indicated marked improvements in sleep posture and nighttime awakenings. Concurrently, overeating episodes decreased substantially, leading to gradual weight reduction without adverse events.

To our knowledge, this is a novel clinical observation of melatonin administration in a pediatric obesity case with a maternal history of diabetes. Beyond its chronobiotic effects, melatonin regulates energy homeostasis by modulating lipid metabolism, enhancing brown adipose tissue activity, and reducing oxidative stress, primarily via MT1 and MT2 receptors (3–5). Furthermore, adult meta-analyses demonstrate weight loss following melatonin administration, underscoring the role of circadian misalignment in metabolic dysregulation (6).

In this patient, melatonin improved sleep quality and reduced hyperphagia, supporting its potential utility as an adjunct therapy when lifestyle interventions fail, particularly in children with prenatal metabolic vulnerabilities and sleep issues. Study limitations include the lack of polysomnography, subjective appetite assessment, unmeasured gut hormones (leptin/ghrelin), short follow-up, and potential placebo effects. Additionally, causality cannot be definitively established. Nevertheless, this case highlights sleep-targeted interventions as a promising strategy. Further controlled trials are warranted to validate the efficacy and safety of melatonin in pediatric obesity.

### Informed consent

Written informed consent was obtained from the guardian of the patient for the publication of this case report.

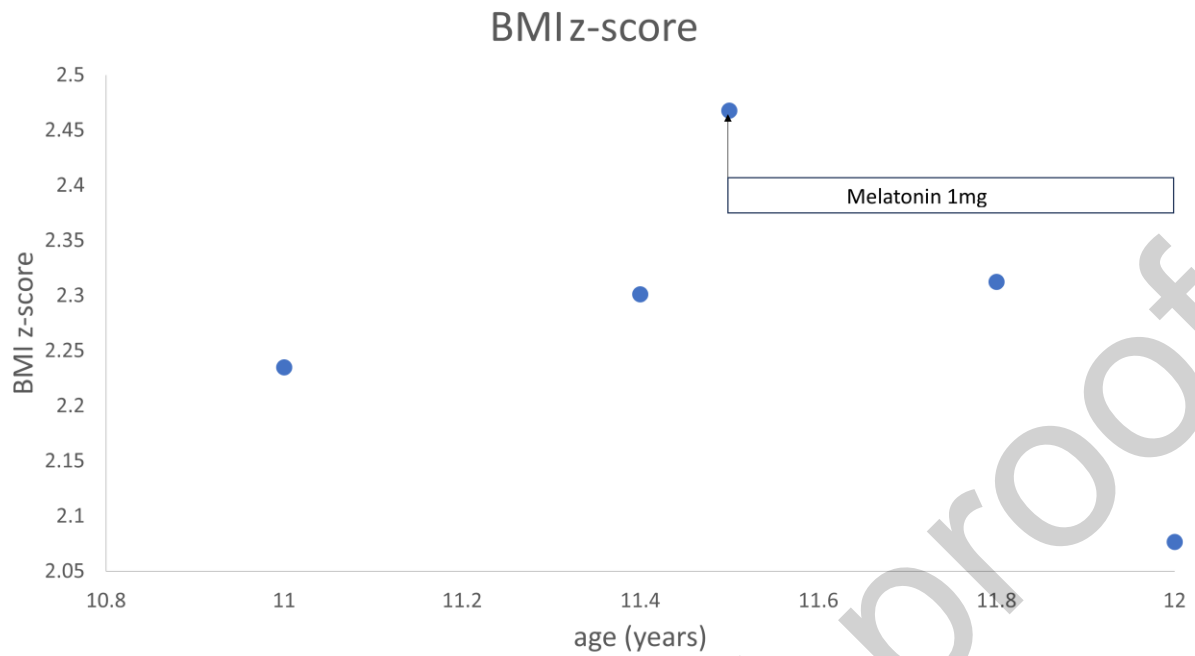
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uncertain about using melatonin, this treatment provided meaningful improvements in daily sleep conditions and appetite control. They hope that sharing this experience will help other families facing similar challenges.

**Competing interests:** The authors declared no conflicting interests.

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**Figure 1. Longitudinal changes in body mass index (BMI) z-score before and after melatonin initiation**

The vertical arrow indicates the start of melatonin treatment (1 mg/d). BMI z-scores were calculated based on Japanese reference data using the lambda-mu-sigma (LMS) method. Note the distinct downward trajectory of the z-score immediately following the intervention. No additional lifestyle modifications or other pharmacotherapies were introduced during the observed period, indicating a potential direct or indirect effect of improved sleep regulation on weight management.