ROHHAD Syndrome an Inconspicuous Cause of Hypernatremia, A Case Report

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Rapid-onset obesity with hypoventilation, hypothalamic dysfunction, and autonomic dysregulation (ROHHAD) syndrome is a rare, life threatening disease with unknown etiology. Dysnatremia is a common finding in these patients.
Here we present a 12-year-old boy with multiple admissions due to hypernatremia and was repeatedly misdiagnosed. An eventual diagnosis of ROHHAD syndrome was made by integration of the previous ignored findings of sleep apnea and obesity.
The diagnosis of this rare but potentially fatal syndrome should be considered in patients with dysnatremia associated with obesity and sleep apnea disorders

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Case Report

INTRODUCTION

ROHHAD syndrome (rapid-onset obesity with hypoventilation, hypothalamic dysfunction, and autonomic dysregulation) is a rare and life-threatening disease.[1-3] Various clinical and endocrine findings including dysnatremia have been attributed to this syndrome. In this paper, we discuss a missed case of ROHHAD syndrome that was finally diagnosed following investigations for the cause of hypernatremia.

CASE REPORT

A 12-year-old boy was admitted due to hyperthermia and asymptomatic hypernatremia in primary lab tests. He had several previous admissions due to the same problem. He was the first child of the family and a product of consanguineous marriage with normal birth measurements and psychomotor development. At the age of 6, parents noticed the rapid weight gain, polyphagia, hypersomnolence, aggressive behaviors, poor stature growth and breathing interruptions while sleeping. A thorough laboratory evaluation revealed a relative hypernatremia (Na: 157 mEq/L) and a significant growth hormone (GH) deficiency. Bone age and brain MRI were normal. He did not have a satisfactory response to human recombinant GH therapy. Despite several admissions, the finding of hypernatremia was unnoticed and the patient had been discharged repeatedly following intravenous fluid therapy and normalization of serum sodium. In physical examination, he was obese with normal vital signs. Anthropometric measures revealed a height of 140cm (< 15th percentile) and weight of 66 kg (> 97th percentile). The pupillary reflex was normal. Assessment of pubertal maturation revealed no axillary hair, pubic hair of Tanner stage 4, and normal size penis and testis. The initial lab-data revealed marked hypernatremia (Na: 162 mEq/L), and a compensated respiratory acidosis (PH: 7.36, PCO_2: 60 mmHg, HCO_3^-: 33mEq/L). Complete blood count, kidney and thyroid function tests, Cortisol and Adrenocorticotropic hormone levels were within normal ranges but the prolactin level was high (50.6 ng/mL; normal range: 1.8 to 20.3 ng/mL). Urinalysis was normal and the urine specific gravity varied between 1.026 and 1040. The overnight polysomnography indicated 11 obstructive apneas with average apnea duration of

35 seconds. O_2 saturation (SPO_2) was less than 90% in 99.7% of the sleep duration and the minimum SPO_2 was 38 %. Based on the clinical history and mentioned findings, the ultimate diagnosis of ROHHAD syndrome was established. Regarding the possibility of neuroendocrine tumors, Chest X-ray, abdominal and pelvic sonography and brain MRI were done which all were normal. Echocardiography revealed no significant pulmonary hypertension. Treatment plan included a water intake schedule and BiPAP therapy during sleep.

DISCUSSION

ROHHAD syndrome is a rare, complex disease with unknown etiology and a mortality rate of nearly 50 to 60% secondary to cardiorespiratory arrest.[4] The presenting sign is usually the rapid onset obesity in a previously healthy child around 3 years of age followed by symptoms of hypoventilation.[5] Our patient had the same initial presentations at the age of six with subsequent GH deficiency, hypernatremia, and hyperprolactinemia which are among the most common reported features of hypothalamic dysfunction in this syndrome.[5]

Undeniably, the hypodipsic hypernatremia was the most neglected part of the patient's findings. Under normal circumstances, even a 2 to 3% rise in serum osmolarity affects the osmoreceptors in anterior hypothalamus triggering both thirst perception and Antidiuretic Hormone (ADH) release from the posterior hypophysis.[6] Our patient had an altered thirst perception, However the ADH response was normal considering the intact urine concentrating ability.

The reported features of autonomic dysfunction in ROHHAD syndrome include thermal dysregulations, pupillary dysfunction, altered pain sensation, gastrointestinal dysmotility, and hyperhidrosis.[5,7] Behavioral problems, psychotic disorders, mental retardation and mood disorders have been noticed in 60% of reported cases. Our patient had a normal IQ score however behavioral changes and aggressive behavior were amongst his initial presentations.

There is no definitive treatment plan for ROHHAD syndrome and most patients are treated based on their presenting symptoms. Our treatment plans included BiPAP therapy during sleep to prevent the life-threatening apnea episodes and forced fluid intake at regular intervals to correct hypernatremia.

CONCLUSION

Pediatricians should be aware of this rare but life threatening entity considering the diverse presentations and should consider this diagnosis especially in obese children with sleep apnea disorders.[8,9] Pediatric nephrologists should also be mindful of this issue as they may be consulted regarding the dysnatremia. Early diagnosis and appropriate treatment strategies may be life-saving regarding the disastrous apnea episodes during sleep.

ABBREVIATIONS

ROHHAD: Rapid-onset Obesity with Hypoventilation, Hypothalamic Dysfunction, and Autonomic Dysregulation
IQ: Intelligence Quotient
GH: Growth Hormone
MRI: Magnetic Resonance Imaging
ACTH: Adrenocorticotropic Hormone
CT: Computed Tomography
WASOs:Wakes After Sleep Onset
AHI:Apnea-Hypopnea Index
SPO_2: O_2 Saturation
ADH: Anti Dureticd Hornone

DECLARATIONS

Ethics Approval and Consent to Participate

The present study was approved by the Medical Ethics Committee of Shiraz University of Medical Sciences. The purpose of this study was completely explained to the patient and his parents and were assured that their information will be kept confidential by the researchers. The written consent form was obtained from the patient's parents

Consent for Publication

Consent was obtained from the parents of the patient regarding the publication of this case report.

Availability of Data and Material: The datasets used and/or analysed during the current study available from the corresponding author on reasonable request.

Competing Interests

The authors declare that they have no competing interests.

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AUTHORS' CONTRIBUTIONS

DD and KR made the ultimate diagnosis of the case. MB carried out the therapeutic measures. KR and DF drafted the manuscript. RS revised and proofread the manuscript. All authors read and approved the final version of the manuscript.

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