

Surveillance Highlights

Micronutrient deficiencies in autism spectrum disorder: A macro problem?

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CASE VIGNETTES

Case 1

A 7-year-old boy with autism spectrum disorder (ASD) was referred for outpatient paediatric assessment because of food selectivity and a limited food repertoire. His diet consisted exclusively of yogurt drink, pudding, and chicken nuggets. His parents had tried to give him a children's multivitamin and encourage a more varied diet, without success. A review of systems was positive for gingival bleeding and fatigue. The physical exam was notable for gingival swelling and perifollicular petechiae in the bilateral lower extremities.

The patient's blood work identified a microcytic anemia (hemoglobin 75 g/L, mean corpuscular volume 58 fL). Hypochromia, microcytosis, and poikilocytosis were present on blood smear. Ferritin was <1 µg/L. Ascorbic acid (vitamin C) level was ultimately reported as <5 µmol/L.

The patient was diagnosed with both iron deficiency anemia and scurvy.

Case 2

A 10-year-old boy with ASD presented to the emergency department following a generalized tonic-clonic seizure (his first known seizure). Initial blood work identified an ionized calcium level of 0.79 mmol/L. He was admitted to hospital for ongoing management of hypocalcemia, including calcium infusion. His diet was found to consist exclusively of rice, banana, and canned chicken. He had refused dairy products since early childhood and was not receiving supplemental vitamin D or calcium.

In the context of the patient's limited dietary repertoire and parental concerns regarding eye pain, an urgent ophthalmological assessment was arranged. Findings were consistent with xerophthalmia, and he was treated urgently with oral vitamin A, as per World Health Organization guidelines (1).

Further blood work showed vitamin D deficiency (25-hydroxy vitamin D <5 nmol/L), elevated alkaline phosphatase (440 U/L) and elevated parathyroid hormone (132 ng/L). On x-ray, there was no radiographic evidence of rickets. As suspected, the patient's vitamin A level was very low (0.2 µmol/L).

The patient had both xerophthalmia (secondary to nutritional vitamin A deficiency), and symptomatic hypocalcemia (secondary to severe vitamin D deficiency).

LEARNING POINTS

- ASD is a neurodevelopmental disorder with onset in childhood, characterized by (i) impairments in social communication and (ii) restricted, repetitive patterns of behaviours, interests or activities (2). ASD affects approximately 1 in 66 Canadian children and youth from 5 to 17 years of age (3).
- Feeding problems are common in children and youth with ASD (4). Food refusal, limited dietary repertoire, and high frequency single food intake, in particular, may be seen in ASD (5). The origins of these problems are not completely understood, but likely relate, in part, to insistence on sameness and sensory differences.
- Restricted diet—resulting from food refusal, limited dietary repertoire and high frequency single food intake—can lead

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to micronutrient deficiencies.

- There are numerous case reports of children and youth with ASD and the following micronutrient deficiencies (6–8):
 - Vitamin A deficiency, causing xerophthalmia (the spectrum of ophthalmologic disease caused by vitamin A deficiency)
 - Vitamin C deficiency, causing scurvy (the disease resulting from severe vitamin C deficiency)
 - Vitamin D deficiency, causing vitamin D-deficiency rickets (a defect in mineralization of newly formed bone)
 - Iron deficiency, causing iron-deficiency anemia (a state of insufficient total body iron, such that normal physiologic processes, like hematopoiesis, are not maintained)
- Micronutrient deficiencies can result in significant morbidity, which may be compounded by invasive investigations, prolonged hospital admission and delayed diagnosis, due in part to the perceived rarity of these conditions (e.g., scurvy [9–11]).
- The incidence of micronutrient deficiencies in Canadian children and youth with ASD is unknown. Furthermore, very little is understood about the clinical characteristics, use of healthcare resources, and significant health complications associated with these micronutrient deficiencies.
- A Canadian Paediatric Surveillance Program (CPSP) study on micronutrient deficiencies in children and youth with ASD began in January 2020 and is ongoing (8).
 - CPSP participants are being asked to report all children and youth less than 18 years of age with ASD and a new diagnosis of one or more of the following: vitamin A deficiency/xerophthalmia; scurvy; severe, symptomatic vitamin D deficiency; and severe iron-deficiency anemia.
 - Detailed case definitions (included in the study protocol [8]) were developed to capture cases of biochemical micronutrient deficiency associated with clinical sequelae, and not biochemical deficiency alone.
- The primary goal of this CPSP study is to understand the burden of serious micronutrient deficiencies better in Canadian children and youth with ASD, in order to inform anticipatory guidance, screening, and prevention strategies in this population.

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