Case Report

Nutritional rickets and severe hypocalcemia in two Canadian newcomers

Yolanda Evong, MD[1]

Arati Mokashi, MD FRCPC[2]

1. Department of Pediatrics, Dalhousie University, IWK Health Centre, Halifax, NS

2. Division of Endocrinology, Department of Pediatrics, Dalhousie University, IWK Health Centre, Halifax, NS

Correspondence to
Dr. Yolanda Evong;
yolanda.evong@dal.ca

Nutritional rickets and hypocalcemia are serious but preventable medical conditions with important and potentially long-lasting health implications. Despite well-established recommendations around dietary modification and nutritional supplementation, these diseases remain disproportionately higher among Canadian newcomers. We describe two cases of nutritional rickets and hypocalcemia in adolescent newcomers from East Africa. Both children attended a primary care clinic on arrival to Canada, but neither child was taking appropriate supplementation at the time of diagnosis. Once diagnosed, both patients responded to supplementation but, due to the severity and chronicity of their nutritional deficiencies, required additional medical testing and intervention to achieve adequate management. This case report emphasizes Canadian newcomers as an at-risk group for nutritional rickets and hypocalcemia, and underlines an urgent need for improved awareness, dietary counselling, supplementation, and access to reliable long-term prescription coverage upon arrival to Canada.

Case Presentation

In our first case, a previously healthy 14-year-old girl was referred to the orthopedic clinic with a two-year history of progressive knock knees, leg pain, and abnormal gait. She moved from East Africa two years before symptom onset, was otherwise asymptomatic, had no history of trauma or fractures, and had no known family history of metabolic bone disease or endocrinopathy. Physical examination found bilateral severe genu valgus deformity and a circumduction gait. Initial bloodwork identified severe hypocalcemia, low 25 hydroxyvitamin D (25[OH]D), low phosphate, high parathyroid hormone (PTH), and high alkaline phosphatase (ALP). Plain radiographs showed markedly elevated femorotibial angles but no radiographic evidence of rickets.

In our second case, a previously healthy, asymptomatic, 12-year-old female presented to her local Canadian newcomer clinic for routine follow-up approximately 18 months after arriving from East Africa. She was incidentally found to have severe hypocalcemia, low 25[OH]D, normal phosphate, high PTH, and high ALP. Plain films did not show radiographic features of rickets; however, electrocardiography identified a prolonged QTc interval. In both cases, dietary history was significant for chronically low calcium and vitamin D intake.
Both patients had visited their local newcomer health clinic on arrival to Canada, but the first patient was never prescribed dietary supplementation, and the second patient stopped taking her recommended supplementation after her temporary medication coverage ended six months before presentation. Ultimately, both children were diagnosed with nutritional rickets and severe hypocalcemia. Although neither child had evidence of rickets on x-ray, we hypothesize that both children would have had some increased exposure to vitamin D after arrival in Canada through supplementation (case 2), albeit for a short period, and diet for both. This may have led to partial healing of the rickets and absence of radiographic findings at diagnosis.

After diagnosis, both patients were prescribed long-term daily calcium and vitamin D supplementation and received dietary education. Their healthcare teams also addressed any barriers to ongoing treatment adherence. Laboratory values gradually normalized, and both patients maintained appropriate calcium and vitamin D levels at their three-month follow-up appointment. Due to the severity and chronicity of her metabolic derangements, the first patient also underwent surgery on her lower limbs to correct her genu valgus deformity. The second patient was admitted to hospital for serial electrocardiograms to ensure resolution of her prolonged QTc without arrythmia.

Table 1 | Laboratory results pre and post supplementation.

		Case 1		Case 2	
Result	**Normal Range**	**Pre**	**Post**	**Pre**	**Post**
Total Calcium	2.1-2.7 mmol/L	1.84	2.35	1.38	2.34
Albumin	36-49 g/L	42.9	41	43	38.5
25[OH]D	49.9-200 nmol/L	14.5	134.9	11.1	61.5
Phosphate	1.3-1.8 mmol/L	1.18	1.46	1.72	1.74
PTH	2.3-9.3 pmol/L	55.9	5.1	41.3	7.6
ALP	70-230 u/L (case 1) 105-420 u/L (case 2)	432	176	489	196

Discussion

Nutritional rickets is a serious and progressive health condition caused by vitamin D deficiency that decreases bone mineralization within pediatric growth plates.[1] This results in softer and weaker bones with higher incidence of motor delays, lower limb deformities such as bowing and knock knees, fractures, and bone pain.[1-3] Additionally, vitamin D deficiency contributes to hypocalcemia which can manifest as seizures, tetany, cardiomyopathy, and/or prolonged QT intervals.[1-3]

Nutritional rickets and hypocalcemia are rare in Canada, but more common among Canadian newcomers.[4,5] Risk factors include genetic predisposition, dark skin pigmentation, northern latitude, sun avoidance, certain cultural clothing practices, low maternal vitamin D levels, breastfeeding without infant vitamin D supplementation, food insecurity, and chronically low or unfortified dairy intake.[3,4,6] Several of these risk factors are modifiable, and most cases of nutritional rickets and hypocalcemia are preventable through timely identification of at-risk individuals, appropriate dietary counselling, and daily nutritional supplementation.

These cases highlight a need for increased awareness of Canadian newcomers as an at-risk group. Once a patient is identified as high risk, current recommendations suggest long-term supplementation.[2,7] Specifically, a daily intake of 400 IU for those under 12 months of age, and 600 IU for those over 12 months of age, of vitamin D is adequate to prevent nutritional rickets in the majority of individuals. However, children with nutritional rickets should consume higher amounts of daily vitamin D (cholecalciferol 2000-6000 IU based on age) and ensure a minimum of 500 mg/day of calcium for at least three months, or until laboratory values normalize.[8]

These cases also underline two potential barriers to supplementation adherence within this demographic. First, there is a lack of access to reliable long-term prescription coverage on arrival to Canada. Second, nutritional supplements such as cholecalciferol and calcium often fall outside of insurance policy coverage guidelines and therefore represent a considerable out of pocket expense for patients.

We advocate for healthcare providers to recognize the increased risk of nutritional rickets and hypocalcemia among Canadian newcomers. The incorporation of dietary counselling and supplementation into routine care for these patients, and screening for potential barriers to long-term supplement adherence, will reduce rates of nutritional rickets and hypocalcemia among Canadian newcomers and thereby improve their long-term health outcomes.

Clinical Pearls

1. Nutritional rickets and hypocalcemia are rare in Canada, but more common among newcomers. These diagnoses can have serious health implications, and providers should consider them in all Canadian newcomers.
2. Most cases of nutritional rickets and hypocalcemia are preventable or treatable with appropriate dietary intake and/or supplementation. Providers should recognize Canadian newcomers as an at-risk group and encourage the current recommendations of long-term vitamin D prophylaxis in all at-risk individuals.
3. Many newcomers face significant barriers to long-term supplementation adherence. It is important to screen for these barriers and advocate when appropriate.

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Consent: Legal guardians provided written consent for the publication of this case report. Patients provided assent.