

# Is vitamin D deficiency an underreported issue in refugee health?

## *Two cases of infants presenting with vitamin D-deficiency rickets*

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It is well known that severe vitamin D deficiency impairs bone tissue and growth plate mineralization, resulting in osteomalacia and rickets, respectively. In fact, even less severe infant vitamin D deficiency might adversely affect not only bone health but also brain development; the incidence of asthma, heart disease, and type 1 diabetes; and cancer progression.<sup>1</sup>

In North America rickets is assumed to be a rare disease. However, in Canada the annual incidence of vitamin D-deficiency rickets is 2.9 per 100 000 children.<sup>2</sup> The Canadian Paediatric Surveillance Program (CPSP) reports that this condition is “most frequently observed among darker-skinned, breast-fed infants and children, with the highest incidence among children from north (Yukon Territory, Northwest Territories and Nunavut).”<sup>2</sup> Here we describe 2 cases of vitamin D-deficiency rickets in infants born in Newfoundland to refugee parents. These cases are presented to raise awareness of this issue in Canadian infants born south of 55°N latitude, especially in the refugee population.

### Case descriptions

**Case 1.** During a well-baby visit, an 18-month-old infant was noted to have delayed walking, pain on attempted standing, and bowing of his lower legs. He had been born via spontaneous vertex delivery in Newfoundland, a week after his parents emigrated from Africa. He was breastfed from birth until at least 14 months of age. All immunizations were up to date. There was no relevant family history. Results of complete blood count showed mild anemia and a vitamin D level of 40 nmol/L (normal 90 to 200 nmol/L). Findings of x-ray scans revealed genu varum of the tibia and fibula but were otherwise normal. The infant was referred to pediatric endocrinology, and after further testing, rickets was confirmed. Administration of vitamin D supplements was monitored. The leg bowing and other symptoms have since improved and vitamin D levels are normal.

**Case 2.** A 4.5-month-old infant was admitted to hospital with a 2-day history of swollen ankles, wrists, and hands associated with general irritability, especially when her extremities were moved. She had no fever, cough, or other symptoms of intercurrent illness. She was born in Canada, after an uneventful full-term pregnancy and uncomplicated vaginal delivery, to parents who had emigrated from Africa 3 years earlier. She was exclusively breastfed. Investigations while in hospital revealed critical hypocalcemia of 1.39 mmol/L (normal 2.25 to 2.75 mmol/L), elevated levels of parathyroid hormone at 474 ng/L (normal 12 to 72 ng/L), and almost nonexistent levels of 25-hydroxyvitamin D at 8 nmol/L (normal 90 to 200 nmol/L). She was diagnosed with acute vitamin D-deficiency rickets, and treated with

### EDITOR'S KEY POINTS

- Vitamin D-deficiency rickets is a real, and probably underrecognized, problem in Canada's refugee population. No specific recommendations exist for vitamin D supplementation in the refugee population, but various factors render refugees especially vulnerable to vitamin D deficiency.
- Two cases of vitamin D-deficiency rickets in infants born to refugee parents in Canada, south of 55°N latitude, are presented. It is important for health care professionals caring for refugee populations to be aware of this and other refugee health issues.
- Sensitivity to the complex biologic, sociocultural, economic, and health literacy factors resulting in increased vulnerability of this group can help avert this preventable disease.

### POINTS DE REPÈRE DU RÉDACTEUR

- Le rachitisme dû à une carence en vitamine D est un problème bien réel, qui passe probablement inaperçu dans la population des réfugiés au Canada. Il n'existe pas de recommandations précises concernant les suppléments de vitamine D pour la population des réfugiés, mais divers facteurs rendent les réfugiés particulièrement vulnérables à de telles carences.
- Nous présentons deux cas de rachitisme dû à une carence en vitamine D chez des nourrissons nés de parents réfugiés au Canada, au sud du 55° de latitude nord. Il importe que les professionnels de la santé qui s'occupent des populations de réfugiés soient conscients de ce problème ainsi que des autres problèmes de santé des réfugiés.
- En étant sensibles aux facteurs complexes sur les plans biologique, socioculturel et économique ainsi qu'à celui de la littératie en matière de santé, qui accroissent la vulnérabilité de ce groupe, il est possible d'aider à prévenir cette maladie évitable.

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intravenous fluids followed by 2000 IU daily of oral vitamin D and 500 mg daily of calcium carbonate (the equivalent of 200 mg of elemental calcium). Within 5 days joint symptoms and signs resolved. All family members were tested and found to be deficient in vitamin D, although none had any clinical evidence of rickets. Before diagnosis, vitamin D supplements had been recommended or prescribed to both infants as newborns but, unknown to their health care providers, these were not consistently taken.

### Discussion

Multiple factors influence vitamin D deficiency, including skin pigmentation and reduced sun exposure as a result of geographic location or physical skin covering from clothing or sunscreen.<sup>3</sup> Maternal vitamin D status determines the vitamin D levels and stores of the fetus, of the newborn, and in breast milk.<sup>3</sup> Pregnant women risk becoming vitamin D deficient because there are increased demands on maternal levels, especially in the third trimester when the fetal skeleton develops.<sup>3</sup> Thus, while breast milk is widely accepted to be the best source of nutrition for infants, it offers an inadequate supply of vitamin D, typically 25 IU or less per litre,<sup>2,4</sup> and therefore supplementation is required.

The Canadian Paediatric Society recommends that pregnant and lactating mothers take no less than 1000 IU of vitamin D daily, while breastfed babies should receive 400 IU daily.<sup>3</sup> Guidelines advise that infant supplementation be increased to 800 IU per day between October and April north of the 55th parallel and between the 40th and 55th parallel in individuals with risk factors for vitamin D deficiency other than latitude.<sup>3</sup>

Infant formula currently contains 400 IU/L of vitamin D,<sup>4</sup> and thus infants drinking less than 1 L (33 oz) daily will not receive the recommended daily dose of vitamin D. One Canadian study observes that the discontinuation of vitamin D supplementation when transitioning to low vitamin D-containing solid foods might result in a rebound of low vitamin D concentration in toddlers.<sup>5</sup> Recognizing that rates of consumption of milk products fortified with vitamin D are low, the American Academy of Pediatrics recommends universal vitamin D supplementation for children beyond breastfeeding and through childhood.<sup>4</sup>

A recently completed double-blind vitamin D dose-response study at McGill University in Montreal, Que, hopes to clarify the suggested upper and lower limits of infant vitamin D intake.<sup>6</sup>

The above cases and the evolving vitamin D recommendations raise a number of issues. First, vitamin D-deficiency rickets is not a rare problem. The CPSP, which is the last study to report the prevalence of rickets in Canada, indicates that between July 2002 and June 2004, pediatricians reported 104 cases in Canada.<sup>2,7</sup>


This likely represents underreporting, as the CPSP is a voluntary survey of pediatricians and not family physicians who might also be diagnosing and treating these cases.

Second, preventive care guidelines for immigrants and refugees to Canada suggest that vitamin D deficiency is an emerging and underrecognized condition.<sup>8</sup> Recent data from the Calgary Refugee Health Program support this.<sup>9</sup> Currently, no specific recommendations exist regarding vitamin D deficiency in the refugee population. Several factors render refugees vulnerable to vitamin D deficiency.

- Refugees have higher breastfeeding rates than do Canadian-born women. Health Canada reports that substantially more recent and nonrecent immigrant mothers exclusively breastfeed for 6 months compared with nonimmigrant women.<sup>10</sup> The high breastfeeding rate in this population is to be celebrated, but also underlines that vitamin D supplementation is essential for breastfed infants; it should also be considered for infants consuming less than 1 L (33 oz) of infant formula a day.
- Many refugees do not have experience with extreme cold and cloudy climates. Of particular relevance to the cases described here, Newhook et al observed that in St John's, Nfld—one of the cloudiest, foggiest, snowiest cities in Canada—there is widespread vitamin D deficiency noted among pregnant women, newborns, and children aged 0 to 14 years, regardless of ethnicity.<sup>11</sup>
- Darker skin pigmentation is less able to absorb vitamin D from the sun.<sup>12</sup>
- Fear of going outside as a result of past experiences in dangerous locations can limit sun exposure.<sup>12</sup>
- Greater diversity of religious and cultural practices exists around covering skin.<sup>12</sup>
- Possible fear of discrimination, distrust of authorities, and lack of awareness of and access to health resources might add to isolation from health resources and support.<sup>12</sup>
- Health literacy challenges can result in lower adherence to recommended vitamin D supplements.<sup>12</sup> This was an important factor in the cases described here. Health literacy challenges in this population are further discussed in a commentary in this issue (page 607).<sup>13</sup>

### Conclusion

Vitamin D-deficiency rickets is a real, and probably underrecognized, problem in Canada's refugee population—as illustrated by these 2 cases in Canadian-born infants. It is important for health care professionals caring for this population to be aware of this and other refugee health issues. Such issues evidently extend to rural and small urban centres. Sensitivity to the complex biologic,

sociocultural, economic, and health literacy factors resulting in increased vulnerability of this group can help avert this preventable disease. 

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#### Competing interests

None declared

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#### References

1. Kaludjeric J, Vieth R. Relationship between vitamin D during perinatal development and health. *J Midwifery Womens Health* 2010;55(6):550-60.
2. Ward LM, Gaboury I, Ladhani M, Zlotkin S. Vitamin D-deficiency rickets among Canadian children in Canada. *CMAJ* 2007;177(2):161-6.
3. Canadian Paediatric Society. Vitamin D supplementation: recommendations for Canadian mothers and infants. *Paediatr Child Health* (Oxford) 2007;12(7):683-9.
4. Wagner CL, Greer FR; American Academy of Pediatrics Section on Breastfeeding, American Academy of Pediatrics Committee on Nutrition. Prevention of rickets and vitamin D deficiency in infants, children, and adolescents. *Pediatrics* 2008;122(5):1142-52. Erratum in: *Pediatrics* 2008;123(1):197.
5. Maguire JL, Birken CS, O'Connor DL, Macarthur C, Thorpe KE, Muhammed M, et al. Prevalence and predictors of low vitamin D concentrations in urban Canadian toddlers. *Paediatr Child Health* 2011;16(2):e11-5.
6. McGill University. *Vitamin D dose-response study to establish dietary requirements for infants*. Bethesda, MD: ClinicalTrials.gov; 2012. Available from: <http://clinicaltrials.gov/ct2/show/study/NCT00381914>. Accessed 2013 Apr 26.
7. Canadian Paediatric Surveillance Program. *CPSP 2004 results*. Ottawa, ON: Canadian Paediatric Society, Health Canada; 2004. p. 51-3.
8. Swinkels H, Pottie K, Tugwell P, Rashid M, Navasiah L; Canadian Collaboration for Immigrant and Refugee Health. Development of guidelines for recently arrived immigrants and refugees to Canada: Delphi consensus on selecting preventable and treatable conditions. *CMAJ* 2011;183(12):E928-32. Epub 2010 Jun 14.
9. Aucoin M, Weaver R, Thomas R, Jones L. Vitamin D status of refugees arriving in Canada. Findings from the Calgary Refugee Health Program. *Can Fam Physician* 2013;59:e188-94. Available from: [www.cfp.ca/content/59/4/e188.full.pdf+html](http://www.cfp.ca/content/59/4/e188.full.pdf+html). Accessed 2013 May 2.
10. Health Canada. *Duration of exclusive breastfeeding by selected socio-demographic characteristics. Food and nutrition*. Ottawa, ON: Health Canada; 2011. Available from: [www.hc-sc.gc.ca/fn-/surveill/nutrition/commun/prenatal/duration-duree-eng.php](http://www.hc-sc.gc.ca/fn-/surveill/nutrition/commun/prenatal/duration-duree-eng.php). Accessed 2013 Apr 24.
11. Newhook LA, Sloka S, Grant M, Randell E, Kovacs CS, Twells L. Vitamin D insufficiency common in newborns, children and pregnant women living in Newfoundland and Labrador, Canada. *Matern Child Nutr* 2009;5(2):186-91.
12. Benson J. Hiding from the sun—vitamin D deficiency in refugees. *Aust Fam Physician* 2007;36(5):355-7.
13. Guigné F, Duke P, Rourke L. Looking beyond literacy. Understanding and approaching barriers to refugee health in 2 cases of vitamin D-deficiency rickets. *Can Fam Physician* 2013;59:607-8 (Eng), e254-6 (Fr).

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