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Vitamin D Deficiency is Common Among Otherwise Healthy Alaskan Children

Introduction

Nutritional vitamin D deficiency leading to rickets has been reported from numerous locations in the US in recent years, including Alaska. In addition to rickets, vitamin D deficiency may increase the risk of tuberculosis disease, dental caries, and autoimmune disorders such as diabetes. Alaska is at high risk for at least two reasons: its extreme northern latitude and high breastfeeding prevalence.

Methods

From January 2001 through May 2002, we recruited children age 6 through 23 months who were enrolled in one of seven Alaska WIC programs. At enrollment, WIC staff collected 1 to 2 cc of blood and administered a questionnaire regarding breastfeeding and vitamin supplementation. During the study period, vitamin D supplementation was available to children free of charge but required a prescription. A low vitamin D level was defined as <15 ng/mL and a low normal level as 15 to <25 ng/mL.

Results

Of 133 children enrolled, the median age was 13 months; 54% were female; and 35% were Caucasian, 29% Alaska Native, 15% Asian, 13% African-American and 8% Hispanic without other racial designation. Seventy-one percent lived in Anchorage (the state's largest city), Dillingham, or Kodiak (latitude 58-61° north), 24% in or around Fairbanks (latitude 65° north) and 4% in or around Barrow (latitude 71° north). Thirty percent were still breastfeeding at the time of enrollment, while 22% had never breastfed.

Fifteen (11%) and 26 (20%) children, respectively, had 25-hydroxyvitamin D levels <15 and 15 to <25 ng/mL (median level, 30 ng/mL). Among currently breastfeeding children, 29% had a 25-hydroxyvitamin D level <15 ng/mL and another 37% had levels of 15 to <25 ng/mL. Compared to other children, currently breastfeeding children were more likely to have low and low normal vitamin D levels (Table 1). Among the 41 children who were still breastfeeding, 14 (34%) received supplemental vitamins at least occasionally including six that received vitamins every day.

Three of 52 measured children with 25-hydroxyvitamin D levels of ≥ 25 ng/mL had an elevated alkaline phosphatase compared to three of 10 with a level of <15 ng/mL (RR, 5.2; 95% CI, 1.2 to 22) and three of 16 with a level of 15 to <25 ng/mL (RR, 3.3; 95% CI, 0.73 to 15).

Discussion

We found that Alaskan children age 6 to 23 months of age attending WIC clinics had a high prevalence of vitamin D deficiency. This deficiency was associated with increased bone metabolic activity as measured by alkaline phosphatase activity.

The primary risk factor for low vitamin D level was breastfeeding in the absence of adequate vitamin D supplementation. In Alaska, the contribution of breastfeeding to vitamin D deficiency has likely increased in recent years, with an increase in the proportion of women who breastfeed longer than 6 months from 28% of infants during 1990 to 50% during 2000.

Recommendations

- In concert with the American Academy of Pediatrics, all breastfeeding infants in Alaska should receive 400 IU per day of vitamin D starting at 2 months of age and continuing for as long as they breastfeed regardless of race or other food intake.
- Previous experience has shown that use of vitamin D may be improved if dispensed by WIC clinic staff at the time of a visit rather than relying on physician prescriptions and pharmacies. Consequently, WIC clinics should continue to receive funding for providing vitamin D supplementation.
- Routine vitamin D screening may be appropriate, given the high prevalence of vitamin D deficiency in the population.
- Future studies should evaluate the prevalence of vitamin D deficiency among other groups and the association between vitamin D deficiency and adverse health events.

Reference

Gessner BD, Plotnik J, Muth PT. 25-hydroxyvitamin D levels among healthy children in Alaska. *J Pediatr* 2003;143:434-7.

Table 1. Risk factors for low serum 25-hydroxyvitamin D levels among children 6 through 23 months of age attending Women, Infant, and Children (WIC) clinics; Alaska, 2001-2.

Risk group	Number with level <15 ng/mL	Number with level 15 to <25 ng/mL	Number with level ≥ 25 ng/mL	Relative risk of having a level of <15 vs. ≥ 25 ng/mL (95% CI)	Relative risk of having a level of 15-<25 vs. ≥ 25 ng/mL (95% CI)
Currently breastfeeding					
Yes	12	14	15	12 (3.6, 39)	3.6 (1.9, 6.8)
No	3	12	77	Ref.	Ref.
Race					
African-American	5	5	7	4.4 (1.6, 12)	2.2 (0.98, 5.2)
Alaska Native	4	8	28	1.3 (0.40, 4.3)	1.2 (0.55, 2.6)
Others (primarily Caucasian)	6	13	57	Ref.	Ref.
Latitude of residence					
$\geq 65^\circ$ North	6	9	24	1.7 (0.67, 4.4)	1.7 (0.85, 3.2)
$\leq 61^\circ$ North	9	17	68	Ref.	Ref.
Age					
<12 months	6	7	29	1.4 (0.53, 3.5)	0.84 (0.39, 1.8)
12+ months	9	19	63	Ref.	Ref.
Gender					
Female	11	11	51	2.0 (0.68, 5.9)	0.66 (0.33, 1.3)
Male	4	15	41	Ref.	Ref.
Peripheral blood hemoglobin					
<10.5 g/dL	4	5	13	1.5 (0.53, 4.0)	1.3 (0.54, 3.0)
≥ 10.5 g/dL	11	16	57	Ref.	Ref.