State of Alaska Epidemiology Bulletin

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Vitamin D Deficiency in Prenatal Alaska Native Women

Background

Rickets is more common in Alaska Native (AN) children than in other U.S. children, with an average annual incidence of 4.2 cases per 100,000 children aged <10 years.[1] Of 16 confirmed AN rickets cases during 1999–2013, 10 (63%) were in infants, underscoring the importance of maternal vitamin D status.[1] Previous dietary evaluations have shown that traditional AN subsistence diets are rich in vitamin D.[1]

This *Bulletin* presents results from three studies that examined the prevalence of vitamin D deficiency in AN women of childbearing age (WCBA) in one Alaska region. The first study explored the role that changing diets in WCBA might have on infant vitamin D deficiency by measuring trends in traditional marine food intake and serum vitamin D levels in Southwest AN WCBA from the 1960s to the present.[2] Next, the Maternal Organic Monitoring (MOM) Study attempted to verify the results of the aforementioned study with recent data. Lastly, YK Delta Regional Hospital (YKDRH) evaluated serum vitamin D concentrations of pregnant women at the time of delivery over a 3-month period during the fall of 2015.

Methods/Results

For all three studies, vitamin D deficiency was defined as a serum concentration of 25(OH)D <20 ng/mL or <50 nmol/).[3]

Study 1. Concentrations of 25-hydroxycholecalciferol ($25(OH)D_3$) and a stable isotope biomarker of traditional marine food intake, the $\delta^{15}N$ value, were measured in 100 serum samples archived in the Alaska Area Specimen Bank and in current samples. The samples were obtained during 1960–2015 from women aged 20–29 years living in the YK Delta (YKD) region. Sample results were analyzed for trends.[3]

Intake of a traditional marine diet as measured by serum $\delta^{15}N$ values decreased significantly during 1960–1999 ($p<0.0001$), then remained stable during 2000–2015 (Figure 1A).[2] Serum $25(OH)D_3$ concentrations also decreased significantly from the 1960s to the present ($p<0.0001$, Figure 1B). Serum $\delta^{15}N$ values were highly correlated with $25(OH)D_3$ concentrations ($p<0.0001$).[3]

Study 2. During 2001–2010, blood was collected from pregnant AN women living in the Southwest region at enrollment in the first trimester, and cord blood was collected at delivery; serum 25(OH)D was measured in maternal and cord blood.[4]

In this study, 28% (45/159) of maternal blood samples drawn at prenatal visits and 91% (71/78) of cord blood samples had 25(OH)D concentrations <50 nmol/L; 53% (41/78) of cord bloods had 25(OH)D concentrations <35 nmol/L (indicating severe vitamin D deficiency).[4]

Study 3. In response to the two previous studies, YKDRH measured 25(OH)D levels on approximately 25% of pregnant mothers at prenatal visits and delivery during the fall of 2015 (on average, roughly 150 women deliver at YKDRH during a 3-month period).

During the 2015 YKDRH evaluation of vitamin D in prenatal women, 60% (24/40) were vitamin D deficient at delivery.

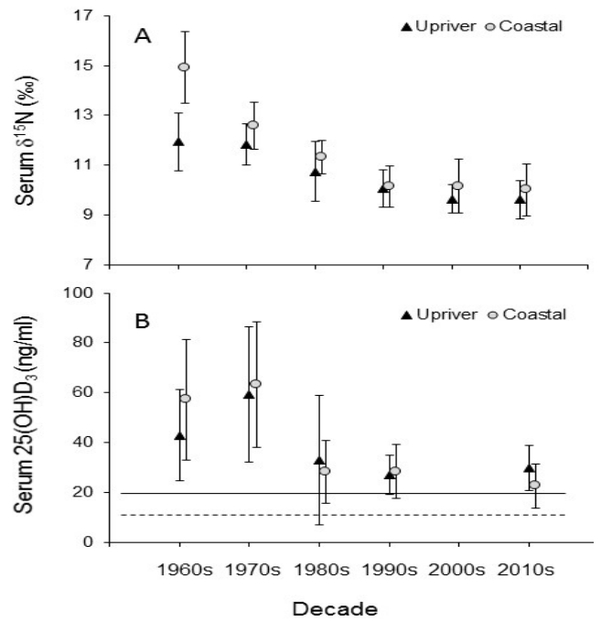
Discussion

In Alaska, consumption of traditional marine foods by young AN women in the Southwest region dropped significantly during the 1960s through the 1990s concurrent with a significant decline in vitamin D levels. Cord blood vitamin D levels in AN infants living in the Southwest region were uniformly low in the MOM study (2001–2010). In 2015, over half of YKD women tested during a prenatal vitamin D evaluation were vitamin D deficient at delivery. Data from these three studies suggest that vitamin D deficiency appears to be highly prevalent in YKD prenatal women. While current evidence does not support routine vitamin D screening and supplementation for prenatal women on a national level,[5,6] such screening and supplementation appears to be warranted in YKD. More research is needed to better understand the epidemiology of vitamin D deficiency in YKD and other Alaska regions.

Current Interventions

1. YKDRH consulted with vitamin D experts and developed guidelines to supplement routinely recommended prenatal vitamins (400 IU/day)[6] with an additional 1000 IU of daily vitamin D and to monitor prenatal vitamin D levels.
2. The Alaska Native Medical Center (ANMC) changed from infant Trivisol (containing vitamins A, D, and C) to one drop of "Baby D drops" to improve adherence.
3. Programs are in place to promote traditional food consumption among AN, such as ANMC's "Store Outside Your Door" and the Center for AN Health Research's "Fish to Schools".
4. The Alaska Native Tribal Health Consortium (ANTHC) developed a research proposal to introduce Native foods into Head Start lunch programs.
5. ANTHC and YK Health Corporation are conducting an analysis of the relationship between prenatal vitamin D levels and early childhood caries. Other outcomes of interest include preterm birth, birthweight, gestational diabetes, and pre-eclampsia.

Figure 1. Differences in Mean (A) Serum $\delta^{15}N$ Values, and (B) Serum $25(OH)D_3$ Concentrations in Women Aged 20–29 Years — Yukon-Kuskokwim Delta, 1960–2015[2]



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