

Winter vitamin D status and its determinants among children living in Auckland, New Zealand

Maryam Delshad¹, Kathryn L Beck¹, Cathryn A Conlon¹, Owen Mugridge¹, Marlena C Kruger¹, Berit P Jensen², Jing Ma², Pamela R von Hurst¹

1. College of Health, Massey University, Auckland, New Zealand
2. Canterbury Health Laboratories, Christchurch, New Zealand

Abstract: We showed that 74.4% our population was vitamin D sufficient.

Background

Vitamin D plays a major role in maintenance of calcium levels and bone metabolism, and a number of extra skeletal functions have been ascribed to it. Although inadequate vitamin D concentrations have been reported in populations worldwide, little is known about vitamin D status and its determinants among children living in New Zealand.

Aim

To observe wintertime vitamin D status and its determinants in 8-11 year-old school children living in Auckland, New Zealand (NZ).

Methods

Healthy children (n=507) 8-11 years old were recruited from six Auckland primary schools. Schools were specifically selected in order to include a range of decile levels (socio-demographic indicator) and ethnicities. All physical data collection took place in school during wintertime (August and September). Finger-prick blood samples were analyzed for circulating 25-hydroxyvitamin D (25(OH)D) concentration using liquid chromatography–tandem mass spectrometry. Weight and percentage of body fat (%BF) were measured using bio-electrical impedance (InBody 230, Biospace Co. Ltd., Seoul, Korea). Standing height and waist circumference (WC) were measured for each child. Further information related to ethnicity, skin color, physical activity, and sun exposure was sought from parents through a questionnaire.

Results

In the total group (n=507) the median and interquartile range (IQR) of finger-prick 25(OH)D was 62 (49, 78) nmol/L, with 74.4% of the population presenting sufficient concentrations (≥ 50 nmol/L) (Figure 1).

Median serum 25(OH)D levels were significantly higher in NZ European compared to all other ethnic groups (75 nmol/L, IQR=59, 89 nmol/L $P < 0.0001$). Children with dark/brown skin color had lower 25(OH)D levels compared to the other skin color categories (50 nmol/L, IQR= 38, 59 nmol/L $P < 0.0001$). Higher 25(OH)D concentrations were observed in underweight (< 18.5 kg/m²) compared to overweight and obese (> 25 kg/m²) (66 nmol/L IQR=51, 83 nmol/L vs. 52 nmol/L IQR=41, 64 nmol/L; $P < 0.0001$) (Cole, Bellizzi, Flegal, & Dietz, 2000; Cole, Flegal, Nicholls, & Jackson, 2007). The following independent variables were included in the multiple regression analysis model: age, WC, %BF (as

continuous variables), and gender, BMI, physical activity, ethnicity, and skin color (as categorical variables). Only ethnicity was significantly associated with vitamin D status ($P < 0.0001$) (Table 1). We found that 31.3% of Maori children and 34.3% of Pacific children were vitamin D deficient. The highest prevalence of vitamin D deficiency was in South Asian children with median 47 nmol/L (IQR=35, 60 nmol/L).

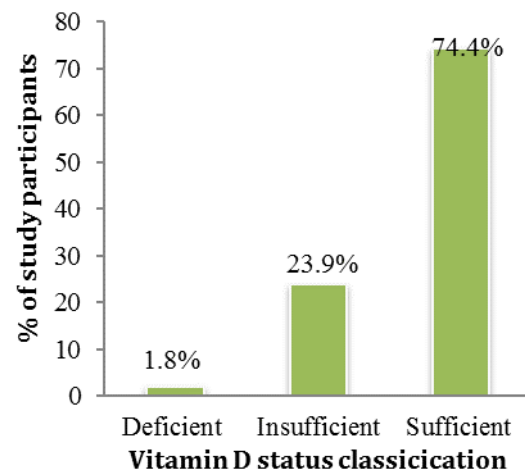


Figure 1. Prevalence of calculated 25(OH)D status (deficiency < 25 nmol/L, insufficient 25.1-49.9 nmol/L, sufficient ≥ 50 nmol/L) (Ministry of Health and Cancer Society of New Zealand, 2012)

Table 1. Results of multinomial logistic regression analysis on serum 25(OH)D and ethnicity.

Ethnicity groups	25(OH)D insufficiency vs. 25(OH)D sufficiency			
	95% CI for Odds Ratio			P-value
	Lower	OR	Upper	
M	0.15	0.34	0.75	< 0.01
P	0.18	0.39	0.84	< 0.05
SA	0.06	0.13	0.31	< 0.001
C/K/SeA	0.10	0.21	0.45	< 0.001
other	0.11	0.30	0.82	< 0.01

Note: $R^2=0.22$ (Cox & Snell, 1989), 0.31 (Nagelkerke, 1991). Model $X^2 = 129.0$. The OR is for the odds of being sufficient.

NZE = New Zealand European (reference group), M=Maori, P=Pacific, SA=South Asian, C/K/SeA= Chinese/Korean/ Southeast Asian.

Conclusions

More than half of our population was vitamin D sufficient. Ethnicity was a predictor for vitamin D insufficiency. Wintertime serum vitamin D was greatly variable, and there are some children at high-risk of vitamin D insufficiency for whom supplementation should be considered.

References

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