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Interactions between vitamin D status, calcium intake and parathyroid hormone concentrations in healthy pregnant women

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Introduction

Adverse effects of low vitamin D status and calcium intakes in pregnancy may be mediated through the calcium metabolic system, resulting in functional vitamin D deficiency, characterised by elevated PTH alongside low serum 25-hydroxyvitamin D [25(OH)D][1,2].

Objective: Examine the relative importance of serum 25(OH)D and calcium intake on PTH concentrations in white-skinned pregnant women resident at Northern latitude (51.9°N).

Methods

Cross-sectional analysis of 142 healthy pregnant women at baseline of a vitamin D intervention trial [mean (SD) 14 (2) weeks' gestation][3]. Serum 25(OH)D was measured using a CDC-accredited LC-MS/MS method[4] and vitamin D and calcium intakes were quantified using a validated quantitative FFQ[5]. Serum intact PTH and albumin-corrected calcium were measured by ELISA and colorimetric assay, respectively.

Results

Mean (SD) 25(OH)D was 54.9 (22.6) nmol/L and 44% were <50 nmol/L[2]. Geometric mean (95% CI) PTH was 9.2 (8.4, 10.2) pg/mL and mean (SD) serum calcium was 2.2 (0.1) mmol/L.

Mean (SD) vitamin D intakes were 10.7 (5.2) µg/day.

Mean (SD) calcium intakes were 1183 (486) mg/day.

22% of women had a calcium intake <800 mg/day[2] and 63% had an intake ≥1000 mg/day[2].

PTH was inversely associated with serum 25(OH)D (r = -0.311) but not with calcium intake (r = -0.087).

While 25(OH)D had a significant effect on PTH (*P* = 0.025), there was no effect of calcium intake (*P* = 0.822) and no nutrient-nutrient interaction (*P* = 0.941).

Table 1. Pearson correlation coefficients (r) between components of the calcium metabolic system and vitamin D and calcium intakes.

		25(OH)D	Serum Calcium	Vitamin D intake	Calcium intake
PTH	r	**-0.311**	0.057	-0.132	-0.087
	(*P*)	**(<0.001)**	(0.499)	(0.118)	(0.306)
25(OH)D	r		-0.092	**0.372**	0.064
	(*P*)		(0.276)	**(<0.001)**	(0.448)
Serum calcium	r			0.058	0.064
	(*P*)			(0.493)	(0.450)
Vitamin D intake	r				**0.194**
	(*P*)				**(0.021)**

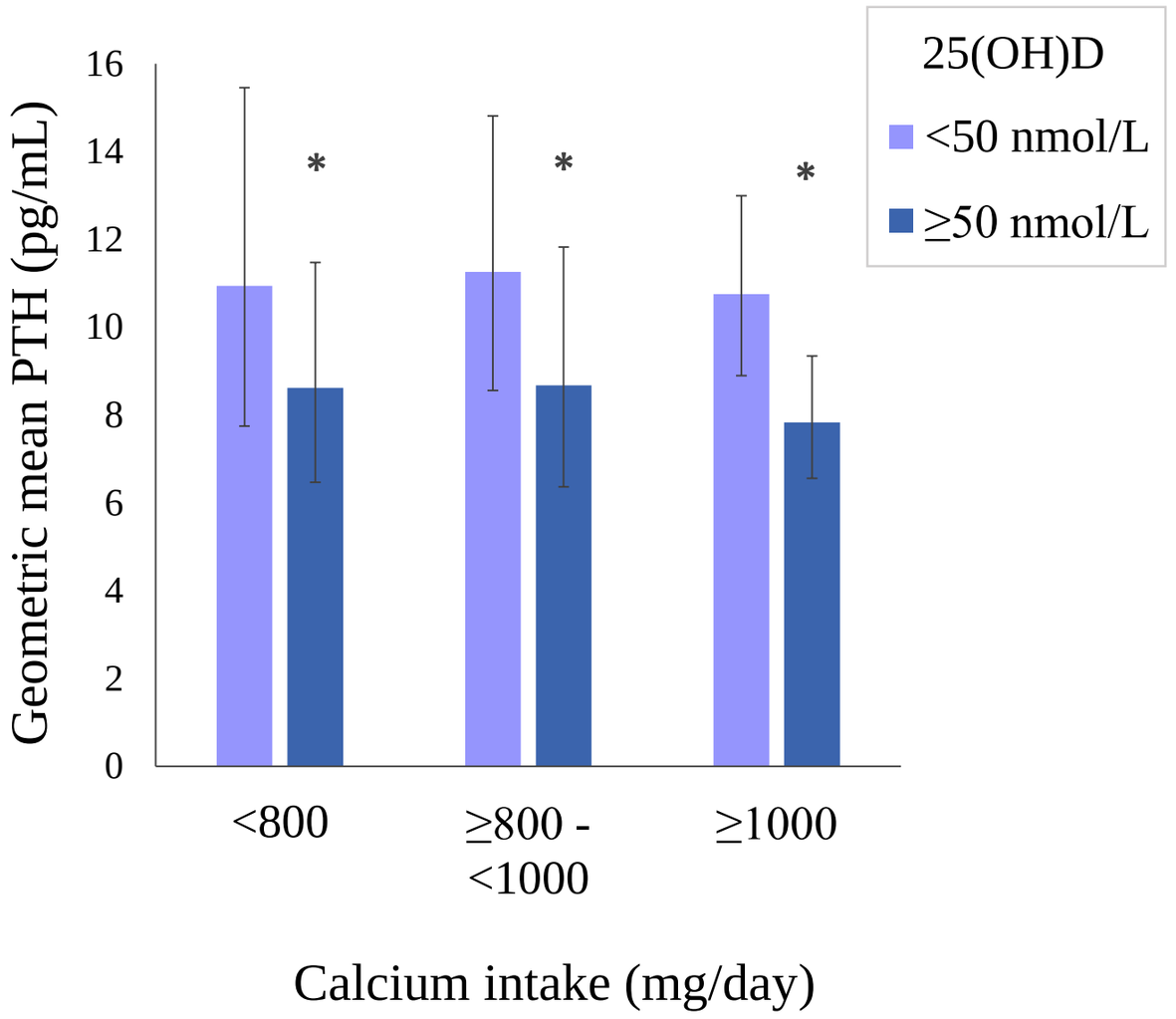


Fig. 1. PTH concentration stratified by 25(OH)D and calcium intake.

Conclusion

The relative importance of circulating 25(OH)D and calcium intake to the calcium metabolic system vary according to the setting and ethnicity.

In this group of white-skinned women at Northern latitude, with largely sufficient calcium intakes, vitamin D status, but not calcium intake, was important for maintaining PTH.

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