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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 method4 and vitamin D and calcium intakes were quantified using a validated quantitative FFQ5. 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. 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 and 63% had an intake ≥1000 mg/day2.

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).

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.

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

<table>
<thead>
<tr>
<th></th>
<th>25(OH)D</th>
<th>Serum Calcium</th>
<th>Vitamin D intake</th>
<th>Calcium intake</th>
</tr>
</thead>
<tbody>
<tr>
<td>PTH</td>
<td>r</td>
<td>-0.311</td>
<td>0.057</td>
<td>-0.132</td>
</tr>
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<td>(P)</td>
<td></td>
<td>(&lt;0.001)</td>
<td>(0.499)</td>
<td>(0.118)</td>
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<tr>
<td>25(OH)D</td>
<td>r</td>
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<td>0.372</td>
<td>0.064</td>
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<tr>
<td>(P)</td>
<td></td>
<td>(0.276)</td>
<td>(&lt;0.001)</td>
<td>(0.448)</td>
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<tr>
<td>Serum calcium</td>
<td>r</td>
<td></td>
<td>0.058</td>
<td>0.064</td>
</tr>
<tr>
<td>(P)</td>
<td></td>
<td></td>
<td>(0.493)</td>
<td>(0.450)</td>
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<td>Vitamin D intake</td>
<td>r</td>
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<tr>
<td>(P)</td>
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Fig. 1. PTH concentration stratified by 25(OH)D and calcium intake.

References