Proceedings of the Nutrition Society (2018), **77 (OCE3)**, E64 doi:10.1017/S002966511800068X

Irish Section Meeting, 20–22 June 2018, Targeted approaches to tackling current nutritional issues

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

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Emerging evidence highlights the potential of the vitamin D and calcium metabolic system to impact pregnancy outcomes and adverse effects of vitamin D-parathyroid hormone (PTH) interactions on perinatal health have been reported[1,2]. PTH concentrations reflect homeostasis in the calcium metabolic system, and can be impacted by calcium intake as well as circulating 25-hydroxyvitamin D [25(OH)D] concentrations, reflecting vitamin D status. Little explored in pregnancy, we aimed to examine the relative importance of vitamin D status and calcium intake on PTH concentrations among healthy pregnant women.

This was a cross-sectional analysis of 142 white-skinned participants of mean (SD) 14 (2) weeks' gestation at baseline of a dose-response randomised controlled trial of vitamin D [NCT02506439][3]. Serum 25(OH)D was measured by a CDC-accredited LC-MS/MS method and calcium intakes were estimated using a validated quantitative food frequency questionnaire[4]. Serum albumin-corrected calcium and intact PTH were measured by colorimetric assay (Randox Laboratories Ltd.) and ELISA (MD Biosciences Inc.), respectively. Serum 25(OH)D was stratified at 50 nmol/L and calcium intakes by < 800, 800–1000 and ≥ 1000 mg/day according to the Institute of Medicine[5]. After log transformation of PTH, we used Pearson's correlations and two-way ANOVA to explore effects of calcium intakes and 25(OH)D on PTH.

Geometric mean (95% CI) PTH concentration was 9·24 (8·37, 10·19) pg/mL. Mean (SD) 25(OH)D and calcium intake were 54·9 (22·6) nmol/L and 1182·5 (485·8) mg/day, respectively. 44% of participants had a 25(OH)D < 50 nmol/L and calcium intake was < 800 and ≥ 1000 mg/day in 22% and 63%, respectively. PTH was inversely correlated with vitamin D status ($r = -0{\cdot}311$, $P < 0{\cdot}01$), but not calcium intake ($r = -0{\cdot}087$) or serum calcium ($r = 0{\cdot}057$). There was no evidence of an interaction between calcium intake and 25(OH)D on PTH concentration ($P = 0{\cdot}941$). There was a statistically significant main effect of serum 25(OH)D ($P = 0{\cdot}025$) but not calcium intake ($P = 0{\cdot}822$) on PTH.

To conclude, in this group of healthy pregnant women with largely sufficient calcium intake, vitamin D status, but not calcium intake was important for maintaining calcium homeostasis.

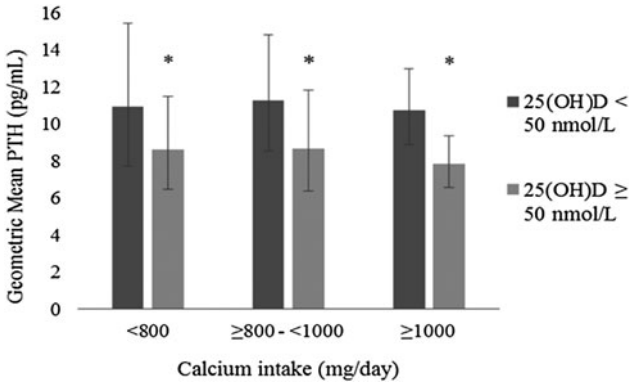

Fig. 1. PTH concentrations in 142 pregnant women stratified by vitamin D status and calcium intake. PTH values are geometric mean (95% CI). * denotes P < 0·05

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