

Vitamin D status and skeletal changes during reproduction

- A longitudinal study from late pregnancy through lactation

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Low vitamin D status has been associated with sub-optimal bone health, as well as with higher frequencies of many chronic diseases. During both pregnancy and postpartum, it has been speculated that vitamin D status may affect maternal bone health, due to its importance in maintaining the calcium balance in the body.

The overall aim of this thesis study was to evaluate vitamin D status and bone changes during pregnancy and postpartum in women living in the vicinity of Gothenburg, Sweden. Ninety-five fair-skinned pregnant women and 21 non-pregnant and non-lactating controls were recruited. Blood samples, anthropometric data, information about sun exposure and lactation habits and four day food diaries were collected in third trimester of pregnancy and two weeks (baseline), four, 12 and 18 months postpartum. Measurements of 25-hydroxyvitamin D (25OHD) were analyzed with chemiluminescence immunoassay or liquid chromatography tandem mass spectrometry. Bone status was assessed postpartum with dual-energy x-ray absorptiometry (DXA) and high-resolution peripheral quantitative computed tomography (HR-pQCT).

In third trimester of pregnancy, mean 25OHD concentration was 47 ± 18 (mean \pm SD) nmol/L (a majority of the women were vitamin D insufficient (< 50 nmol/L)). During the first year postpartum, no change in mean 25OHD concentration was found and no association between duration of lactation and changes in 25OHD concentrations was observed. Estimates of sun exposure and use of vitamin D supplements were found to be major determinants both for 25OHD concentrations during pregnancy and for the variation in changes in 25OHD concentrations postpartum. During the first four months postpartum, bone decreases were observed at several skeletal sites in women lactating four months or longer. At 18 months postpartum, cortical volumetric bone mineral density and trabecular thickness at the ultradistal tibia were still significantly lower than baseline in women lactating nine months or longer. Calcium intake and 25OHD concentrations appear to have different influences on the cortical and trabecular bone changes postpartum.

In conclusion, a majority of the women were vitamin D insufficient in third trimester of pregnancy. No changes in 25OHD concentrations were observed during the first year postpartum. Longer follow-up than 18 months is needed to confirm whether women with long lactation fully recover their bone minerals or whether the postpartum bone changes could potentially lead to an increased fracture risk in later life.

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- I. Brembeck P, Winkvist A, Olausson H. Determinants of vitamin D status in pregnant fair-skinned women in Sweden. *British Journal of Nutrition* 2013; 110: 856-864.
- II. Brembeck P, Winkvist A, Bååth M, Hedlund L, Augustin H. Determinants of changes in vitamin D status postpartum in Swedish women. *Submitted*.
- III. Brembeck P, Lorentzon M, Ohlsson C, Winkvist A, Augustin H. Changes in cortical volumetric bone mineral density and thickness, and trabecular thickness in lactating women postpartum. *Journal of Clinical Endocrinology and Metabolism* 2015; 100(2): 535-543.
- IV. Brembeck P, Winkvist A, Ohlsson C, Lorentzon M, Augustin H. Calcium intake and vitamin D status as determinants of microstructural, dimensional and bone mineral changes postpartum. *Manuscript*.



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