

# Longitudinal vitamin D status during pregnancy in Sweden – The GraviD cohort

Akademisk avhandling

som för avläggande av medicine doktorsexamen vid Sahlgrenska akademien,  
Göteborgs universitet, kommer att offentlig försvaras i hörsal Arvid Carlsson,  
Medicinaregatan 3, fredagen den 12 maj, klockan 09.00

av Linnea Bärebring

Fakultetsopponent:  
Mairead Kiely, professor  
University Collage Cork, Irland

## Avhandlingen baseras på följande delarbeten:

- I. Bärebring L, Schoenmakers I, Glantz A, Hulthén L, Jagner Å, Ellis J, Bärebring M, Bullarbo M, Augustin H. Vitamin D status during pregnancy in a multi-ethnic population-representative Swedish cohort.  
*Nutrients* 2016;8(10)
- II. Bärebring L, Bullarbo M, Glantz A, Leu Agelii M, Jagner Å, Ellis J, Hulthén L, Schoenmakers I, Augustin H. Preeclampsia and Blood Pressure Trajectory during Pregnancy in Relation to Vitamin D Status.  
*PLoS One.* 2016;11(3):e0152198
- III. Bärebring L, Bullarbo M, Glantz A, Hulthén L, Ellis J, Jagner Å, Schoenmakers I, Winkvist A, Augustin H. Trajectory of vitamin D status during pregnancy in relation to neonatal birth size and fetal survival: a prospective cohort study.  
*Submitted for publication, under revision*
- IV. Bärebring L, Amberntsson A, Winkvist A, Augustin H. Validation of habitual dietary vitamin D intake using three dietary assessment tools and the biomarker 25-hydroxyvitamin D.  
*In manuscript*

**SAHLGRENKA AKADEMIN  
INSTITUTIONEN FÖR MEDICIN**



# Longitudinal vitamin D status during pregnancy in Sweden – The GraviD cohort

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## Abstract

The aim of this thesis was to study vitamin D status among pregnant women in Sweden and if it was associated with gestational complications. A total of 2125 women were recruited at registration for antenatal care. Data were collected in early (T1, mean gestational week 11) and late pregnancy (T3, mean gestational week 34), when the women had blood drawn and answered questionnaires. In late pregnancy, women were asked to provide dietary intake data. After delivery, medical charts from antenatal and obstetrics care were retrieved. Vitamin D status was measured as 25-hydroxyvitamin D (25OHD) in serum by liquid chromatography– tandem mass spectrometry.

In T1, mean 25OHD was 65 nmol/L and 10% had vitamin D deficiency (25OHD <30 nmol/L). Almost half of the women born in Africa and Asia were vitamin D deficient. Other risk factors associated with vitamin D deficiency were sampling in spring, lower vitamin D intake, less sun exposure and younger age. Vitamin D status increased by ~11 nmol/L during pregnancy and change in season-corrected vitamin D status was associated with origin, sun seeking behavior, clothing style, vitamin D intake and travels to southern latitudes. Vitamin D status in T1 was weakly associated with pregnancy loss, but no other outcomes. Vitamin D status in T3 was inversely associated with preeclampsia, small for gestational age and low birth weight. Change in 25OHD concentration from T1 to T3 was inversely associated with preeclampsia, small for gestational age, low birth weight and preterm delivery. A short vitamin D questionnaire was the only dietary assessment method that provided estimates of vitamin D intake that were reflected in circulating 25OHD. In conclusion, vitamin D status in late, but not early pregnancy, and changes in vitamin D status during pregnancy are associated with several pregnancy complications with implications for both woman and child. A short vitamin D questionnaire is a valid tool for estimation of dietary vitamin D intake.

**Keywords:** Vitamin D status, pregnancy, pregnancy complications, vitamin D intake, dietary assessment