Vitamin D in women of reproductive age and during pregnancy

Focus on intake, status and adiposity

Akademisk avhandling

som för avläggande av medicine doktorsexamen vid Sahlgrenska akademin vid Göteborgs universitet kommer att offentligen försvaras i hörsal Arvid Carlsson, Academicum, Medicinaregatan 3, Göteborg, torsdagen den 19 september 2013 kl. 9:00

Av

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The thesis is based on the following papers:

I. **Increased vitamin D-binding protein and decreased free 25(OH)D in obese women of reproductive age**
Therese Karlsson, Amra Osmancevic, Nina Jansson, Lena Hulthén, Agneta Holmäng, and Ingrid Larsson
Eur J Nutr 2013 E-pub ahead of print 21 April

II. **Lower vitamin D status despite higher vitamin D intake in early pregnancy in obese compared with normal-weight women**
Therese Karlsson, Louise Andersson, Aysha Hussain, Marja Bosaeus, Nina Jansson, Amra Osmancevic, Lena Hulthén, Agneta Holmäng, and Ingrid Larsson
Submitted

III. **A new approach to measuring vitamin D in adipose tissue using time-of-flight secondary ion mass spectrometry: A pilot study**
Per Malmberg, Therese Karlsson, Henrik Svensson, Malin Lönn, Nils-Gunnar Carlsson, Ann-Sofie Sandberg, Eva Jennische, Amra Osmancevic, and Agneta Holmäng
Submitted

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ABSTRACT

Vitamin D is attained either through synthesis in the skin by sun exposure or through diet. Vitamin D status is important for skeletal health but optimal vitamin D status may also be important in the development of other diseases such as type 2 diabetes, gestational diabetes, preeclampsia, and cancer. Circulating vitamin D is known to be decreased in obese compared to non-obese individuals. There is a lack of documented knowledge on vitamin D status and intake in Swedish women of reproductive age and during pregnancy.

The aim of this thesis was to compare vitamin D status and intake between obese and normal-weight women. In a cross-sectional study in women of reproductive age and in a longitudinal study during pregnancy, blood samples, adipose tissue biopsies, and information on dietary intake were collected. Data on lifestyle including physical activity and sun exposure were also collected.

Vitamin D status, measured as serum 25-hydroxyvitamin D [25(OH)D], was lower in obese women of reproductive age compared with normal-weight women. In contrast, circulating vitamin D-binding protein was higher in the obese women. Despite reporting a higher vitamin D intake, the obese pregnant women had lower serum 25(OH)D compared with normal-weight women in early pregnancy. A higher proportion of the obese compared with normal-weight women had 25(OH)D concentrations that might be defined as insufficient. Circulating 25(OH)D concentrations below 25 nmol/L were uncommon in both pregnant and non-pregnant women. Dietary vitamin D intake was between 7.2 and 8.8 μg/day during pregnancy and in non-pregnant obese and normal-weight women, and a major part did not reach national dietary recommendations. There were no major differences in vitamin D intake between obese and normal-weight women. Vitamin D and its metabolites were detected in adipose tissue and were localized in the lipid droplet in the adipocyte.

The present studies show that Swedish obese women of reproductive age and during pregnancy have lower circulating 25(OH)D compared with normal-weight women but few had very low concentrations. However, what effects an increased circulating 25(OH)D would have on long-term health in obese individuals is yet to be studied. The fact that obese women had higher circulating vitamin D-binding protein is interesting and should be further examined to clarify why, and what impact that may have on the action of vitamin D. We found no evidence of a lower vitamin D intake in obese women, thus, the intake was not contributing to the lower circulating 25(OH)D. Many women do not reach the recommendations for vitamin D intake. Actions should be taken to improve dietary intake of vitamin D in women of reproductive age and during pregnancy, this might have future implications not only for women's health but for generations to come. Intervention studies are urgently needed to explore the effect of vitamin D status and intake during pregnancy and in obese subjects.

Keywords: Vitamin D, Obesity, Pregnancy, Vitamin D intake

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