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SHORT COMMUNICATION

Severe vitamin D deficiency in pregnant women of Somali origin living in Sweden

Maria Sääf (maria.saaf@ki.se)[1,2], Elisabeth Fernell[3], Frida Kristiansson[4], Martina Barnevik Olsson[5], Sven A Gustafsson[6], Gunnel Bågenholm[7]

1.Department of Endocrinology, Metabolism and Diabetes, Karolinska University Hospital Solna, Stockholm, Sweden
2.Department of Molecular Medicine and Surgery, Karolinska Institute Stockholm, Stockholm, Sweden
3.Autism Centre for Young Children, Handicap and Habilitation, Stockholm, Sweden
4.Faculty of Medicine, Medical Student, Uppsala University, Uppsala, Sweden
5.PRIMA Child and Adolescent Psychiatry, Stockholm, Sweden
6.Karolinska Institute and Clinical Chemistry, Karolinska University Hospital, Stockholm, Sweden
7.Department of Paediatrics, Astrid Lindgren Children's Hospital, Karolinska University Hospital, Stockholm, Sweden

Correspondence
M Sääf, Department of Endocrinology, Metabolism and Diabetes, Karolinska University Hospital, SE-171 76 Stockholm, Sweden.
Tel: +46-8-51772863 |
Fax: +46-8-51772119 |
Email: maria.saaf@ki.se

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Sweden is situated between latitude 55–69°N, resulting in only a short period of the year when sunlight, specifically UVB range 280–315 nm, is available. The dominating endogenous source of vitamin D is synthesis of prohormones in the skin via UVB-mediated reactions.

Dietary sources of vitamin D are rare, and the only abundant natural source is actually fatty fish/marine oils. Vitamin D is a circulating hormone, regulating mineral and skeletal homeostasis and seems to be a protective factor in relation to autoimmune responses, cancer development and psychiatric disturbances (1,2). Vitamin D insufficiency during pregnancy is associated with increased risks for pregnancy complications (3,4). The foetus is entirely dependent on the mother for vitamin D supply because S-25-hydroxyvitamin D (S-25-OHD) crosses the placenta. Experimental studies indicate that vitamin D sufficiency is critical for foetal development and especially for foetal brain development (3).

Several studies have confirmed vitamin D deficiency in groups of non-western immigrants living in Northern Europe, including Scandinavia (5). An increasing number of individuals from foreign countries are now residing in Sweden. Individuals who are dark-skinned or avoid sun exposure run the risk of not reaching satisfactory vitamin D levels in Sweden.

Studies on vitamin D status in pregnant women have been carried out in the northern United States in black and white women revealing that both black and white pregnant women and their neonates were at high risk of vitamin D insufficiency (6). The need for high-dose supplementation to improve maternal and neonatal vitamin D status was brought up for discussion.

To our knowledge, no study has been published on vitamin D status in pregnant women living in Sweden. The aim of this descriptive study therefore was to analyse S-25-OHD after the summer season in women in early pregnancy of Somali and of Swedish ethnicity living in the county of Stockholm at the latitude 59°N. Somali women were chosen as our research group has found an increased prevalence of autism in children with Somali background living in the county of Stockholm (7).

In a cross-sectional study, 20 women of Somali ethnicity and 20 women of Swedish ethnicity who came to antenatal clinics for their first visit in pregnancy were asked by the midwives in a consecutive manner if they were willing to participate in a study including blood test for S-25-OHD. The women of Swedish ethnicity made their first visit to the antenatal clinic during the 7–11th week of gestation, except for one mother who came during her 21st week of gestation. The women of Somali ethnicity made their first visit during the 7–26th week of gestation (median 15th week). Because of the geographical housing situation, the ethnic Swedish women were recruited from one antenatal clinic in the central part of Stockholm and the women of Somali origin from two antenatal clinics in the north-western suburbs of Stockholm county. After accepting to participate, a short questionnaire translated into Somali language was filled out by the participants concerning sun exposure, consumption of milk products fortified with vitamin D and intake of vitamin D rich fish. The aim was not to quantify food intake or sun exposure in detail, rather to get a brief view of food and sun habits in the two groups. Skin pigmentation was classified by a nurse according to the Fitzpatrick scale (8). Serum

samples were taken from the end of September to the beginning of November in 2008 to reflect the higher levels of vitamin D after the summer season. Because of a slow recruitment process, four women of Somali origin were included with serum samples taken in late December 2008 (one) and three in January 2009.

Venous blood samples were drawn, centrifuged (1700–2000 ***g*** for 10 min) and frozen within 2 h and kept from light. Samples were stored in −70°C until analysed in the same assay. All S-25-OHD concentrations were analysed by a chemiluminescent assay method from DiaSorin on a LIAISON instrument with equimolar measurement of both 25-hydroxyvitamin D2 and D3, free and dissociated from vitamin D-binding protein. CV (coefficient of variance) intra-and interassay was 5% and 7–14%, respectively, with the highest variance in the lowest test range.

Analysis included standard descriptive statistics. Differences between the two groups regarding age and levels of S-25-OHD were analysed by unpaired *t*–test and Mann–Whitney test, respectively. The significance level was set to <0.05. Data were analysed using Statistica, version 8.0 (StatSoft, Tulsa, OK, USA).

The study was approved by the Ethics committee at Karolinska Institute. All women gave written consent to their participation.

All women of Swedish origin immediately accepted participation in the study. A few of the Somali women declined participation because of time constraints. Therefore, the recruitment process lasted until January for the Somali group. The mean ages of the women of Somali and of ethnic Swedish origin were 30 and 32 years, respectively (ns) (Table 1). All women of Somali origin were graded as having skin pigmentation grade 5–6 and the women of ethnic Swedish origin had pigmentation grade 1–3 according to Fitzpatrick scale.

The median level of S-25-OHD was significantly lower in women of Somali origin compared to ethnic Swedish women. The median values were 11 nmol/L (range 5–25 nmol/L) and 70 nmol/L (range 28–101 nmol/L) in Somali and ethnic Swedish women, respectively ($p < 0.001$) (Table 1). Among the women of Somali origin, none had a value above 25 nmol/L, and among the women of ethnic Swedish origin, none had a value below 25 nmol/L (Table 2 and Fig. 1).

Exposure of face, arms and lower legs to sunshine during summer, consumption of milk products fortified with vitamin D and consumption of fatty fish (salmon) are presented in Table 3.

Our study demonstrates that pregnant women of Somali origin living at latitude 59°N have a significantly lower vitamin D status when compared to pregnant ethnic Swedish women. All of the participating Somali women had values classified as vitamin D deficiency. Vitamin D deficiency during pregnancy is associated with increased risks for pregnancy complications and risks for the foetus. Hence, there is an urgent need for strategies to improve vitamin D status in populations at risk.

Table 1 Numbers of pregnant women in different groups, mean and median age and S-25-OHD in the autumn

	Somali origin	Ethnic Swedish origin
Numbers	20	20
Age, years		
Mean	30	32
Median (range)	29 (20–41)	33 (24–37)
S-25-OHD, nmol/L		
Mean (SD)	11 (5)*	66 (18)
Median (range)	11 (5–25)*	70 (28–101)

*S-25-OHD values of seven pregnant mothers of Somali origin were recorded as below 10. These values were coded as 5.
S-25-OHD, S-25-hydroxyvitamin D

Table 2 Numbers of women in each range of S-25-OHD

	Somali origin		Ethnic Swedish origin	
S-25-OHD (nmol/L)	N	%	N	%
>75	0	0	6	30
>50–≤75	0	0	11	55
>25–≤50	0	0	3	15
>12.5–≤25	5	25	0	0
≤12.5	15	75	0	0

S-25-OHD, S-25-hydroxyvitamin D.

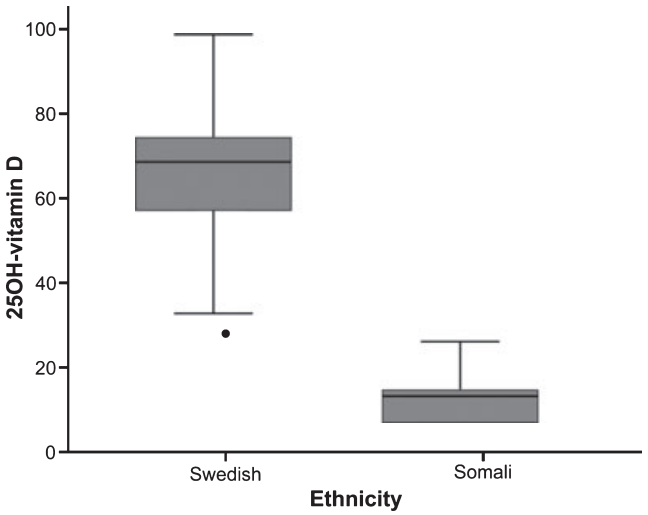

Figure 1 Median and range of S-25-OHD levels in pregnant women of ethnic Swedish and of Somali origin.

There is an ongoing debate concerning optimal and suboptimal levels of S-25-OHD in non-pregnant adults. At present, a level above 75 nmol/L is considered as advantageous by an increasing number of researchers (1,9,10). If a level of 75 nmol/L was applied in our study, only 30% of women of ethnic Swedish origin would have values in the optimal range. All guidelines recognize values below 25 nmol/L as deficiency and values as low as 12.5 nmol/L as severe deficiency (9). Values between 25 and 75 nmol/L are variably characterized as deficiency, insufficiency or sufficiency (9,10).

Table 3 Numbers with sun exposure and numbers consuming milk fortified with vitamin D and consuming fatty fish (salmon)

	Somali origin		Ethnic Swedish origin	
	N = 20		N = 20	
	N	%	N	%
Exposure of face, arms and lower legs to sun during summer	6	30	20	100
Consumption of milk fortified with vitamin D	11	55	18	90
Consumption of fatty fish(salmon) once or twice a week	11	55	12	60

The low numbers of women consuming vitamin D rich/fortified food and exposing their skin to sunshine highlights the importance of how to disseminate proper information about sources of vitamin D.

There are certain limitations of this study. The study is descriptive, and S-25-OHD is the only laboratory variable analysed. Moreover, the study groups are small, and there is a possible selection bias in the group of Somali origin as a few of the consecutively asked women declined participation. However, their reason was time constraints, and we have no indications of other motives.

The women of Somali origin had their vitamin D levels analysed at a somewhat later time point during pregnancy compared with the Swedish pregnant women. Moreover, a few of the Somali women had their serum samples taken during the beginning of the winter season, which might have an impact on the results. However, in our previous study of vitamin D levels in mothers of Somali children with and without autism, we found vitamin D levels of the same range with no variation between autumn and spring (11). In the present study, the S-25-OHD values in the Somali women were in the deficient range independent of when in the study period the sample was taken.

We have to date no information on pregnancy outcome but a follow-up of the children at the age of 18 months is planned.

In Sweden, there is no established programme for prevention of vitamin D deficiency in groups at risk. International recommendations vary in recommended vitamin D intakes up to 10-fold (12), and there are no specific recommendations for pregnant women at high risk of vitamin D deficiency.

However, and in conclusion, the investigated women of childbearing age of Somali origin living in the county of Stockholm have severe vitamin D deficiency in the first and second trimester of pregnancy, even in autumn after the summer season. None of the pregnant women of Swedish ethnicity had vitamin D deficiency (if defined as <25 nmol/L), but only 30% of the women of ethnic Swedish origin reached levels of S-25-OHD after the sunny season considered optimal for non-pregnant adults. Further studies are urgent in pregnant women and in populations at risk, and proper recommendations of how to prevent vitamin D deficiency during pregnancy are needed.

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