

VITAMIN D₃ STUDIER I UMEÅ OCH MALMÖ

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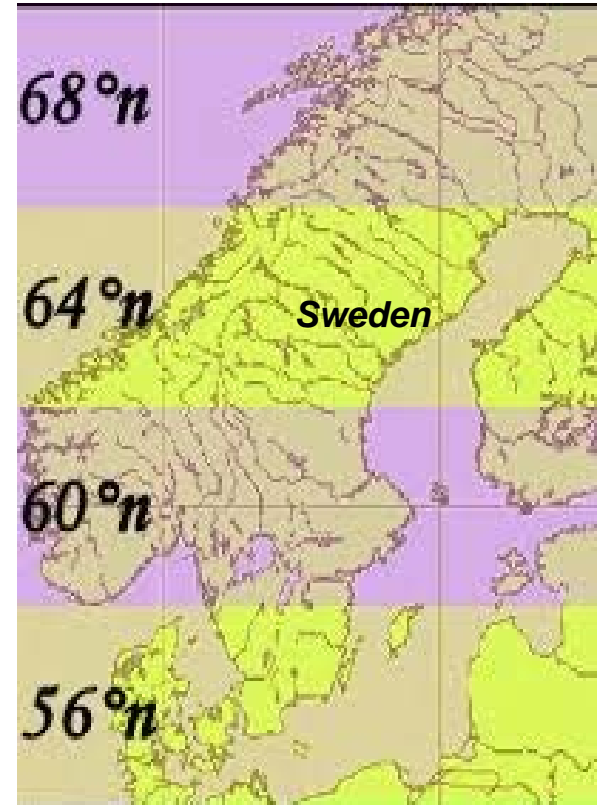
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Vitamin D status is insufficient



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Öhlund I., et al. JPGN, 2013
Persson K., et al. Acta Paediatr, 2013
Karlsland Åkeson P., et al, JPGN, 2016

Pre-school children, (age 4-6 y, n=90), 50% dark skinned and 50% fair-skinned, living in Northern Sweden (latitude 63°), were recruited from well-baby clinics and their plasma vitamin D status [P-25 (OH) D] measured after summer (August-September) and followed up in the winter (January-February).





STUDIE I

To examine vitamin D status in preschool-age children in relation to vitamin D intake, season, body mass index, and skin color.

Preschool-age children (n=90; mean age 54 ± 7.1 months), all living in northern Sweden (latitude 63° north), half of them with fair skin, half with darker complexion, were recruited from well-baby clinics. The study group was examined first in August–September (late summer) and then the following January–February (winter).

Skin type, vitamin D intake, anthropometrics, serum 25-hydroxyvitamin D (S-25[OH] D), and serum parathyroid hormone were assessed.



RESULTAT STUDIE I

	Late summer		Winter	
	Fair skin	Dark skin	Fair skin	Dark skin
P-25(OH) D				
Mean concentrations nmol/L (SD) ¹	66 (13) ^{***}	52 (14) ^{***}	60 (14) ^{***}	49 (16) ^{***}
Insufficient ² <50nmol/L (%)	8 ^{***}	43 ^{***}	27 [*]	52 ^{**}
Adekvat ² 50-75 nmol/L (%)	77 ^{ns}	53 ^{ns}	66 ^{ns}	43 ^{ns}
Optimal ² >75 nmol/L (%)	15 [*]	2.5 [*]	7 ^{ns}	5 ^{ns}
PTH ¹ (mmol/L) mean (SD)	3.0 (1.2) [*]	3.6 (1.13) [*]	3.7(1.3) ^{ns}	4.1(1.5) ^{ns}



P-25 (OH) D

Predictor	R ²	Beta	p-value
	0.255		
Darker skin		-0.431	<0.001
Vitamin D intake		0.192	≤ 0.009
Winter season		-0.179	<0.012
BMI Z-score		0.178	<0.013



SLUTSATS

Vitamin D status is suboptimal in children living in northern Sweden although the vitamin D intake was in accordance with the Nordic Nutrition Recommendations.

The suboptimal concentrations of P-25(OH)D after the summer decreased further during the winter.

Darker skin type and winter seasons were negatively affecting vitamin D status and vitamin D intake and higher BMI were positively associated with the children's concentration of P-25 (OH) D.

These findings call for new recommendations and strategies to improve the intake of vitamin D in children living in Northern areas with limited sun exposure during most of the year

Öhlund I, Silfverdal SA, Hernell O, Lind T. J Pediatr Gastroenterol Nutr. 2013 May;56(5):551-5.





What about serum 25(OH)D and serum lipids?

In adults; low vitamin D status is associated with metabolic syndrome and cardiovascular diseases (CVD)

In children; a systematic review revealed that higher levels of 25 (OH)D was associated with more favourable lipid levels.

The Cardiovascular Risk in Young Finns Study found low levels of S-25-OH vitamin D in childhood, but not adulthood, to be associated with subclinical atherosclerosis in adults

Jorde R. Prog Lipid Res, 2011. 50: p. 303-12.

Parker J. Maturitas, 2010. 65: p. 225-36.

Kelishadi.et.al,.Int J Food Sci Nutr, 2014.65: p. 404-10

Juonala M. et al. J Clin Endocrinol Metab, 2015 100: p. 1469-76





METHODS STUDIE II-IV

- A longitudinal, double-blinded randomized, intervention study in the south and north of Sweden
- 206 five to seven-year-old children were randomized to a milk-based vitamin D₃ supplement





AIM

To evaluate the impact of vitamin D₃ supplementation during winter

- on S-25(OH)D
- on serum lipids
- association with BMI





BRIFLY:

Included (n)



3 m

Follow-up (n)

86



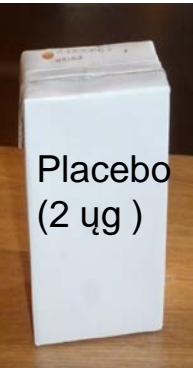
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80



69

40



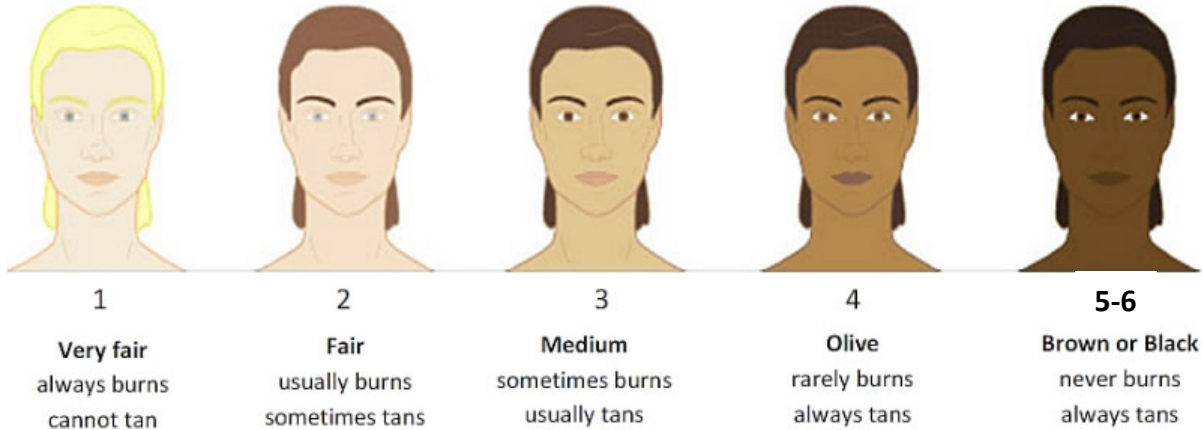
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Skin pigmentation

Skin colour, sunburn, tanning

Skin Types



Fitzpatrick 1975

RESULTS



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Serum Vitamin D Depends Less on Latitude Than on Skin Color and Dietary Intake During Early Winter in Northern Europe.

Åkeson PK, Lind T, Hernell O, Silfverdal SA, Öhlund I.
J Pediatr Gastroenterol Nutr. 2016 Apr;62(4):643-9

Vitamin D insufficiency [S-25 (OH)D < 50 nmol/L]
15-30 % of fair skinned
60-75 % of dark skinned



Increased vitamin D intake differentiated according to skin color is needed to meet requirements in young Swedish children during winter: a double-blind randomized clinical trial.

Öhlund I, Lind T, Hernell O, Silfverdal SA, Karlsland Åkeson P.
Am J Clin Nutr. 2017 Jul;106(1):105-112.

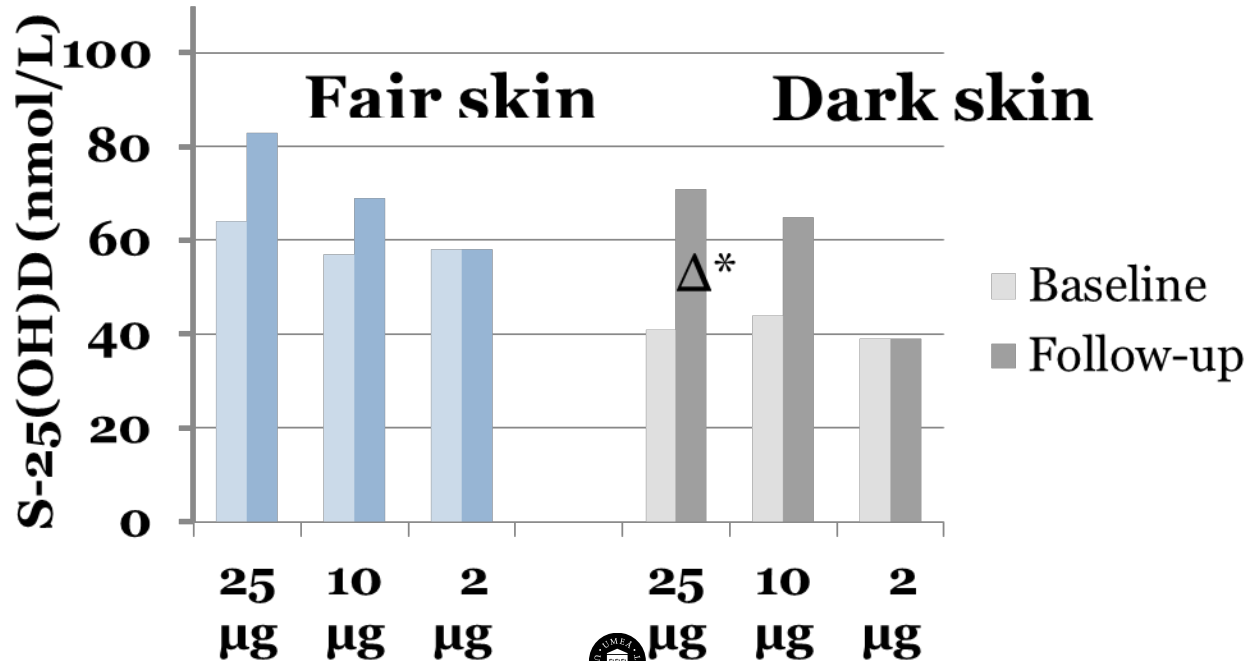
Children adherent to the study product, 97% (95% CI: 91.3%, 100%) and 87.9% (95% CI: 76.8%, 99%) of fair- and dark-skinned children, respectively, achieved sufficient concentrations if supplemented with 10 µg/d.

Intakes of 6 and 20 µg/d are required in fair-skinned children, whereas 14 and 28 µg/d are required in children with dark skin.

Conclusion: Children with fair and dark skin require vitamin D intakes of 20 and 28 µg/d, respectively, to maintain S-25(OH)D \geq 50 nmol/L, whereas intakes of 6 and 14 µg/d, respectively, are required to maintain concentrations \geq 30 nmol/L during winter.



S-25(OH)D IN VITAMIN D INTERVENTION GROUPS



Vitamin D and BMI

Children with lower BMI responded with higher increase in S-25(OH) D levels

Inger Öhlund, ESPGHAN 2017

Bone density

Despite lower S-25-hydroxy vitamin D concentrations, bone density was higher in dark than fair skinned children

Pia Karlsland Åkeson, ESPGHAN 2016



IN CONCLUSION

- Vitamin D status is suboptimal in children living in northern Sweden although the vitamin D intake was in accordance with the Nordic Nutrition Recommendation
- Serum Vitamin D Depends Less on Latitude Than on Skin Color and Dietary Intake During Early Winters
- Increased vitamin D intake differentiated according to skin color is needed to meet requirements in young Swedish children during winter

