

# Insufficient vitamin D supplement use during pregnancy and early childhood: a risk factor for positional skull deformation

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## INTRODUCTION

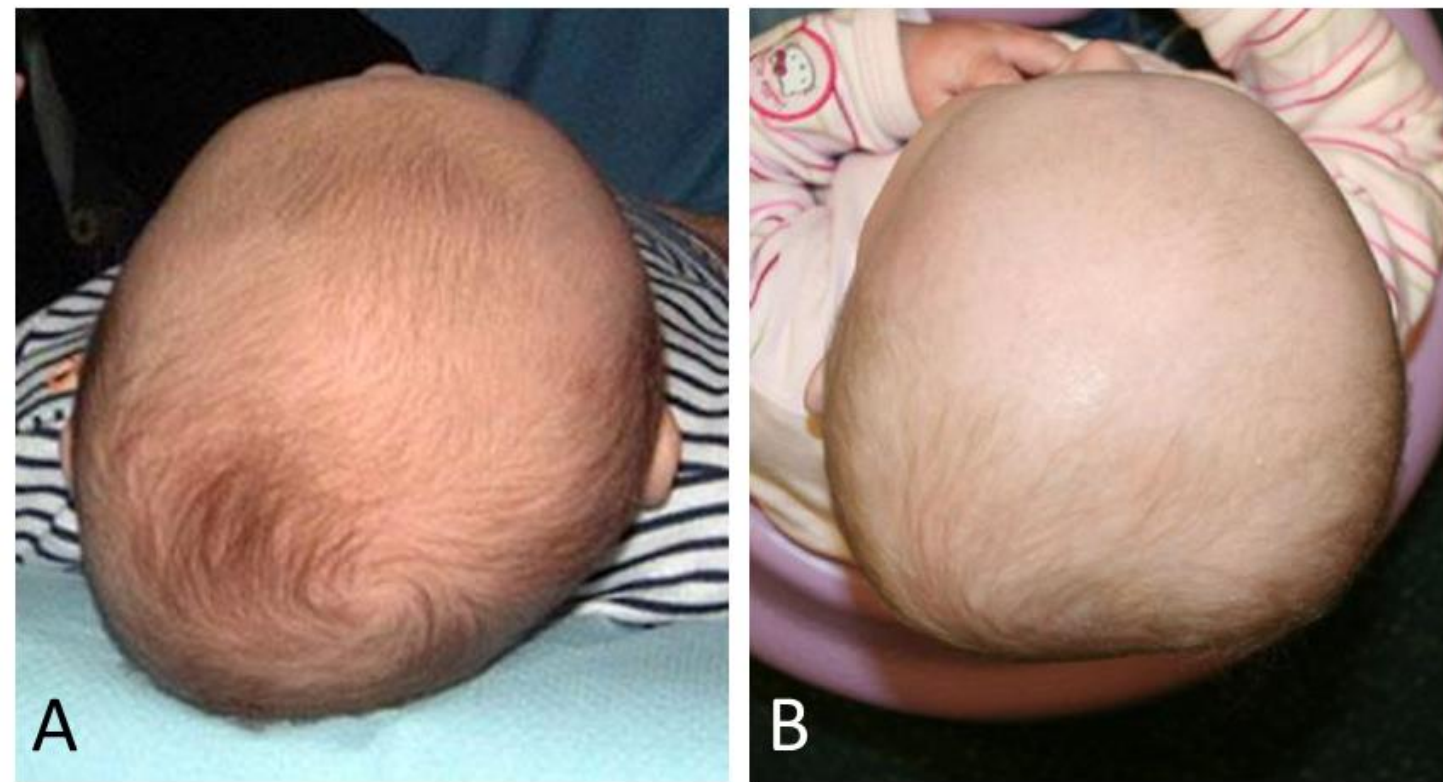
- Positional skull deformation is a condition in which the shape of the head is deformed as a result of positional preference or external moulding forces.
- Vitamin D insufficiency during pregnancy is associated with disturbed skeletal homeostasis during infancy.
- Hypothesis: lower vitamin D supplement intake during later pregnancy and early infancy is associated with an increased risk of positional skull deformation.

### Research question:

*What is the influence of adherence to recommendations for vitamin D supplement intake of 10 µg per day (400 IU) during pregnancy (mother) and in the first months of life (child) on the occurrence of positional skull deformation of the child at the age of 2 to 4 months?*

## METHODS

- Population-based case-control study
- 275 cases with positional skull deformation (HEADS study; van Wijk et al., 2012)
- 548 matched controls recruited from well-baby clinics (survey on type of infant milk feeding; Lanting & Rijpstra, 2011)
- Questionnaire on background characteristics and vitamin D intake of pregnant woman and child: food, time spent outdoors and supplement use
- Multivariate logistic regression



Components of skull deformation:  
A. plagiocephaly  
B. brachycephaly

## RESULTS

- Insufficient vitamin D supplement intake of pregnant women (aOR 1.86) and children (aOR 7.15) were independently associated with an increased risk of skull deformation during infancy.
- Other significant associations were: younger maternal age, lower maternal education, shorter pregnancy duration, assisted vaginal delivery, male gender and starting with milk formula consumption after birth.
- Adequate vitamin D supplement intake in the third trimester of pregnancy was observed in 30% of the mothers of cases and 44% of the mothers of controls.
- The vitamin D supplement intake advice for infants had a better uptake: 94% of cases and 97% of controls met the daily required intake of 10 µg (400 IU) of vitamin D.

### Multiple logistic regression analysis with case/control as outcome

Variable	Adjusted OR (95% CI)	P
<b>Pregnant woman vitamin D intake</b>		
Insufficient vitamin D supplement use*	1.86 (1.27 – 2.70)	0.001
Not consuming fish 1-2 times a week	1.50 (1.04-2.16)	0.031
<b>Child vitamin D intake</b>		
Insufficient time spent outdoors†	0.68 (0.45 – 1.03)	0.071
Insufficient vitamin D supplement intake‡	7.15 (3.77 – 13.54)	0.000
<b>Maternal sociodemographic, obstetric and infant factors</b>		
Maternal age (y)	0.94 (0.90 – 0.98)	0.002
Educational level of mother		0.023
Low	1.97 (1.19 – 3.26)	0.009
Medium	1.51 (1.00 – 2.27)	0.049
Pregnancy duration (wk)	0.84 (0.74 – 0.95)	0.006
Assisted vaginal delivery	2.55 (1.33 - 4.86)	0.005
Male gender	2.34 (1.63 – 3.35)	<0.001
Milk formula consumption after birth	1.51 (1.00 – 2.27)	0.049

\*Not taking 10 µg per day of vitamin D at least five times per week

†Not being outside for more than 15 min on more than five occasions per week, from April-September.

‡Not taking 10 µg per day if vitamin D supplement intake if breastfeeding or ≤0.5 L of formula milk per day.

## DISCUSSION

- The association between skull deformation and adequacy of vitamin D intake was stronger for infant rather than maternal adequacy of vitamin D supplement intake.
- However, a sufficient vitamin D supplement intake by infants themselves in the first months of life did not reverse the consequences of the insufficient vitamin D intake during pregnancy.
- Dietary intake advice specific to pregnancy can be combined into a single 'healthy lifestyle' advice which enables more effective promotion.
- Our study provides an early infant life example of the importance of adequate vitamin D intake during pregnancy and infancy.

More information:

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### References:

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