



## Letter to the Editor

# Highlights of the importance of vitamin B<sub>12</sub> for neurological and cognitive function: from pregnancy to childhood

Dear Editor,

I read with great interest the article ‘Adequate vitamin B<sub>12</sub> and folate status of Norwegian vegans and vegetarians’ by Henjum *et al.* (2022)<sup>(1)</sup>. The authors conducted a cross-sectional study with 205 participants to evaluate the vitamin B<sub>12</sub> and folate status of Norwegian vegans and vegetarians using multiple approaches for its assessment. While acknowledging these results, I would also like to point some methodological issues and mainly provide a perspective about vitamin B<sub>12</sub> role during pregnancy and for the first years of life.

First, it is reported in the methodology that the participants were between 18 and 60 years old, but in the discussion they say that in their sample only three participants were over 60 years old. Second, one of the inclusion criteria was no consumption of poultry, meat and/or meat products the previous 6 months or more; however, as the body storage of vitamin B<sub>12</sub> is quite long, a greater restriction would probably result in different results for the study. Third, the study considers serum vitamin B<sub>12</sub> adequate above 221 pmol/l, but perhaps an analysis with a more rigorous cut-off point would bring interesting results given its importance for health. As a fourth question, the authors mention Fig. 1 in the results, but none is presented in the study. And finally, interestingly, in the population studied, there was no vitamin B<sub>12</sub> deficiency, although 14% had low levels of vitamin B<sub>12</sub>. In addition, vegan participants supplemented more vitamin B<sub>12</sub> than vegetarians, and older participants had higher serum concentrations of vitamin B<sub>12</sub> despite the majority of the population being women, young and of childbearing age. As the article only mentions the importance of vitamin B<sub>12</sub> in pregnancy and lactation, I would like to make some remarks about it.

The development of the central nervous system and the brain begins during the third week of pregnancy and continues through early childhood. Also myelination and synaptogenesis are processes that begin in the pregnancy in third trimester and continue to influence neuronal development in the offspring during the first years of life<sup>(2)</sup>. In this, the vitamin B<sub>12</sub> plays an important role with potential effects on cognitive development that refers to the mental processes involved in memory, attention, learning and executive functions<sup>(3)</sup>. The child of a mother with a vitamin B<sub>12</sub> deficiency can be born with the deficiency or can become deficient during the period of exclusive breastfeeding as the concentrations of vitamin B<sub>12</sub> in human milk are strongly related to the state maternal during pregnancy and postpartum<sup>(4)</sup>. Notably, the neurological manifestations of vitamin B<sub>12</sub> deficiency may precede or occur in the absence of hematological consequences; that is, deficiencies were often

not diagnosed until permanent neurological damage had occurred<sup>(5)</sup>. For this reason, serum vitamin B<sub>12</sub> values considerably above the lower limit of the reference value are indicated.

Most of the initial data on childhood vitamin B<sub>12</sub> deficiency comes from case studies of infants exclusively breastfed by mothers on vegan or vegetarian diet. A baby born to a vegetarian or vegan mother is at high risk of being born with low vitamin B<sub>12</sub> stores and developing severe clinical signs of deficiency as failure in brain development with imaging showing atrophy and delays in myelination<sup>(2,6)</sup>. Importantly, vegetarian women who have had repeated pregnancies put their babies at greater risk because their vitamin B<sub>12</sub> stores were likely depleted in previous pregnancies<sup>(7)</sup>. In vegan diets, the risk of nutrient inadequacy is supposedly greater than in vegetarian diets, as food selection is even more limited and unfortified plant foods, such as seaweed, do not contain any significant amounts of active vitamin B<sub>12</sub><sup>(7,8)</sup>. However, in the study by Henjum *et al.* (2022),<sup>(1)</sup> vegans supplemented more vitamin B<sub>12</sub> which may change this risk of deficiency while vitamin B<sub>12</sub> supplementation results in rapid improvements in laboratory measurements of individuals' status, but cognitive function may not show the same improvement<sup>(9)</sup>.

I respectfully thank Henjum *et al.* (2022)<sup>(1)</sup> for providing us with a valuable research that from it further studies should be designed. Vitamin B<sub>12</sub> deficiency is emerging as a public health problem in many countries with infants and pregnant women being the most vulnerable groups. So the relationship of maternal vitamin B<sub>12</sub> with that of her offspring highlights the crucial role of pregnancy in preventing vitamin B<sub>12</sub> deficiency in the next generation and should probably be the focus of future research.

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doi:10.1017/S0007114522003920

## Acknowledgements

None.

Financial support: None.

Conflicts of interest: The author declare no conflict of interest.

Authorship section: P.B.Z. conceptualization, writing - original draft and writing - review and editing.



## References

1. Henjum S, Groufh-Jacobsen S, Allen LH, *et al.* (2022) Adequate vitamin B<sub>12</sub> and folate status of Norwegian vegans and vegetarians. *Br J Nutr*, 1–20.
2. Georgieff MK (2007) Nutrition and the developing brain: nutrient priorities and measurement. *Am J Clin Nutr* **85**, 614S–620S.
3. Venkatramanan S, Armata IE, Strupp BJ, *et al.* (2016) Vitamin B<sub>12</sub> and cognition in children. *Adv Nutr* **7**, 879–888.
4. Williams AM, Stewart CP, Shahab-Ferdows S, *et al.* (2018) Infant serum and maternal milk vitamin B<sub>12</sub> are positively correlated in Kenyan infant-mother dyads at 1–6 months postpartum, irrespective of infant feeding practice. *J Nutr* **148**, 86–93.
5. Ralapanawa DMPUK, Jayawickreme KP, Ekanayake EMM, *et al.* (2015) B<sub>12</sub> deficiency with neurological manifestations in the absence of anaemia. *BMC Res Notes* **8**, 458.
6. Allès B, Baudry J, Méjean C, *et al.* (2017) Comparison of socio-demographic and nutritional characteristics between self-reported vegetarians, vegans, and meat-eaters from the NutriNet-Santé study. *Nutrients* **9**, 1023.
7. Sebastiani G, Barbero AH, Borrás-Novell C, *et al.* (2019) The effects of vegetarian and vegan diet during pregnancy on the health of mothers and offspring. *Nutrients* **11**, 557.
8. Clarys P, Deliens T, Huybrechts I, *et al.* (2014) Comparison of nutritional quality of the vegan, vegetarian, semi-vegetarian, pesco-vegetarian and omnivorous diet. *Nutrients* **6**, 1318–1332.
9. Kwok T, Lee J, Ma RC, *et al.* (2017) A randomized placebo controlled trial of vitamin B<sub>12</sub> supplementation to prevent cognitive decline in older diabetic people with borderline low serum vitamin B<sub>12</sub>. *Clin Nutr* **36**, 1509–1515.

