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Assessment of vitamin B12 status among women of childbearing age in the UK following vegan and vegetarian diets: results from the National Diet and Nutrition Survey (NDNS)

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Introduction: With the rising popularity of plant-based diets, assessing the nutritional status of individuals following these diets has become increasingly important, especially for vulnerable groups such as women of childbearing age (WCBA)(1). Vitamin B12, an essential nutrient primarily found in animal products, is of particular concern, as its deficiency can lead to serious health problems. Evaluating vitamin B12 status through multiple biomarkers provides a more comprehensive analysis, ensuring a thorough understanding of nutritional health in these populations.

Aims: To assess vitamin B12 status using a full battery of B12 biomarkers, including serum B12, Holotranscobalamin (Holo-TC) and total homocysteine (tHcy), among women of childbearing age adhering to vegan and vegetarian, compared to omnivorous diets, and to examine the association between vitamin B12 status and vitamin B12 dietary and supplement intake.

Methods: Repeated cross-sectional study based on data from four publicly available NDNS (2008-2012, 2012-2014, 2014-2015, 2016-2019) datasets (2,3). These were population-based surveys of randomly selected samples of adults which were conducted in their households.

Results

A total of 2,299 WCBA (6 vegans, 89 vegetarians & 2,204 omnivorous) across all the NDNS year groups, of which 521 had complete data for biochemical and dietary intake (participant number varies for each variable), were included in the study. Among WCBA group, the median dietary intake of B12 was 0.9mcg (IQR = 0.5) in the vegan group, 1.7mcg (IQR = 2.0) in the vegetarian group, and 2.0mcg (IQR = 2.4) in the omnivore group. Median B12 intake from both diet and supplements was 1.2mcg (IQR = 1.7) in vegans, 3.6mcg (IQR = 2.6) in vegetarians and 5.2mcg (IQR = 2.6) among omnivores. No significant differences in B12 intake were observed between WCBA and older women (5 vegans and 48 vegetarians, age: 46-64) among vegan or vegetarian groups. We did observe significant differences in serum B12 ($p=0.02$) and Holo-TC concentrations ($p<0.001$) but not for tHcy ($p=0.760$) between these two age groups among vegetarians. Vitamin B12 biomarker data was available for only four vegans of which none were deficient, but half had insufficient B12 status based on serum B12 (<258 pmol/L) and Holo-TC (<70 pmol/L) levels. The proportion of B12 supplement users among vegans and vegetarians was 50% and 27%, respectively. Among all WCBA, of those with intake levels below 2.5mcg (current WHO/FAO recommended EAR for B12) (4) 41% had serum B12 levels below 200pmol/L compared with 23% when intake is above 2.5mcg. There were not enough data for vegans but 54% of vegetarians had serum B12 levels below 200pmol/L when not meeting the EU EAR.

Conclusion

There has been a considerable rise in the number of individuals taking up plant-based diets in Western society but data pertaining to this demographic remains notably scarce. Results presented here based on four combined releases of the NDNS program underscores a significant risk of B12 deficiency and insufficiency among individuals adhering to plant-based diets significantly exacerbated in WCBA and not adhering to an appropriate regimen of B12 supplement use.

References

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