

ABSTRACT

Introduction: Plant-based diets (vegetarian = VG and vegan = VN) are gaining increasing popularity among the pediatric population in the Czech Republic. Studies on the adult population suggest that a vegan diet may reduce the risk of certain chronic diseases and lead to better weight control and improved lipid profiles. However, excluding all animal components from the diet is associated with the risk of developing nutritional deficiencies (e.g., proteins, vitamin B12, D, calcium, iron, and iodine). Recommendations regarding plant-based diets differ among expert groups and health organizations. Therefore, a thorough assessment of the health status of vegan and vegetarian children is essential. This work primarily focuses on vitamin B12 and iodine but also considers other macro- and micronutrients.

Objectives: A cross-sectional study was conducted to describe the health status of vegan and vegetarian children compared to omnivore children (= OM) in the Czech Republic. The findings were compared with international studies and could be used to create preventive recommendations. The study focuses on analyzing laboratory parameters of risk nutrients in vegan children and their anthropometric parameters. For selected micronutrients (B12, iodine, vitamin D, and iron), we also conducted an analysis of nutritional intake and supplementation habits.

Methodology: The study included $n = 227$ children, i.e., $n = 96$ VG, $n = 79$ VN, and $n = 52$ OM. The study involved participants with different dietary habits (vegetarians, vegans, omnivores) who underwent anthropometric, clinical, laboratory, and questionnaire examinations. Anthropometric data, including BMI and percentiles, were obtained using calibrated instruments and recorded in the software Růst.cz. Clinical examinations, including questionnaire evaluations of participants' conditions, were conducted by a pediatrician. Laboratory tests included thyroid and iodine status parameters, vitamin B12 metabolism, iron metabolism, calcium-phosphate metabolism including vitamin D, lipid profile, and serum proteins. Nutritional intake assessment was based on a 3-day weighed dietary record. Statistical analysis included dividing participants according to dietary preferences and supplementation habits and determining the strength of the association between diet and selected nutritional parameters.

Results: Detailed examination of vitamin B12 metabolism showed a very low prevalence of B12 deficiency in the VG/VN group due to high awareness of the need for preventive supplementation. On the other hand, unconsidered excessive dosage led to laboratory hypervitaminosis B12 in several cases with unknown health impacts on children. VG/VN children tend to have lower iodine levels in morning urine samples and a higher prevalence of AhTGc positivity as a marker of suboptimal iodine saturation. The intake of vitamin B12 and iodine purely from the diet (without preventive supplementation) was evaluated as insufficient in our study. There was a statistically significant difference in 25OHD levels, with the highest levels in VN children, followed by VG, and the worst findings in OM children, correlating with a high prevalence of preventive vitamin D supplementation in VG/VN children. VG/VN children had lower iron stores, the more restrictive the diet, with significant findings in hemoglobin, ferritin, RDW, RBC, and iron levels. Cholesterol, HDL, and LDL values followed the same trend. VN children were leaner, with seven children having a BMI below the 3rd percentile. There was no statistically significant difference (or a small effect size) in serum proteins (CB, Alb, IGF-I) and WBC; in Ca, P, Mg, ALP, PTH; MCV, MCH, MCHC; TAG, and uric acid levels.

Conclusion: Based on our cross-sectional study, we identified a new risk group of children in the Czech Republic regarding iodine deficiency, primarily VN children, who often do not consume the recommended daily intake of iodine from food. This is reflected in lower iodine levels in urine and more frequent AhTGc positivity. Regular iodine supplementation is therefore deemed necessary. We also found that VG/VN children are at risk of vitamin B12 deficiency if not regularly supplemented. Iron metabolism parameters are also at risk, with VG/VN children having reduced stores, though this does not increase the risk of anemia.

In conclusion, although a varied and balanced plant-based diet with regular adequate supplementation can minimize risks, a VN diet cannot be recommended for children and adolescents. It remains that a rational, varied conventional diet is the safest option for the growth and development of children. If parents insist on adhering to this dietary direction, regular medical check-ups and supplementation led by an expert are necessary. Our experience has shown that mere prohibition is not an effective preventive measure and there is a need for new preventive guidelines taking care of this particular part of population.