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ARTICLE

Maternal Vitamin B₁₂ Status and Risk of Neural Tube Defects in a Population With High Neural Tube Defect Prevalence and No Folic Acid Fortification

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OBJECTIVE. Folic acid fortification has reduced neural tube defect prevalence by 50% to 70%. It is unlikely that fortification levels will be increased to reduce neural tube defect prevalence further. Therefore, it is important to identify other modifiable risk factors. Vitamin B₁₂ is metabolically related to folate; moreover, previous studies have found low B₁₂ status in mothers of children affected by neural tube defect. Our objective was to quantify the effect of low B₁₂ status on neural tube defect risk in a high-prevalence, unfortified population.

METHODS. We assessed pregnancy vitamin B₁₂ status concentrations in blood samples taken at an average of 15 weeks' gestation from 3 independent nested case-control groups of Irish women within population-based cohorts, at a time when vitamin supplementation or food fortification was rare. Group 1 blood samples were from 95 women during a neural tube defect-affected pregnancy and 265 control subjects. Group 2 included blood samples from 107 women who had a previous neural tube defect birth but whose current pregnancy was not affected and 414 control subjects. Group 3 samples were from 76 women during an affected pregnancy and 222 control subjects.

RESULTS. Mothers of children affected by neural tube defect had significantly lower B₁₂ status. In all 3 groups those in the lowest B₁₂ quartiles, compared with the highest, had between two and threefold higher adjusted odds ratios for being the mother of a child affected by neural tube defect. Pregnancy blood B₁₂ concentrations of <250 ng/L were associated with the highest risks.

CONCLUSIONS. Deficient or inadequate maternal vitamin B₁₂ status is associated with a significantly increased risk for neural tube defects. We suggest that women have vitamin B₁₂ levels of >300 ng/L (221 pmol/L) before becoming pregnant. Improving B₁₂ status beyond this level may afford a further reduction in risk, but this is uncertain.

Key Words: vitamin B₁₂ • cobalamin • neural tube defects • folic acid fortification • folate

Abbreviations: NTD—neural tube defect • B₁₂—vitamin B₁₂ • AP—affected pregnancy • NAP—nonaffected pregnancy • RCF—red cell folate • OR—odds ratio

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