Vitamin D status in pregnancy and its association with offspring lung function and asthma at age 12: An Odense Child Cohort study

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Background: Low exposure to maternal serum 25-hydroxyvitamin D_{2+3} (s-25(OH)D) levels during fetal life may impair embryonic lung and immune system development, potentially influencing lung function and increasing the risk of childhood asthma. However, previous research reports inconsistent findings, requiring additional studies.

Objective: This study aims to assess whether maternal s-25(OH)D levels during critical periods of fetal lung development are associated with lung function Z-scores – Forces vital capacity (FVC), forced expiratory volume in 1 second (FEV_1) and FEV_1/FVC, and the risk of childhood asthma at age 12.

Methods: In this population-based prospective cohort study, nested within Odense Child Cohort (OCC), we included 245 mother-child pairs. Maternal s-25(OH)D concentrations were measured in early and late pregnancy and in cord blood. Spirometry was performed on the children at age 12, and asthma diagnosis was based on the spirometry results, symptoms, medication use, and physician diagnosis. Multiple regression models adjusted for birth season, maternal age, pre-pregnancy BMI, household smoking, ethnicity, height, weight, and sex were used to examine associations.

Results: (Preliminary results) The mean (SD) s-25(OH)D levels in early pregnancy, late pregnancy, and cord blood were 65.12 (19.03) nmol/L, 78.04 (27.02) nmol/L and 48.02 (21.49) respectively, and the mean (SD) FVC and FEV_1 Z-score at 12 y were both -0.48 (0.83) (0.85). We found that children with early pregnancy s-25(OH)D levels >75 nmol/L had lower FEV_1/FVC Z-scores (-0.413; p=0.044) and higher odds ratio of developing asthma (OR 3.059; p=0.021), compared to children with s-25(OH)D levels in the clinical cut-off group 50-75 nmol/L. The FEV_1/FVC Z-score also decreased when comparing the 3rd tertile (-0.436; p=0.043) to the 2nd tertile of early pregnancy s-25(OH)D. No significant linear associations were observed between s-25(OH)D levels measured in early pregnancy, late pregnancy or cord blood and FVC or FEV_1. Similarly, categorizing s-25(OH)D levels into tertiles and clinical routine cut-offs did not reveal any associations with FVC or FEV_1.

Conclusion: Higher s-25(OH)D levels in early pregnancy were associated with a lower FEV_1/FVC Z-score and an increased risk of asthma, but no linear association between s-25(OH)D levels, at any point during pregnancy, and FVC or FEV_1 was observed. These findings suggest that maternal vitamin D levels may influence specific lung function parameters and asthma risk, but with a complex, non-linear association, warranting further research. However, these results should be interpreted with caution, as they are preliminary.

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