

Gestational Vitamin D Levels Mitigate the Effect of Pre-pregnancy Obesity on Gestational Diabetes Mellitus: A Birth Cohort Study

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Abstract : Background and Aim: Gestational diabetes mellitus (GDM) is a common pregnancy complication affecting around 14% of pregnancies globally that carries short and long-term consequences to the mother and her child. Pre-pregnancy overweight or obesity is the most consistently and strongly associated modifiable risk factor with GDM development. This analysis aimed to determine whether vitamin D status during pregnancy modulates the effect of pre-pregnancy obesity/overweight on GDM risk while stratifying by maternal age. Methods: Data from the Kuwait Birth Cohort (KBC) study were analyzed, which enrolled pregnant women in the second or third trimester of gestation. Pre-pregnancy body mass index (BMI; kg/m²) was categorized as under/normal weight (<25.0), overweight (25.0 to <30.0), and obesity (≥30.0). 25 hydroxyvitamin D levels were measured in blood samples that were collected at recruitment and categorized as deficiency (<50 nmol/L) and insufficiency/sufficiency (≥50 nmol/L). GDM status was ascertained according to international guidelines. Logistic regression was used to evaluate associations, and adjusted odds ratios (aOR) and 95% confidence intervals (CI) were estimated. Results: The analyzed study sample included a total of 982 pregnant women, with a mean (SD) age of 31.4 (5.2) years. The prevalence of GDM was estimated to be 17.3% (95% CI: 14.9-19.7), and the prevalence of pre-pregnancy overweight and obesity was 37.8% (95% CI: 34.8-40.8) and 28.8% (95% CI: 26.0-31.7), respectively. The prevalence of gestational vitamin D deficiency was estimated to be 55.3% (95% CI: 52.2-58.4). The association between pre-pregnancy overweight or obesity with GDM risk differed according to maternal age and gestational vitamin D status (Pinteraction[BMI × age × vitamin D = 0.047). Among pregnant women aged <35 years, prepregnancy obesity compared to under/normal weight was associated with increased GDM risk among women with gestational vitamin D deficiency (aOR: 3.65, 95% CI: 1.50-8.86, p = 0.004) and vitamin D insufficiency/sufficiency (aOR: 2.55, 95% CI: 1.16-5.61, p = 0.019). In contrast, among pregnant women aged ≥35 years, pre-pregnancy obesity compared to under/normal weight was associated with increased GDM risk among women with gestational vitamin D deficiency (aOR: 9.70, 95% CI: 2.01-46.69, p = 0.005), but not among women with vitamin D insufficiency/sufficiency (aOR: 1.46, 95% CI: 0.42-5.16, p = 0.553). Conclusion: The effect of pre-pregnancy obesity on GDM risk is modulated by maternal age and gestational vitamin D status, with the effect of pre-pregnancy obesity being more pronounced among older pregnant women (aged ≥35 years) with gestational vitamin D deficiency compared to those with vitamin D insufficiency/sufficiency. Whereas, among younger women (aged <35 years), the effect of pre-pregnancy obesity on GDM risk was not modulated by gestational vitamin D status. Therefore, vitamin D supplementation among pregnant women, specifically older women with pre-pregnancy obesity, may mitigate the effect of pre-pregnancy obesity on GDM risk.

Keywords : gestational diabetes mellitus, vitamin D, obesity, body mass index

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