Maternal Weight Trajectories in Successive Pregnancies and Their Association With Gestational Diabetes Mellitus

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Gestational diabetes mellitus (GDM) can have serious clinical consequences for both the woman and her offspring in the short and long term (1). Previous research suggests that an interpregnancy weight increase of just 1–2 BMI units is associated with an increased risk of the development of GDM in future pregnancies (2). However, BMI units may not be the most practical approach to addressing weight management (3). In the general population, international guidelines on weight management recommend percentage weight loss for use in clinical practice (4). This study aimed to determine if change in percentage body weight between the start of the first and second pregnancies was associated with the development of GDM in the second pregnancy.

This study was conducted using a database of all births in the Coombe Women and Infants University Hospital, Dublin, between 2011 and 2018 inclusive. Women who had first and second singleton babies weighing ≥500 g were included. Women whose weight was measured at >18 weeks' gestation, who had preexisting diabetes, or who had a previous baby weighing >4.5 kg were excluded.

The hospital follows the International Association of Diabetes and Pregnancy Study Groups (IADPSG) recommendations on the diagnosis and classification of hyperglycemia in pregnancy. Women were screened selectively for GDM based on risk factors (5). Maternal height (in meters) and weight (in kilograms) were measured in both pregnancies at the first prenatal visit by trained midwives. The interpregnancy percentage weight change was calculated.

Data were analyzed using SPSS Version 24 and Vassarstats. Data were assessed for normality and analyzed using cross-tabulation and multinomial regression models. The study was approved by the Hospital Research Ethics Committee (study number 4-2013).

Of the 6,785 women, the prevalence of GDM increased from 4.8% in the first pregnancy to 8.2% in the second. In total, 6,112 women (90.0%) did not have GDM diagnosed in either pregnancy and 214 (3.2%) had GDM diagnosed in both. An additional 115 (1.7%) had GDM diagnosed only in the first pregnancy and 344 (5.1%) had GDM diagnosed only in the second pregnancy. In total, 9.4% of women lost ≥5.0% and 34.5% gained ≥5.0% of their body weight between the start of their two pregnancies.

Table 1 shows the unadjusted odds ratios (OR) (%) of GDM status by percentage body weight change category. When all women were included in analysis (model 1), gaining ≥5.0% of body weight was associated with developing GDM in the second pregnancy despite not having GDM in the first pregnancy (OR 2.4, 95% CI 1.7–3.4, $P < 0.001$). In contrast, losing ≥5.0% of body weight was associated with not developing GDM in the second pregnancy, despite having GDM in the first (OR 2.4, 95% CI 1.2–4.6, $P < 0.01$). In model 2, women who developed obesity between their first and second pregnancy were excluded because obesity was a factor for selective screening for GDM. Results for model 2 were similar to those for model 1. When stratified by BMI category in the second pregnancy, all women who gained ≥5.0% were associated with developing GDM in the second pregnancy despite not developing GDM in the first pregnancy (models 3 and 4). However, only women with a BMI ≥25 kg/m^2 were associated with not developing GDM in the second pregnancy when they lost ≥5.0% body weight, despite having GDM the first time around (OR 2.9, 95% CI 1.2–6.8, $P < 0.05$) (model 4).

A strength of this longitudinal study was that BMI was calculated based on the accurate measurement of weight and height at the first prenatal visit and not on self-reporting, which can lead to BMI underestimation. A potential weakness of the study is that, because numbers within subcategories were small, some confounding variables could not be controlled for in the analysis.

Previous studies have focused on the associations between pregnancy outcomes and maternal weight changes over time in BMI units. However, we support the recommendation that the percentage of

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Table 1—Odds ratios of GDM status according to percentage weight change categories stratified by maternal BMI

	GDM only in 2nd pregnancy	GDM only in 1st pregnancy
Model 1: All women (n = 6,785)	n = 344	n = 115
Lost ≥5.0%	0.9 (0.5–1.5)	2.4 (1.2–4.6)*
Lost 2.5 to <5.0%	0.9 (0.5–1.5)	1.3 (0.6–2.9)
Lost 0.1 to <2.5%	0.8 (0.5–1.3)	1.5 (0.8–2.9)
Gained 0.1–2.49%	Reference	Reference
Gained 2.5 to <5.0%	1.1 (0.7–1.7)	1.2 (0.6–2.4)
Gained ≥5.0%	2.5 (1.8–3.5)‡	1.0 (0.6–1.9)
Model 2: Women who developed obesity excluded[a] (n = 6,461)	n = 283	n = 108
Lost ≥5.0%	0.9 (0.5–1.6)	2.5 (1.3–4.9)†
Lost 2.5 to <5.0%	0.9 (0.5–1.5)	1.4 (0.7–3.1)
Lost 0.1 to <2.5%	0.8 (0.5–1.4)	1.6 (0.8–3.1)
Gained 0.1–2.49%	Reference	Reference
Gained 2.5 to <5.0%	1.1 (0.7–1.8)	1.3 (0.6–2.6)
Gained ≥5.0%	2.1 (1.5–3.0)‡	1.1 (0.6–2.0)
Model 3: Women <25 kg/m^2 second pregnancy (n = 3,763)	n = 81	n = 40
Lost ≥5.0%	0.7 (0.3–2.0)	2.3 (0.8–6.6)
Lost 2.5 to <5.0%	0.9 (0.4–2.4)	1.3 (0.4–0.3)
Lost 0.1 to <2.5%	0.8 (0.3–1.9)	1.7 (0.6–4.8)
Gained 0.1–2.49%	Reference	Reference
Gained 2.5 to <5.0%	1.4 (0.7–3.1)	1.0 (0.3–3.3)
Gained ≥5.0%	2.7 (1.4–5.2)†	1.1 (0.4–3.2)
Mode 4: Women ≥25 kg/m^2 second pregnancy (n = 3,104)	n = 263	n = 75
Lost ≥5.0%	1.1 (0.6–2.2)	2.9 (1.2–6.8)*
Lost 2.5 to <5.0%	1.1 (0.5–2.1)	1.7 (0.6–4.6)
Lost 0.1 to <2.5%	0.9 (0.5–1.8)	1.5 (0.6–3.7)
Gained 0.1–2.49%	Reference	Reference
Gained 2.5 to <5.0%	0.9 (0.5–1.6)	1.3 (0.5–3.0)
Gained ≥5.0%	1.6 (1.0–2.6)*	0.7 (0.3–1.5)

[a]Women who developed obesity (n = 406) were excluded in this analysis to reduce the number of confounding variables, as women who developed obesity between pregnancies would be screened automatically for GDM. Overall reference group was women who did not have GDM in either pregnancy. *Significant difference from the reference group at $P < 0.05$. †Significant difference from the reference group at $P < 0.01$. ‡Significant difference from the reference group at $P \leq 0.001$.

initial baseline weight gained or lost over time should be used to describe maternal weight trajectories (3). It facilitates communication about weight optimization with the woman and is recommended as a realistic target for weight loss in the National Institute for Health and Care Excellence guidelines for obesity (4).

Our study found that gaining ≥5.0% body weight between pregnancies resulted in an increased odds of having GDM in the second pregnancy, irrespective of BMI. Furthermore, losing ≥5.0% body weight between pregnancies appeared protective. However, when women were stratified by second pregnancy BMI, this only remained true for women who started their second pregnancy with a BMI ≥25.0 kg/m^2. These observations are consistent with international recommendations for weight loss in the adult population and should be considered for interpregnancy care.

Duality of Interest. No potential conflicts of interest relevant to this article were reported.

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