OBSTETRICS

The impact of interpregnancy weight change on birthweight in obese women

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OBJECTIVE: The purpose of this study was to estimate the impact of interpregnancy weight change from first to second pregnancies in obese women on the risk of large-for-gestational-age (LGA) and small-for-gestational-age (SGA) infants.

STUDY DESIGN: A population-based historical cohort analysis of 10,444 obese women in Missouri who delivered their first 2 singleton live infants from 1998-2005. Interpregnancy weight change was calculated as the difference between prepregnancy body mass index (BMI) of the first and second pregnancies. LGA and SGA births were compared among 3 interpregnancy weight change groups: (1) weight loss (≥2 BMI units), (2) weight gain (≥2 BMI units), and (3) reference group (BMI maintained within 2 units). Adjusted odds ratios (aOR) were calculated for LGA and SGA births with the use of multiple logistic regression. A dose-response relationship was assessed with a linear-by-linear χ^2 test.

RESULTS: Compared with the reference group, interpregnancy weight loss was associated with lower risk of an LGA infant (aOR, 0.61; 95% confidence interval, 0.52–0.73), whereas interpregnancy weight gain was associated with increased risk of an LGA infant (aOR, 1.37; 95% confidence interval, 1.21–1.54). Interpregnancy BMI change was not related to SGA infant risk, except for weight loss of >8 BMI units. A significant dose-response relationship was observed for LGA infant risk ($P < .001$), but not SGA infant risk ($P = .840$).

CONCLUSION: Mild-to-moderate interpregnancy weight loss in obese women reduced the risk of subsequent birth of LGA infants without increasing the risk of SGA infants. The interpregnancy interval may be a crucial period for targeting weight loss in obese women.

Key words: interpregnancy weight change, large-for-gestational-age, obesity, small-for-gestational-age

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Obesity has reached epidemic proportions in the United States, increasing dramatically over the past 20 years. Current obesity trends project that, by the year 2030, 51% of US adults will be obese.[1] More than one-quarter of US women currently begin their pregnancies as obese.[2] Furthermore, the severity of obesity is also increasing; the prevalence of class III obesity (body mass index [BMI], ≥40 kg/m^2) in women of reproductive age has tripled over the past 30 years.[3]

Obesity is a modifiable condition that is associated with significant health consequences for both mothers and offspring. Obese women tend to retain more weight after delivery, which leads to a further increase in obesity and its comorbidities later in life.[4,5] Prepregnancy obesity contributes to adverse neonatal and maternal outcomes, which include macrosomia, large-for-gestational-age (LGA) infants, composite neonatal morbidity, pregnancy-induced hypertension, gestational diabetes mellitus, and cesarean delivery.[6,7] Furthermore, increasing the severity of obesity significantly elevates the risk of these adverse outcomes.[8]

Prepregnancy obesity has a dose-dependent positive relationship with the risk of macrosomia and LGA infant delivery.[6] LGA infants have greater adiposity at birth and an increased risk of obesity and metabolic syndrome during childhood and adolescence.[9,10] In contrast, obesity has an inverse association with the risk of a small-for-gestational-age (SGA) infant.[11] SGA infants are predisposed to a number of long-term health sequelae, which includes an increased risk of metabolic syndrome later in life.[12]

Given the increasing prevalence of obesity among women of reproductive age, which places them at increased risk for both postpartum weight retention and LGA births, it is important to study the impact of interpregnancy weight change on birthweight of the offspring in obese women. Two previous studies have demonstrated an association between interpregnancy BMI change and LGA risk in the subsequent pregnancy in overweight and obese women.[13,14] However, the effect of weight loss between pregnancies in obese women requires additional focus. Interpregnancy weight loss may offer the potential to improve both maternal and neonatal outcomes

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The authors report no conflict of interest.

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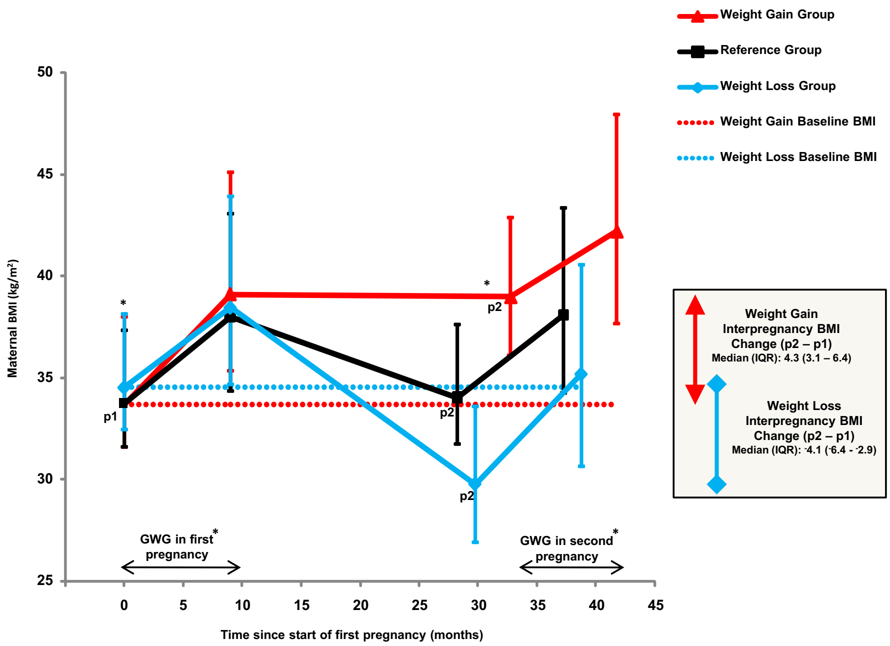
FIGURE 1

Temporal changes in body mass index



Changes in BMI across first and second pregnancies in women who increased their BMI by ≥2 units (weight gain group; n = 3962), women who maintained their BMI within a 2-unit loss or gain (reference group; n = 4743), and women who decreased their BMI by ≥2 units (weight loss group; n = 1739). Interpregnancy weight change, in BMI units, was calculated as the difference between prepregnancy BMI of their first (*p1*) and second pregnancies (*p2*). The *asterisk* indicates a probability value of < .001, which denotes group effect that was obtained from the nonparametric Kruskal-Wallis test.

BMI, body mass index; *GWG*, gestational weight gain; *IQR*, interquartile range.

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for obese women in the subsequent pregnancy. The aim of this population-based study was to determine (1) the impact of interpregnancy BMI change in obese pregnant women on the risk of delivering an LGA or SGA infant in the subsequent pregnancy and (2) the dose-dependent relationship between changes in maternal interpregnancy BMI and the risk of an LGA or SGA infant.

MATERIALS AND METHODS

This population-based, historical, cohort study was conducted with data from the Missouri maternally linked birth and fetal death registry, which links maternal health data longitudinally to infant birth certificate data with the use of unique identifiers. The methods and algorithm that are used within the Missouri vital record system have been described previously,[15] are considered reliable, and have been used to validate US national datasets that involve matching and linking procedures.[16]

There were 69,555 eligible women included within the registry during the study years 1998-2005. Eligible women resided in Missouri and delivered their first 2 singleton live births without congenital malformations at 20-42 weeks' gestation. Included in this analysis were 10,672 women who started their first pregnancy as obese (BMI, ≥30 kg/m^2), which was 15.3% of the total study population. Prepregnancy weight of the second pregnancy was missing for 228 women (2.1%). Therefore, the final cohort for analysis consisted of 10,444 women.

Maternal prepregnancy BMI was calculated from self-reported weight and height records from the Missouri dataset. BMI was calculated as weight (in kilograms) divided by the squared height (in meters). Participants were placed into 3 study groups on the basis of *interpregnancy weight change*, which was defined as a change in prepregnancy BMI from the first to second pregnancy. We deemed a change of at least 2 BMI units as a realistic, but clinically relevant, weight change. On the basis of this definition, our 3 study groups included (1) women who decreased their BMI by ≥2 units (weight loss group), (2) women who increased their BMI by ≥2 units (weight gain group), and (3) women who maintained their BMI within a 2 unit loss or gain (reference group).

The primary outcome variables for this study were LGA and SGA infants, defined as birthweight >90th percentile and <10th percentile, respectively, that were corrected for sex and gestational age.[17] Potential demographic, obstetric, and medical confounders that could impact the risk of LGA and SGA infants in the second pregnancy were collected and adjusted for in the study. Demographic variables included maternal age (18-35 years, >35 years), race and ethnicity (non-Hispanic white, non-Hispanic African American, other), marital status (married, unmarried), education (≤12 years, >12 years), and socioeconomic status (using Medicaid enrollment as a proxy). The obstetric and medical confounders included baseline obesity status that was indicated by prepregnancy BMI of the first pregnancy (categorized as class I [30-34.9 kg/m^2], class II [35-39.9 kg/m^2] or class III [≥40 kg/m^2]), interpregnancy interval (<12 months, 12-36 months, and >36 months), and the following characteristics of the second pregnancy: gestational weight gain (GWG; in pounds), gestational age (in weeks), smoking, preeclampsia, adequacy of prenatal care, birth of an LGA or SGA infant in the first pregnancy, diabetes mellitus, chronic hypertension, renal disease, and cardiac disease.

Interpregnancy interval was calculated as the time (in months) between first and second births excluding clinical gestational age of the second pregnancy. Gestational age was determined by clinical estimate (a required field on the birth certificate since 1989), which was esti-