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Original article

Racial differences in gestational weight gain and pregnancy-related hypertension

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ABSTRACT

Purpose: The aim of the study was to examine racial differences in gestational weight gain (GWG) and pregnancy-related hypertension.
Methods: Logistic regression models tested racial differences in adequacy of GWG and pregnancy-induced hypertension in all singleton live births from the South Carolina 2004–2006 birth certificates.
Results: Compared with white women, black and Hispanic women had 16%–46% lower odds of gaining weight above the recommendations. However, the odds of inadequate GWG was ~50% higher in black and Hispanic women with a pregnancy body mass index (BMI) less than 25 kg/m^2. Furthermore, compared with women with adequate GWG, women with excessive GWG had higher odds of pregnancy-related hypertension (underweight: 2.35, 95% confidence interval [CI; 1.66, 3.32]; normal: 2.05, 95% CI [1.84, 2.27]; overweight: 1.93, 95% CI [1.64, 2.27]; obese: 1.46, 95% CI [1.30, 1.63]). Among women with a BMI less than 25 kg/m^2, black women had higher odds of pregnancy-related hypertension than white women (underweight: 1.64, 95% CI [1.14, 2.36]; normal weight: 1.28, 95% CI [1.15, 1.42]), whereas among women with a BMI less than 25 kg/m^2, Hispanic women had 40% lower odds.
Conclusions: Programs are needed to curb excessive GWG in all racial groups and to help some subgroups ensure adequate GWG. Maternal obesity and GWG are two factors that should be used in combination to reduce racial differences in pregnancy-related hypertension.

Introduction

Pregnancy-related hypertension, including gestational hypertension, preeclampsia, and eclampsia, is the leading cause of maternal death in industrialized countries, accounting for 16% of deaths [1]. It is also a serious condition that may lead to maternal and offspring complications [2]. An estimated 3% of pregnancies are complicated by preeclampsia and 5%–10% by hypertensive disorders including chronic hypertension [1], and the prevalence of these disorders are increasing in the United States [2,3].

Racial disparities exist for these disorders with the burden being the highest in black women [2,4,5]. Data from the 1998–1999 National Inpatient Sample found the prevalence of pregnancy-related hypertension to be 6.5% in black, 4.7% in white, and 3.8% in Hispanic women [5]. After adjustment for age, gestational diabetes, preexisting diabetes and hypertension, black women had increased odds of pregnancy-related hypertension, whereas Hispanic women had a decreased odds of gestational hypertension but not preeclampsia compared with white women [5]. Another study found the age-adjusted prevalence of pregnancy-related hypertension increased significantly more among black women (4.8%) than that in white (2.6%) or Hispanic women (2.3%) [2].

The observed increase in pregnancy-related hypertension might be explained by the increase in both high prepregnancy body mass index (BMI) and excessive gestational weight gain (GWG), both risk factors for pregnancy-related hypertension [6–24]. Furthermore, because minority women are more likely to be overweight or obese before pregnancy [25] and overweight and obese women are more likely than normal weight women to exceed GWG recommendations [23], high prepregnancy BMI and GWG might also contribute to the increasing racial gap in pregnancy-related hypertension. Yet, some studies have found that black women gain less total weight gain during pregnancy than white women [15,16,26,27]. Thus, it is important to examine the interactive effects of GWG and prepregnancy BMI in explaining the racial differences in pregnancy-related hypertension.

To date, the joint effect of GWG and prepregnancy BMI on the risk of pregnancy-related hypertension has received some attention in previous research [11,12,14,17–19]. Half of these studies, however, have been underpowered [11,18,19]. Approximately, half of

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studies have been conducted in the geographic areas with limited racial diversity such as China [13], Canada [11], or predominantly Caucasian, European populations [12,14,19,20,24]. Studies conducted in US populations have controlled for race [16,17,21] or have been restricted to a specific racial/ethnic group [18,22] or to only normal weight [16] or obese women [21]. They have not investigated the role of race in pregnancy-related hypertension and how other modifiable risk factors may contribute to racial differences. Although de la Torre et al. [15] examined racial disparities in gestational hypertension by prepregnancy BMI, they studied a group of high-risk pregnant women who received comprehensive home-based nursing services, thus limiting its generalizability.

The aim of this article was to examine the interactive roles of GWG and prepregnancy BMI in racial disparities in pregnancy-related hypertension in a large population of women residing in the state of South Carolina (SC) who delivered in 2004–2006. SC has poor maternal and child health indicators compared with the rest of the nation and women living the southern United States have the highest prevalence of gestational hypertension [3]. Each year approximately one-third of births in SC is to black women, which provide a unique opportunity to examine the proposed questions. Given that, few population-based studies have examined racial differences in GWG, we first examined racial differences in GWG according to prepregnancy BMI. We then examined whether racial differences in pregnancy-related hypertension were explained by differences in GWG and prepregnancy BMI.

Data and methods

Live, singleton births between 20 and 44 weeks with a birth weight greater than 500 grams to mothers without prepregnancy hypertension were included from the 2004–2006 SC birth certificates ($n = 44{,}274$ non-Hispanic black; 79,004 non-Hispanic white; and 12,401 Hispanic women). Women whose race and ethnicity did not fit into one of these categories (3287) or women with missing information on race and ethnicity (1271) were excluded from the analysis because of small number and the difficulty in defining heterogeneity in this category. Births before 20 weeks were not included because preeclampsia and gestational hypertension are diagnosed after 20 weeks of pregnancy [28]. In addition, exclusions were made for missing information for prepregnancy weight, height or BMI (2975); a prepregnancy BMI less than 10 (7) or greater than 80 (2); missing GWG (641); gestational weight loss of more than 30 pounds (311) or GWG greater than 97 pounds (390), and missing information for other covariates (2963) such as date of first prenatal care visit (2197), maternal education (374), and marital status (288). Cut points less than 10 and greater than 80 for BMI and less than −30 and greater than 97 pounds for GWG have been used previously to define improbable values [26,29].

Main variables

The SC birth certificate collected information on total GWG and clinical estimates of gestational age in weeks. Considering that total GWG varies by weeks of gestation at delivery, we used a measure of adequacy of GWG, which takes into account gestational age at delivery. Table 1 summarizes the 2009 Institute of Medicine guideline for each prepregnancy BMI group: underweight (<18.5 kg/m^2), normal weight (18.5–24.9), overweight (25.0–29.9) and obese (≥30.0). It assumes that women with BMI less than 25 typically gain 4.4 lb during the first 12 weeks of pregnancy compared with 2.2 lb if they are overweight and 1.1 lb if they are obese [30]. For each BMI group, we divided the lower and upper limits of recommended weight-gain range by expected mean weight gain at 40 weeks' gestation to derive corresponding adequate ranges of expected weight gain based on the recommendation as shown in the last column of Table 1. We calculated the ratio of actual weight gain at delivery-to-the expected weight gain for that gestational week according to the 2009 Institute of Medicine's recommendations. If the ratio of actual to expected weight gain fell into the adequate ranges based on the recommendation shown in Table 1, then the woman was defined as gaining adequate weight during pregnancy. If the ratio fell above or below these ranges, then total GWG was considered to be above (excessive) or below (inadequate) the recommendation, respectively. Additional details are available in previous studies [31,32].

The SC birth certificate collects information on hypertension status: (1) prepregnancy (chronic); (2) gestational (pregnancy-induced hypertension, preeclampsia); and (3) eclampsia. In this study, pregnancy-related hypertension includes pregnancy-induced hypertension, preeclampsia, and eclampsia. This definition is consistent with previous studies [3–5], although Wallis et al. [3] examined preeclampsia/eclampsia as a separate category. Race and ethnicity was categorized as non-Hispanic black, Hispanic, and non-Hispanic white (hereafter, black, Hispanic, and white).

Statistical analyses

For GWG, we estimated the prevalence of inadequate or excessive GWG by race and ethnicity and prepregnancy BMI categories. Multinomial logistic regression models were used to predict the outcome of excessive or inadequate GWG compared with adequate GWG. Independent variables were race, prepregnancy BMI, and race*prepregnancy BMI. Covariates, based on previous studies, were maternal age, race and ethnicity, marital status, smoking status, education level, month prenatal care began, and parity. Odds ratios (ORs) and 95% confidence intervals (CIs) from both the crude and adjusted models were presented.

We also estimated the prevalence of pregnancy-related hypertension by race, GWG, prepregnancy BMI category, and other

Table 1
The 2009 Institute of Medicine's recommendations on total weight gain and rate of weight gain for singleton pregnancy

Prepregnancy weight category	BMI	Recommended total weight gain		Rate of weight gain in the second and third trimesters*		Adequate ranges of expected weight gain based on the recommendation†
		Range (kg)	Range (lb)	Mean (range, kg/wk)	Mean (range lb/wk)	
Underweight	<18.5	12.5–18	28–40	0.51 (0.44–0.58)	1.0 (1.0–1.3)	0.79–1.14
Normal weight	18.5–24.9	11.5–16	25–35	0.42 (0.35–0.50)	1.0 (0.8–1.0)	0.86–1.20
Overweight	25.0–29.9	7.0–11.5	15–25	0.28 (0.23–0.33)	0.6 (0.5–0.7)	0.81–1.34
Obese	≥30.0	5.0–9.0	11–20	0.22 (0.17–0.27)	0.5 (0.4–0.6)	0.78–1.41

* Calculations assume that total weight gain in the first trimester (<13 weeks of pregnancy) is 0.5 kg for obese women, 1 kg for overweight women, and 2 kg for normal weight or underweight women.

† This is calculated by dividing the lower and upper limits of recommended weight gain range by expected weight gain at 40 weeks' gestation. For example, for underweight women, the expected weight gain at 40 week's gestation is 15.77 kg (2 kg + [(40−13)*0.51). Thus, the adequate range of expected weight gain based on recommendation for underweight women is (0.79–1.14), where 0.79 = (12.5/15.77).