Prenatal Weight Gain Counseling and Gestational Weight Gain in Pre-Pregnant Normal Weight Women

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Abstract

Objectives: Almost half of all pregnant women gain excessive weight during pregnancy, which is linked to a variety of poor pregnancy and long term outcomes including post-partum weight retention and obesity. Given the large number of women at risk for excessive gestational weight gain, prenatal visits offer a vital opportunity for obesity prevention. The objective of this study was to assess whether receipt of prenatal weight gain counseling is associated with a decreased risk of excessive weight gain among pre-pregnant normal weight women.

Methods: We conducted a population-based case control study of normal weight women using the Washington State Pregnancy Risk Assessment Monitoring System (PRAMS) data to examine the association of self-reported receipt of pregnancy weight gain counseling during prenatal care and excessive gestational weight gain. Women were eligible for participation if they had a normal body mass index (BMI) of 18.5 -24.9 kg/m^2, delivered a live-born singleton infant, and were interviewed as part of PRAMS from 2004-2008. Cases were women who gained excessive, and controls were those who gained adequate gestational weight according to 1990 Institute of Medicine Guidelines. Because excess weight gain was not rare, we used Poisson regression using generalized linear models with a log-link function to estimate the relative risk (RR) and 95% confidence interval (CI) for the association between prenatal weight counseling and excessive weight gain.

Results: Of the 2,157 women eligible for the study, 49.6% gained excessive weight and 83.9% reported that their provider discussed weight gain during pregnancy. Weight counseling was not associated with excess weight gain. (RR 1.03, 95% CI: 0.88-1.20).

Conclusions: Prenatal counseling was not associated with a decreased risk of excessive gestational weight gain. Perhaps counseling alone is not sufficient to prevent excess gestational weight gain. Further research should not only seek to identify effective counseling methods and resources, but also modifiable maternal and community factors that contribute to healthy weight gain during pregnancy.

Introduction

The Institute of Medicine (IOM) recommends a range of gestational weight women should gain based on pre-pregnancy body mass index (BMI) to address the potential adverse health outcomes associated with gaining too little or too much weight during pregnancy.[1] In recent years, more than half of pregnant women gain more or less than the recommended amount of weight.[1] A recent 2009 IOM report noted that between 1993 and 2007 the percent of normal weight women with singleton term deliveries gaining excessive weight has increased between 3.0 to 6.0%.[1] Approximately 40% of normal weight women are now gaining excessive gestational weight, which is associated with increased risk of gestational hypertension and diabetes, large-for-gestational-age infant, cesarean delivery, lower breastfeeding rates, maternal postpartum weight retention, long-term obesity, and other metabolic and cardiovascular risk factors.[1-7] Given the large number of women at risk for excessive gestational weight gain (and consequently, for future obesity), prenatal visits offer a vital opportunity for obesity prevention.

Numerous multi-dimensional factors contribute to pregnancy weight gain, which makes management of gestational weight gain challenging. Medical providers may play a role in the prevention of excessive gestational weight gain by counseling women about optimal weight gain. New guidelines stress the role of providers and the importance of weight counseling in

supporting women to achieve a healthy weight. Thus, the provision of effective and appropriate weight counseling during prenatal care is one possible intervention for preventing excessive gestational weight gain. Receiving no advice was found to be associated with gestational gain outside the recommended ranges by Cogswell et al 1999[8]; however, no association was identified in a more recent study by Ferrari et al 2012.[9] With the IOM emphasizing the significant role of providers in managing gestational weight gain, understanding the effectiveness of counseling is important. The purpose of this study was to evaluate if provider counseling is associated with a decreased risk of excessive weight gain during pregnancy in Washington State live births.

Methods

Study Design and Sample

We conducted a population-based case control study using data from the Washington State Pregnancy Risk Assessment Monitoring System (PRAMS), which is an ongoing population-based surveillance project of the Centers for Disease Control and Prevention (CDC) and state health departments. In Washington, approximately 1,600 surveys are sent statewide annually to participants selected from birth certificates using a random, stratified sample based on maternal race/ethnicity and geographic area.[10] The PRAMS survey is linked to the birth certificate data. The PRAMS sampling and data collection methods are described in detail elsewhere.[11] Between 2004 and 2008, 7,414 women completed the PRAMS survey by mail or telephone two to six months after delivery. Women were eligible for participation in our study if they began pregnancy with a normal BMI (18.5 -24.9 kg/m^2) and delivered a singleton live birth. Pre-pregnancy BMI was calculated by dividing the pre-pregnancy weight in kilograms by the height in meters squared. If either height or prepregnancy weight or both were missing from the

birth certificate, PRAMS data were used to calculate pre-pregnancy BMI, which occurred for 6% of the eligible study population.

Subjects were excluded if they had a pre-pregnancy BMI < 18.5 or > 24.9 kg/m^2, gained inadequate gestational weight, defined as < 28 or < 25 pounds for women with pre-pregnancy BMI of <19.8 and 19.8-24.9 kg/m^2 respectively**,** delivered prior to 32 weeks or after 44 weeks gestation, or were missing BMI, gestational age, weight gain, or weight counseling data. (Figure 1) Overall, 2,157 women were included in the analysis. The de-identified data used for this study met the exemption criteria of the Washington State Institutional Review Board (IRB).

Measures

Gestational weight gain was calculated by subtracting the pre-pregnancy weight from the delivery weight on the birth certificate and classified as excessive or adequate according to 1990 IOM recommendations based on pre-pregnancy BMI as those were the most current guidelines during the study years.[12] Cases were women whose weight gain exceeded the upper limit of their recommended range (excessive) and controls were women whose weight gain was within their recommended range (adequate). The ranges of recommended weight gain were 28-40 lbs for women with BMI 18.5-19.8 kg/m^2 and 25-35 lbs for women with BMI 19.8-26 kg/m^2. For women who delivered between 32 and 36, or after 41 weeks, adequate weight gain was categorized based on the rates of weight gain recommended in pounds per week for the second and third trimester of pregnancy: 1.3 pounds per week for BMI 18.5-19.8 and 1.0 pound per week for BMI 19.8-24.9.[12]

The main exposure for our study was weight gain counseling during pregnancy, defined by a self-reported (yes/no) response to one question from the PRAMS questionnaire: "During

any of your prenatal care visits, did a doctor, nurse, or other health care worker...talk with you about how much weight you should gain during pregnancy?"

Statistical Analysis

We compared cases and controls on demographic, perinatal, and behavioral characteristics. For our main analysis, we used Poisson regression using generalized linear models with a log-link function to estimate the relative risk (RR) and 95% confidence interval (CI) for the association between prenatal weight counseling and excessive weight gain. This method was selected because excessive gestational weight gain was not rare. Because PRAMS oversamples women of certain racial/ethnic groups and geographic locations, respondents were assigned sampling weights and an analysis weight was generated as a product of the sampling weight, non-response weight, and the frame non-coverage weight.[11] All analyses were conducted with STATA 11 using the weighted survey and sub-population analysis procedures.[13]

Demographic characteristics assessed as potential confounders from the birth certificate included age (≤18/19-24/25-30/30-35/>35 years), marital status (married/not married), education (less than high school/high school/more than high school), race/ethnicity (non-Hispanic White/ non-Hispanic Black/ Hispanic/ Hispanic/ Asian/ American Indian/ Alaska Native/ Multiple Races or Other). Other demographic characteristics from the PRAMS survey included urban/rural residence, annual income (<$15,000 /$15-35,000 / > $35,000), Federal Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) participation, and prenatal care insurance (private insurance or HMO/ Medicaid, Healthy Options or medical coupon/Other). Behavioral characteristics assessed included pre-pregnancy multivitamin use reported (yes/no), pre-pregnancy physical activity (less than one day per week/more than one day per week), smoking status (never smoked/smoked during pregnancy/quit before first trimester),

and drinking status (drank in third trimester/did not drink), which were all collected from the PRAMS survey. Perinatal characteristics assessed included pregnancy intention (intentional/unintentional from the PRAMS survey, and timing of prenatal care (first trimester/≥second trimester or never), number of previous live births (0/1/≥2), pre-pregnancy BMI, and gestational age from the birth certificate. Gestational age in weeks was generated first from the calculated gestational age of delivery date minus last menses date, and replaced with the clinically estimated gestational age if missing or appearing inconsistent with infant birth weight. All gestational ages < 32 weeks were replaced with the clinical estimate for gestational age. These variables were selected given their plausible association with both the exposure and the outcome, and were evaluated as potential confounders by examining their effects on the risk estimate. As none of these changed the risk estimate by >10%, an unadjusted estimate is presented.

Possible effect modifiers were the above potential confounders in addition to language preference (Spanish/English), life stress events (any of 13 stressors/none), intimate partner violence during the 12 months prior to delivery (yes/no), available social support (any of four forms of support/none), and food security (yes/no) from PRAMS. We evaluated for effect modification using the Wald test and found no effect modification.

Results

Among the 2,157 women in our study population, the average weight gain during pregnancy was 38.3 pounds (95% CI: 37.7-38.8 lbs), 3.3 pounds more than the upper limit recommended. Cases comprised almost half of the study population, with 49.6% of women gaining excessive weight. Compared to controls, cases were more likely to be younger,

unmarried, non-Hispanic white, with no previous live birth and of higher pre-pregnancy BMI (Table 1). They were less likely to report multi-vitamin use before pregnancy, intended pregnancy, and to be a non-smoker. Overall, 83.9% of women in the study reported that their provider discussed weight gain during pregnancy (84.3% of cases; 83.4% of controls). Weight counseling was not associated with a decreased risk of excessive gestational weight gain (RR 1.03, 95% CI: 0.88-1.20) (Table 2).

Discussion

Nearly half of women in the study gained excessive weight during pregnancy according to 1990 IOM guidelines. However, the majority of women (83.9%) reported that their provider discussed how much weight they should gain during pregnancy. Report of weight counseling did not differ between cases and controls, and our findings suggest that weight gain counseling, as measured by this single question in PRAMS, is not associated with a decreased risk of excessive gestational weight gain during pregnancy.

Previous studies also report that relatively large percentages of women gain excessive gestational weight, with the majority of reports indicating that > 50% of study participants gain excessive weight.[9,14,15] Our study, however, had a slightly lower proportion of women gaining excessive gestational weight, likely due to the fact that only normal weight women were included in the study population. Additionally, data assessed by the IOM in multiple US studies found that the mean weight gain for normal weight women in many of the samples is at or above the upper limit of weight gain recommendations ranging from 33.1 to 36.6 pounds, which is similar to the mean weight gain of 38.3 pounds we calculated in our study.[1] Over the time period

of the study, it is likely that greater consumption of low nutrient-density foods and lower rates of physical activity contributed to incidence of excessive gestational weight gain.[1]

Although we observed that the majority (83.9%) of women reported their providers discussed weight gain during pregnancy, other studies have found varying percentages of provider weight counseling ranging from 41.7% to 73%.[8,16,17] Levels of self-reported receipt of pregnancy weight gain counseling were greater in our study population than any of the others.[8, 9, 16, 17, 18, 19] However, some of these studies asked women earlier during pregnancy when they may have not yet been counseled, whereas our information was obtained after delivery. Other potential reasons for the difference include over-report of weight gain counseling or an increasing number of providers discussing gestational weight gain over time as our study contains more recent data than the previous studies.

In contrast to our findings of no association, Cogswell et al found that not receiving weight counseling was associated with a 2-fold increased risk of excessive weight gain.[8] That earlier study differs from ours because it included women in all BMI categories and utilized only self-reported weight (BMI and weight gain) information, which could bias the results. That study was also conducted > ten years ago, and it is possible that the nature and/or content of counseling has changed over time due to increasing time constraints and competing demands during provider visits. Our results however, are consistent with a more recent study reporting that receipt of provider advice was not significantly associated with a decreased risk of excessive gestational weight gain.[10] Our lack of an association may also be the result of other factors including providers' lack of knowledge, cultural competency, and/or tools, or the patients' inability to effectively follow the given advice. Stotland et al. in a 2010 qualitative study of obstetrician/gynecologists, midwives, and nurse practitioners demonstrated that providers are

concerned about excessive gestational weight, but often feel they have insufficient training and that their counseling is ineffective.[20] Providers have varied counseling approaches and want new tools to assist them in counseling women appropriately and effectively during pregnancy. Qualitative research has also shown that providers feel that they would better address pregnancy weight gain and nutrition if they had more time with their patients.[21] Chang et al 2013 found that providers lacked resources for patients and did not feel weight gain was a priority, and thus often did not counsel women until they gained excessive weight.[22] It should be noted, that pregnant women are diverse and have varying normative and behavioral beliefs and perceptions around weight change and in pregnancy.[23] These cultural differences can influence their risk factors for excessive gestational weight gain and the potential effectiveness of the prenatal care they receive.

Our results should be considered in light of several limitations including limited exposure information, recall bias, and selection bias. For pregnancy weight gain counseling, we could only measure whether or not a woman reported being counseled, and not the timing, number of sessions, or content of weight gain counseling or how she chose to use the information. Women who gained excessive weight during pregnancy may have been more likely to remember receiving weight counseling than women who gained adequate weight, and this potential recall bias would likely attenuate our findings. Additionally, women may have actually received weight gain counseling later in pregnancy when excessive weight had already been gained and this could result in our null finding. This was observed in Stotland et al 2010 as providers noted having a more reactive approach to gestational weight gain, addressing it only when a women had already gained too much weight or brought it up herself.[20] Given that women who are gaining excessive weight may be more likely to be counseled than those who are gaining within

recommended ranges as noted in previous studies, it is possible that the outcome preceded the exposure. [20, 22] The study population only included women who were sampled by and responded to the PRAMS survey and had available height, pre-pregnancy weight, delivery weight, gestational age, and weight counseling information. Missing weight, height, and/or weight gain data limited the sample size and leads to potential selection bias. However, because pre-pregnancy weight and height are reported in both PRAMS and the birth certificate, the amount of missing data was greatly reduced. Although it is difficult to make assumptions regarding how this would impact our findings, this missingness is most likely to be non-differential between cases and controls and thus not greatly impact the results.

Our findings do not provide evidence for an association between provider counseling and a decreased risk of excessive gestational weight gain. Although it is possible that we were unable to detect an effect due to our study's limitations, it is also possible that the lack of effect could be due to limitations in weight gain counseling as it is currently practiced in prenatal care. Research regarding interventions to prevent excessive gestational weight gain have focused mainly around behavior change related to diet and/or physical activity.[24] Several studies have found a modest effect of prenatal lifestyle interventions, with most successful interventions promoting both healthy eating and physical activity habits together.[25] However, the intervention components and participants have been considerably varied, which makes it challenging to identify the most effective means of integrating obesity prevention into prenatal care.[25] A recent Dutch randomized controlled trial of an intensive four-session counseling intervention to prevent excessive gestational weight gain did not have an effect on either excessive gestational weight gain or post-partum weight retention.[14] However, many of the interventions that decreased the

risk of excessive gestational weight gain have been time and resource-intensive, making their translation into routine prenatal care services difficult.

Given the multifactorial nature of gestational weight gain, counseling alone may not be sufficient to reduce the risk of excessive gestational weight gain. Further research should identify effective counseling methods and resources, in addition to other important maternal and community factors that contribute to healthy weight gain during pregnancy.

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Figure 1. Study population selection methods from PRAMS dataset

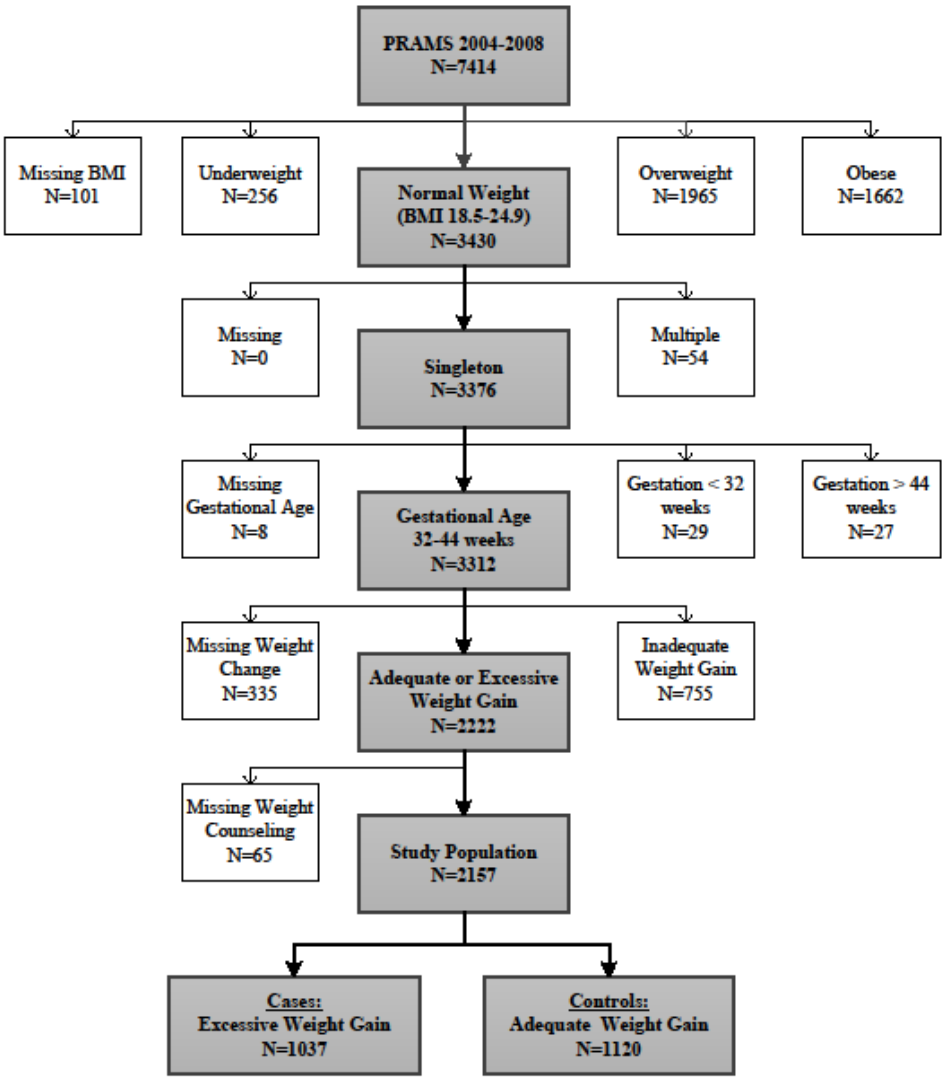

Table 1. Demographic and perinatal characteristics of pre-pregnant normal weight women, by gestational weight gain status (excess/recommended), Washington State, 2004-2008.

Characteristics [γ]	Adequate weight gain (N=1,120)		Excessive weight gain (N=1,037)	
	N[α]	(%)[β]	N[α]	(%)[β]
Age (years)				
<19	60	(4.2)	82	(6.6)
19-25	264	(21.4)	304	(28.3)
25-30	273	(25.9)	276	(26.7)
30-34	326	(30.8)	236	(27.4)
35+	197	(17.8)	139	(15.7)
Married	786	(75.8)	652	(69.5)
Years of Education				
<12	182	(13.2)	175	(12.4)
12	221	(19.4)	225	(22.0)
13+	704	(67.4)	632	(65.6)
Rural Residence	289	(32.6)	297	(36.3)
Race				
Non-Hispanic White	352	(66.6)	380	(73.5)
Non-Hispanic Black	105	(2.6)	106	(2.5)
Hispanic	234	(15.1)	176	(11.5)
Asian	268	(11.7)	120	(6.9)
American Indian/Alaska Native	87	(1.1)	153	(1.4)
Multiple Race/Other	71	(3.0)	102	(4.2)
Previous live births	590	(55.4)	455	(46.2)
0	524	(44.6)	570	(53.8)
1	327	(29.9)	273	(28.4)
≥2	263	(25.5)	182	(17.9)
Pre-pregnancy BMI				
18.5-20.0 kg/m^2	201	(17.6)	103	(10.5)
20.1-22.5 kg/m^2	491	(43.5)	492	(46.6)
22.6-24.9 kg/m^2	428	(38.9)	442	(42.9)
Used WIC	450	(32.4)	466	(36.7)
Prenatal care insurance				
Insurance/HMO	574	(58.4)	463	(52.2)
Medicaid/Healthy Options	452	(34.7)	471	(39.5)
Other	63	(6.9)	86	(8.4)
Smoking Status				
Never smoked	987	(88.2)	803	(77.5)
Smoked during pregnancy	68	(6.7)	103	(9.8)
Quit during pregnancy	60	(5.1)	126	(12.7)
Intentional Pregnancy	715	(69.5)	615	(61.6)
Late Prenatal Care	189	(15.9)	205	(19.1)
Prenatal care adequacy (Kotelchuck Index)				
Inadequate	202	(19.1)	202	(20.7)
Intermediate	107	(10.5)	79	(7.9)
Adequate	407	(38.5)	342	(35.0)
Adequate Plus	297	(31.9)	307	(36.3)
Gestational Age (weeks)				
32-36	109	(9.8)	79	(7.0)
37-41	964	(86.7)	898	(86.9)
42-44	47	(3.5)	60	(6.1)

[α] Unweighted N-values [β] Weighted percentages

[γ] Missing unweighted n-values include: 1control and 3 cases for marital status; 13 controls and 5 cases for education; 3 controls and 0 cases for race; 1 control and 0 cases for language preference; 6 controls and 12 cases for previous live birth; 2 controls and 1 case for WIC; 31 controls and 17 cases for insurance; 5 controls and 5 cases for smoking; 8 controls and 23 cases for drinking; 14 controls and 16 cases for pregnancy intention; 3 controls and 2 cases for late prenatal care; 107 controls and 107 cases for Kotelchuck Index.

Table 2. Results for the association between receipt of weight counseling and excessive gestational weight gain.

	Case		*Control*			
Exposure	**n** [α]	**(%)** [β]	**n** [α]	**(%)** [β]	**RR ***	**95% CI**
Weight Counseled						
Normal Weight Women	870	(84.3)	952	(83.4)	1.03	0.88-1.20

[α] Unweighted N-values
[β] Weighted percentages