

Effect of Gestational Weight Gain on Overweight and Obese Pregnant Women

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ABSTRACT

Objective: To examine the adherence of gestational weight gain (GWG) recommendations and pregnancy outcomes among overweight and obese pregnant women.

Materials and Methods: The medical records of 405 overweight or obese pregnant women who delivered at Siriraj Hospital between September 2018 and June 2019 were reviewed. The adherence to GWG recommendations according to pre-pregnancy body mass index (BMI) was examined. The characteristics and pregnancy outcomes of the overweight and obese pregnancies as well as between the adherence and non-adherence to the GWG recommendations groups were studied and compared between the groups.

Results: Adherence to the GWG recommendations between the overweight and obese pregnancy groups were significantly different at 60.2% and 44% respectively (p-value = 0.002), although the average GWG was significantly lower in the obese than overweight pregnancies (p-value = 0.003). Pre-pregnancy BMI was significantly higher in the non-adherence group compared with the adherence group (p-value = 0.025). Pregnancy outcomes as well as the prevalence of gestational diabetes mellitus between these two groups were comparable. Also, adverse pregnancy outcomes were not statistically significantly different among the adherence and non-adherence groups.

Conclusion: The adherence to gestational weight gain recommendations in obese and overweight pregnancies is still a challenge. Obese pregnant women are less likely to control weight gain during pregnancy. Pre-pregnancy BMI is an important factor for overweight and obese pregnant women to achieve the GWG goal. Ensuring a proper GWG alone might not improve most adverse pregnancy outcomes in overweight and obese pregnancies.

Keywords: Obese pregnancy; overweight pregnancy; gestational weight gain; pregnancy outcomes (Siriraj Med J 2022; 74: 364-370)

INTRODUCTION

Obesity is a medical condition with public health concern. In pregnancy, the pre-pregnancy body mass index (BMI) can significantly affect the pregnancy outcome. Nowadays, many women are getting pregnancy with an high BMI; which leading to the higher the risk of maternal and fetal complications.¹⁻⁴ Gestational weight gain (GWG) is a modifiable risk factor for adverse pregnancy

outcomes. GWG outside the recommended level has been found to be related with a higher risk of many adverse pregnancy outcomes.⁵⁻⁸ Pregnant women in all BMI categories are more likely to gain excessive weight during pregnancy. However, a higher pre-pregnancy BMI and higher GWG are associated with a higher risk of pregnancy complications.⁹⁻¹³

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In overweight or obese women, the GWG is particularly problematic due to the narrow range of optimal weight gain, and as the chances of a difficult delivery is dramatically increased with excessive GWG, along with other adverse pregnancy outcomes, such as postpartum hemorrhage, cesarean section, and genital tract injury. Risk of pregnancy-induced hypertension, and gestational diabetes mellitus also increased among obese pregnancy due to changes of many peptides.^{14,15} Such pregnancies with excessive GWG are also more common to have postpartum weight retention, which is an important risk factor for metabolic disease development in the future. In addition, infants born to overweight or obese mothers with excessive GWG have a higher risk of large for gestational age (LGA), macrosomia, birth hypoxia, and birth injury, and a higher probability of childhood obesity and impaired glucose tolerance. Unfortunately, many pregnant women, especially those in the overweight/obese categories, lack knowledge about personal BMI, GWG targets, and appropriate weight management during pregnancy.^{16,17}

Pre-conception weight loss is ideal to prevent adverse pregnancy outcomes; however, this is unlikely to be practiced. Counseling for diet, exercise, lifestyle behavioral changes, and motivation to maintain appropriate GWG throughout pregnancy is crucial.¹⁸ Proper weight gain through different dietary interventions during pregnancy is one of the keystones to optimizing maternal and neonatal outcomes, especially in overweight/obese pregnancy.¹⁹

Our previous study showed the relation between gestational weight gain, using institutional criteria (Siriraj GWG recommendation), and pregnancy outcomes.²⁰ In comparing the adherence to GWG for all pre-pregnancy BMI categories between the Siriraj and the 2009 Institute of Medicine (IOM) guidelines²¹, the pregnancy outcomes yielded similar results; however, 60% of Thai pregnant women were able to adhere to the Siriraj guideline, compared to only 40.5% who adhered to the 2009 IOM guideline.²⁰

This study was confined to overweight and obese pre-pregnancy BMI categories only. Siriraj optimal GWG recommendations were made and monitored throughout the pregnancy period. The primary objective of this study was to examine the adherence to GWG recommendations among these two groups of obese and overweight pregnant women. The association between pre-gestational BMI (overweight and obese) and the effect of adherence to GWG recommendations (based on the Siriraj guideline) on the rates of adverse pregnancy outcomes were also evaluated.

MATERIALS AND METHODS

This study was a retrospective study that involved a review of the medical records of 405 overweight or obese pregnancies delivered at Siriraj Hospital between September 2018 and June 2019. Ethical approval for this study was obtained from the Siriraj Institutional Review Board (SIRB), Faculty of Medicine Siriraj Hospital, Mahidol University (Si 717/2020).

In Siriraj Hospital, the height of each pregnant woman is measured. The self-reported pre-pregnancy weight is recorded at the first antenatal visit. Pre-gestational BMI is calculated as weight (kg)/height² (m²). In this study, overweight (25.0–29.9 kg/m²) and obese (30.0 kg/m² or higher) pregnant women were the target participants.

Gestational weight gain (GWG) was obtained from the difference between a woman's weight at delivery and her pre-gestational weight. The inclusion criteria for this study were singleton pregnant women with a first antenatal visit before 20 weeks' gestation, and a maternal pre-pregnancy BMI of 25 kg²/m or more with available pre-pregnancy weight data. The exclusion criteria included multiple pregnancies and fetal anomalies. Pregnant women were categorized into two groups based on their GWG relative to Siriraj recommendations (adherence and non-adherence). The Siriraj GWG recommendations for overweight and obese pregnant women are 6–14 kg and 4–8 kg, respectively. All the pregnant women were offered dietary counseling and advice on physical activity during antenatal care.²⁰

We examined the following maternal and neonatal outcomes: gestational age at delivery, route of delivery, gestational diabetes mellitus (GDM), preeclampsia, postpartum hemorrhage (≥ 500 ml for vaginal delivery and $\geq 1,000$ ml for cesarean delivery), birthweight $< 2,500$ g (low birth weight) and $\geq 4,000$ g (macrosomia), Apgar scores < 7 at 1 minute and 5 minutes, neonatal intensive care unit (NICU) admission, neonatal hypoglycemia, brachial plexus injury, fracture clavicle, and neonatal death.

Statistical analysis

Descriptive statistics were used for analyzing the data, including the mean, standard deviation (SD), median, interquartile range (IQR), number, and percentages as appropriate. The chi-square test was used to compare characteristics between two groups. Logistic regression analysis was used to determine the independent associated factors for gestational diabetes outcome, adjusted for potential confounders. A p-value of less than 0.05 was considered statistically significant.

RESULTS

In the study period, a total of 405 women fitted the inclusion criteria and were enrolled in the study. Two-thirds (65.2%) of them were overweight (pre-pregnancy BMI = 25–29.9 kg/m²), while the others were obese pregnancies (pre-pregnancy BMI ≥ 30.0 kg/m²). The maternal characteristic of these two groups are shown in [Table 1](#). Both groups were comparable in terms of age, parity, and gestational age at first antenatal care (ANC) visit. The overweight group significantly adhered to the GWG recommendations more than the obese group, 60.2% vs. 44.0% respectively; although the mean GWG in the overweight pregnancy was significantly higher than in the obese pregnancy. [Table 2](#) shows a comparison of the maternal characteristic according to the adherence to the GWG recommendations. Only BMI was significantly lower among the adherence group compared to the non-adherence group. The pregnancy outcomes were also compared among the groups, and the details are listed in [Tables 3 & 4](#). None of the pregnancy outcomes were statistically significantly different between the adherence and non-adherence groups as well as the overweight and obese pregnancies. For the most common pregnancy complication, namely GDM, this condition was still seen in about one-third of the women, even those who adhered to the GWG protocol (53/159 and 21/62 in the overweight and obese groups, respectively). ([Table 4](#))

DISCUSSION

This study showed that the overall adherence to GWG recommendations in the overweight and obese pregnancies was only a half (54.6%). Adverse pregnancy complications and pregnancy outcomes were not found to be statistically significantly different between the adherence and non-adherence groups. Pre-pregnancy BMI is a highly important factor for overweight and obese pregnancy to achieve the GWG goal.

Adherence to the Siriraj GWG recommendations was higher, with statistical significance, in the overweight group (60.2%) compared to in the obese group (44.0%). This might be explained by the wider range of GWG (6–14 kg) in the overweight pregnancy, compared with the narrower range (4–8 kg) in the obese pregnancy.²⁰ Most Asian studies to date have used the IOM 2009 GWG recommendation as a reference data with Asian populations due to the lack of well-established GWG recommendations and as no consensus has yet been reached for Asian populations. Siriraj Hospital proposed our own GWG recommendations in 2014 for all pre-pregnancy BMI categories according to the appropriate fetal birth weight.²⁰

Similar to previous studies, this study showed that the rates of pregnancy complications in the overweight and obese pregnancies were higher than those in overall pregnancy especially for GDM (31.4% and 27.7%, respectively).^{22,23}

TABLE 1. Comparison of the maternal and clinical characteristics between overweight and obese pre-pregnancy BMI categories (n = 405).

Characteristics	BMI 25–29.9	BMI ≥ 30	P-value
	N = n (%)	N = n (%)	
	264 (65.2)	141 (34.8)	
Maternal age (years) median (IQR)	32 (28, 36)	32 (27, 36)	0.398
Parity			0.969
Nullipara	81 (30.7)	43 (30.5)	
Multipara	183 (69.3)	98 (69.5)	
GA at 1st ANC (weeks) median (IQR)	9 (7, 13)	9 (7, 12)	0.374
GWG during pregnancy (kilograms) mean (SD)	11.3(5.1)	9.7 (5.3)	0.003
Adherence	159 (60.2)	62 (44.0)	0.002

Abbreviations: ANC; antenatal care, BMI; body mass index, GA; gestational age, GWG; gestational weight gain.

TABLE 2. Comparison of the maternal and clinical characteristics between adherence and non-adherence to the Siriraj gestational weight gain recommendation groups (n = 405).

Characteristics	Adherence N = n (%) 221 (54.6)	Non-adherence N = n (%) 184 (45.40)	P-value
Maternal age (years), median (IQR)	32 (27, 36)	32 (27, 36)	0.956
Parity			0.719
Nullipara	66 (29.9)	58 (31.5)	
Multipara	155 (70.1)	126 (68.5)	
Body mass index (kg/m ²), median (IQR)	27.8(26.2, 30.9)	29.2 (26.6, 31.6)	0.025
25–29.9	159 (71.9)	105 (57.1)	0.002
≥ 30	62 (28.1)	79 (42.9)	
GA at 1st ANC (weeks), median (IQR)	9 (7,13)	9 (7, 12.2)	0.714

Abbreviations: ANC; antenatal care, GA; gestational age, kg/m²; kilogram per square meter.

TABLE 3. Comparison of the pregnancy outcomes between overweight and obese pre-pregnancy BMI categories (n = 405).

Outcomes	BMI 25–29.9 N = n (%) 264 (65.2)	BMI ≥ 30 N = n (%) 141 (34.8)	P-value
Gestational age at delivery (weeks)	38 (38, 39)	38 (37, 39)	0.241
24–33	5 (1.9)	6 (4.3)	0.205
34–36	25 (9.5)	18 (12.8)	
≥ 37	234 (88.6)	117 (83.0)	
Route of delivery			0.063
Normal labor	112 (42.4)	64 (45.4)	
Operative vaginal delivery	10 (3.8)	0 (0)	
Cesarean delivery	142 (53.8)	77 (54.6)	
Pregnancy complications			
Gestational diabetes	83 (31.4)	39 (27.7)	0.499
Preeclampsia	24 (9.1)	18 (12.8)	0.325
Post-partum hemorrhage	17 (6.4)	13 (9.2)	0.413
Birth weight (grams), median (IQR)	3160 (2900, 3455)	3150 (2870, 3430)	0.48
<2,500	23 (8.7)	16 (11.3)	0.642
2,500–3,999	228 (86.4)	117 (83)	
≥ 4,000	13 (4.9)	8 (5.7)	
Apgar score at 1st minute <7	22 (8.3)	20 (14.2)	0.095
Apgar score at 5th minute <7	3 (1.1)	2 (1.4)	1
Neonatal hypoglycemia	16 (6.1)	15 (10.6)	0.146
NICU admission	5 (1.9)	4 (2.8)	0.725
Brachial plexus injury	0	2 (1.4)	0.121

Abbreviations: DFIU; dead fetus in utero, NICU; neonatal intensive care unit.

TABLE 4. Comparison of the pregnancy outcomes between adherence and non-adherence to the Siriraj gestational weight gain recommendation groups (n = 405).

Outcomes	Adherence N = n (%) 221 (54.6)	Non-adherence N = n (%) 184 (45.40)	P-value
Gestational age at delivery (weeks)			0.532
median (IQR)	38 (38, 39)	38 (37, 39)	
24–33	6 (2.7)	5 (2.7)	0.893
34–36	22 (10.0)	21 (11.4)	
≥ 37	193 (87.3)	158 (85.9)	
Route of delivery			0.608
Normal labor	95 (43.0)	81 (44.0)	
Operative vaginal delivery	4 (1.8)	6 (3.3)	
Cesarean delivery	122 (55.2)	97 (52.7)	
Pregnancy complications			
Gestational diabetes	74 (33.5)	48 (26.1)	0.132
Preeclampsia	23 (10.4)	19 (10.3)	1
Post-partum hemorrhage	17 (7.7)	13 (7.1)	0.961
Birth weight (grams), median (IQR)	3130 (2850, 3360)	3215 (2900, 3492)	0.083
<2,500	23 (10.4)	16 (8.7)	0.699
2,500–3999	188 (85.1)	157 (85.3)	
≥ 4,000	10 (4.5)	11 (6.0)	
Apgar score at 1st minute <7	20 (9.0)	22 (12.0)	0.429
Apgar score at 5th minute <7	1 (0.5)	4 (2.2)	0.181
Neonatal hypoglycemia	3 (1.4)	6 (3.3)	1
NICU admission	17 (7.7)	14 (7.6)	0.311
Brachial plexus injury	0	2 (1.1)	0.206

Abbreviations: DFIU; dead fetus in utero, NICU; neonatal intensive care unit.

These can be explained by the existence of a pre-existing degree of glucose intolerance and insulin insensitivity in the overweight and obese pregnant women from them having a high BMI, placing them at increased risk of developing GDM. A systematic review and meta-analysis revealed that physical activity and diet interventions designed for controlling GWG are still beneficial and effective for reducing the incidence of GDM.²⁴ However, the prevalence of GDM in this study was not statistically significantly different among the adherence and non-adherence to the GWG recommendations groups. The stronger association of weight gain in the first trimester

with the development of GDM might affect this finding²⁵, although our data for first trimester weight gain was limited.

Systematic reviews have shown that excessive GWG is associated with multiple adverse maternal and fetal outcomes. There is the evidence that lifestyle interventions during pregnancy could be decrease excessive weight gain, however benefit for most adverse pregnancy outcomes have not been shown.^{26,27} Similar to this study, the immediate fetal and maternal outcomes (e.g., preterm birth, macrosomia, low Apgar score) and pregnancy complications (e.g., preeclampsia, gestational diabetes,

postpartum hemorrhage) between the overweight and obese groups as well as between the adherence and non-adherence groups were not statistically significantly different. On the contrary, meta-analysis and a review of the systematic reviews revealed that the risks of macrosomia, pregnancy-induced hypertension, and neonatal respiratory distress syndrome in pregnancies with overweight or obese could be effectively reduced by multi-component diet and physical activity interventions. In addition, diet-only interventions could reduce the risks of pregnancy-induced hypertension and GDM in this people.²⁸ The different results of these studies might be explained by the evidence that pre-pregnancy BMI is more strongly associated with adverse pregnancy outcomes than the amount of gestational weight gain alone.²⁹ Therefore, in overweight and obese pregnancies, more research on innovative interventions, including pre-conception counseling, should be considered to achieve proper pregnancy outcomes.

There are some limitations in this study. First, this is a retrospective observational study with some confounding factors that might have affected the pregnancy outcomes. Second, information on the long-term maternal and neonatal outcomes was limited. Last, the ability to identify statistical significance in the analysis of pregnancy outcomes related to gestational weight gain adherence and pre-pregnancy BMI might be limited by the relatively small sample size.

CONCLUSION

Obese pregnancies were less likely to control weight gain during pregnancy, although pregnancy complications were not significantly different to those in overweight pregnancies. More innovative interventions are still needed to overcome this public challenge.

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