
OBSTETRICS

Knowledge of Pregnant Women on Gestational Weight Gain and Associated Factors

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ABSTRACT

Objectives: To evaluate knowledge of pregnant women on pre-pregnancy body mass index (BMI) status, gestational weight gain (GWG) and associated factors.

Materials and Methods: A total of 230 singleton, healthy pregnant women who attended antenatal clinic before 20 weeks of gestation were included. Knowledge and self-evaluation of BMI status and GWG were evaluated by self-administered questionnaire. Various characteristics were compared between those with correct and incorrect self-evaluation of BMI and GWG to identify possible associated factors.

Results: Mean age was 29.2 years and 67.8% were nulliparous. Mean BMI was 22.3 kg/m², 17% were overweight and 5.2% were obese. Of 230 women, 20.9% and 62.2% did not know their BMI status and appropriate GWG, respectively. BMI status were correctly identified in 55.7% while 3.9% and 19.6% under- and overestimated their status. Appropriate GWG were correctly identified in only 12.2% while 15.7% and 10% under- and overestimated their GWG. Underweight women were significantly more likely to overestimate their BMI status and GWG while overweight/obese women were more likely to overestimate their GWG. Women who graduated Bachelor degree or higher were significantly more likely to correctly identify their BMI status ($p = 0.007$) and GWG ($p = 0.019$). Women with normal weight were significantly more likely to correctly identify their BMI status ($p < 0.001$), but not GWG.

Conclusions: Only 55.7% and 12.2% of pregnant women can correctly identify their BMI status and appropriate GWG. Pre-pregnancy BMI status and higher education significantly associated with correct knowledge on both issues.

Keywords: pregnancy, body mass index, gestational weight gain, knowledge.

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ความรู้ของหญิงตั้งครรภ์เกี่ยวกับน้ำหนักตัวที่เพิ่มขึ้นในช่วงตั้งครรภ์และปัจจัยที่เกี่ยวข้อง

พรพิมล เรืองวุฒิเลิศ, อุไร สำเภาเจริญ, ดิฐกานต์ บริบูรณ์หิรัญสาร

บทคัดย่อ

วัตถุประสงค์: เพื่อประเมินความรู้ของสตรีตั้งครรภ์เกี่ยวกับน้ำหนักที่เพิ่มระหว่างตั้งครรภ์และปัจจัยที่เกี่ยวข้อง

วัสดุและวิธีการ: ทำการศึกษาในสตรีตั้งครรภ์เดี่ยวที่มีสุขภาพแข็งแรง 230 คน ที่ฝากครรภ์ก่อน 20 สัปดาห์ ทำการประเมินความรู้ และการประเมินตนเองเกี่ยวกับดัชนีมวลกายและน้ำหนักที่ควรเพิ่มระหว่างตั้งครรภ์ โดยให้ตอบแบบสอบถามด้วยตนเอง ทำการเปรียบเทียบลักษณะต่างๆ ของสตรีตั้งครรภ์ระหว่างกลุ่มที่สามารถประเมินตนเองเกี่ยวกับดัชนีมวลกาย และน้ำหนักที่ควรเพิ่มระหว่างตั้งครรภ์ ได้ถูกต้องและไม่ถูกต้อง เพื่อประเมินปัจจัยที่เกี่ยวข้อง

ผลการศึกษา: สตรีตั้งครรภ์มีอายุเฉลี่ย 29.2 ปี และร้อยละ 67.8 ยังไม่เคยมีบุตร ค่าดัชนีมวลกายเฉลี่ยเท่ากับ 22.3 กก/ตารางเมตร ร้อยละ 17 มีภาวะน้ำหนักเกิน และร้อยละ 5.2 มีภาวะอ้วน ร้อยละ 20.9 และร้อยละ 62.2 ของสตรีตั้งครรภ์ไม่ทราบเกี่ยวกับเกี่ยวกับดัชนีมวลกายและน้ำหนักที่ควรเพิ่มระหว่างตั้งครรภ์ ร้อยละ 55.7 ของสตรีตั้งครรภ์ สามารถประเมินดัชนีมวลกายได้ถูกต้อง ในขณะที่ร้อยละ 3.9 และร้อยละ 19.6 ประเมินค่าต่ำและสูงกว่าความเป็นจริงตามลำดับ ร้อยละ 12.2 ของสตรีตั้งครรภ์สามารถประเมินน้ำหนักที่ควรเพิ่มระหว่างตั้งครรภ์ได้ถูกต้อง ในขณะที่ร้อยละ 15.7 และร้อยละ 10 ประเมินค่าต่ำและสูงกว่าความเป็นจริงตามลำดับ สตรีตั้งครรภ์ที่น้ำหนักต่ำกว่าเกณฑ์จะประเมินค่าดัชนีมวลกายสูงกว่าจริง และสตรีตั้งครรภ์ที่น้ำหนักเกินหรืออ้วนจะประเมินน้ำหนักที่ควรเพิ่มระหว่างตั้งครรภ์สูงกว่าจริง อย่างมีนัยสำคัญ สตรีตั้งครรภ์ที่จบการศึกษาปริญญาตรีหรือสูงกว่าจะสามารถประเมินค่าดัชนีมวลกายและน้ำหนักที่ควรเพิ่มระหว่างตั้งครรภ์ได้ถูกต้องสูงกว่าอย่างมีนัยสำคัญ ($p = 0.007$ และ $p = 0.019$) สตรีตั้งครรภ์ที่น้ำหนักปกติจะสามารถประเมินค่าดัชนีมวลกายได้ถูกต้องสูงกว่าอย่างมีนัยสำคัญ ($p < 0.001$)

สรุป: สตรีตั้งครรภ์เพียงร้อยละ 55.7 และร้อยละ 12.2 สามารถประเมินดัชนีมวลกายและน้ำหนักที่ควรเพิ่มระหว่างตั้งครรภ์ได้ถูกต้อง ค่าดัชนีมวลกายก่อนตั้งครรภ์และการศึกษาในระดับปริญญาตรีหรือสูงกว่าสัมพันธ์กับการประเมินดัชนีมวลกายและน้ำหนักที่ควรเพิ่มระหว่างตั้งครรภ์ได้ถูกต้อง

คำสำคัญ: การตั้งครรภ์, ดัชนีมวลกาย, น้ำหนักที่เพิ่มระหว่างการตั้งครรภ์, ความรู้

Introduction

Overweight and obesity represent a rapidly growing threat to the health of populations in an increasing number of countries. Consequently, number of pregnant women who are overweight and obese also increase. Moreover, excessive gestational weight gain (GWG) is now a common problem with an increasing worldwide incidence⁽¹⁾. Achieving recommended GWG is among priorities for obstetrical care, as it is necessary to support healthy fetal growth and can prevent maternal and child health complications⁽²⁾.

Maternal obesity and excessive GWG have been associated with various maternal and neonatal complications, such as preeclampsia, gestational diabetes mellitus, instrumental delivery, cesarean section, postpartum complications, preterm delivery, stillbirth, congenital anomalies, fetal macrosomia, birth injuries, neonatal hypoglycemia, perinatal mortality, and childhood obesity⁽³⁻⁷⁾.

The Institute of Medicine (IOM) published the recommendations for weight gain during pregnancy⁽⁸⁾. However, the Centers for Disease Control and Prevention reported that only approximately 32% of pregnant women had appropriate GWG⁽⁹⁾. Reported associated factors for appropriateness of GWG included pre-pregnancy overweight and obesity, socioeconomic status, and underestimation of pre-pregnancy body weight^(10, 11). Other important determinants were awareness and knowledge of pregnant women on both their pre-pregnancy body mass index (BMI) status and appropriate GWG.

A previous study reported that 74% of obese pregnant woman underestimated their own BMI, and 64% of obese women and 40% of overweight women overestimated their recommended GWG⁽¹²⁾. This was similar to other studies which reported that pregnant woman commonly had poor knowledge about GWG, especially if they were overweight or obese. These women usually gained more weight than those with normal pre-pregnancy BMI because they commonly underestimated their BMI, which could lead to misunderstanding about their appropriate GWG^(11, 13). Another previous study reported that only 27% of pregnant women correctly knew their appropriate GWG,

and more than 20% reported an amount of weight gain that is not recommended by the IOM for any woman of any weight category⁽¹³⁾.

The problem of inappropriate GWG is also not uncommon in Siriraj Hospital and Thailand⁽¹⁴⁾. However, there is still limited information regarding this issue, especially in terms of knowledge of pregnant women both on their pre-pregnancy weight status and appropriate GWG. Therefore, this study was primarily aimed to assess if the pregnant women can correctly evaluate their expected GWG. Secondary objectives were to evaluate if the women can correctly identify their pre-pregnancy BMI status. In addition, knowledge and perception on expected GWG of pregnant women were explored. Factors associated with correct knowledge of pregnant woman on pre-pregnancy BMI status and expected GWG were evaluated.

Materials and Methods

After approval from Siriraj Institutional Review Board (SIRB), a cross-sectional study was conducted at the Department of Obstetrics and Gynecology, Faculty of Medicine, Siriraj Hospital. During August to December 2017, a total of 230 singleton, healthy pregnant women who started their antenatal care before 20 weeks of gestation were included by simple random sampling. A sample size of at least 196 women was required based on the 15% rate of correct knowledge of GWG from a pilot study, with 5% allowable error and at 95% significance level. However, to include 15% loss from incomplete questionnaire answers or other reasons, a total of 230 women were enrolled.

After informed consent, the woman was asked to complete a self-administered questionnaire in a private room and return it without any identification before leaving the antenatal care unit. The questionnaire consisted of baseline demographic data, self-assessment of pre-pregnancy BMI and expected GWG. The women were asked which group of BMI (underweight, normal, overweight, obesity) they thought they were in and how much weight gain they expected in current pregnancy. In addition, perception and knowledge regarding GWG were also evaluated. The questionnaire was evaluated for its validity by 2 senior obstetricians and reliability

was tested using Chronbach's alpha with the result of 0.85. Pre-pregnancy BMI and recommended GWG were categorized according to IOM recommendation⁽⁸⁾. Recommended weight gain during pregnancy were as follows: GWG of 12.5-18 kg for women who are underweight (BMI < 18.5 kg/m²), 11.5-16 kg for women with normal weight (BMI 18.5-24.9 kg/m²), 7-11.5 kg for overweight women (BMI 25.0-29.9 kg/m²) and 5-9 kg for obese women (BMI ≥ 30 kg/m²).

Descriptive statistics were used to describe various variables, using mean, standard deviation, number, and percentage, as appropriate. Rates of correct self-evaluated pre-pregnancy BMI and GWG were estimated. Student t test and chi square test were used to compare various characteristics between

women with correct and incorrect self-evaluated pre-pregnancy BMI and GWG. A p value of < 0.05 was considered statistically significant.

Results

Baseline characteristics of the participants are demonstrated in Table 1. Mean age was 29.2 years, mean gestational age at enrollment was 10 weeks and mean BMI was 22.3 kg/m². Of 230 participants, 17.8% were underweight, 60% had normal weight, 17% were overweight and 5.2% were obese. Majority of the woman were nulliparous (67.8%), married (95.2%), worked as employee (57.4%), graduated less than Bachelor degree (54.3%) and had family income between 20,000-50,000 Baht (52.6%).

Table 1. Baseline characteristics of the participants (N=230).

Characteristics	Mean ± SD
Mean age ± SD (years)	29.2 ± 6.5
Mean gestational age ± SD (weeks)	10 ± 4
Mean BMI ± SD (kg/m ²)	22.3 ± 4.3
	N (%)
BMI category	
Underweight	41 (17.8%)
Normal weight	138 (60.0%)
Overweight	39 (17.0%)
Obese	12 (5.2%)
Nulliparous	146 (67.8%)
Married	219 (95.2%)
Occupation	
Housewife	25 (10.9%)
Government service	14 (6.1%)
Employee	132 (57.4%)
Own business	27 (11.7%)
Others	32 (13.9%)
Education	
Below bachelor degree	125 (54.3%)
Bachelor degree or higher	105 (45.7%)
Family income	
< 20,000 Baht	66 (28.7%)
20,000-50,000 Baht	121 (52.6%)
≥ 50,000 Baht	43 (18.7%)

SD: standard deviation, BMI: body mass index

Table 2 shows the results of self-evaluation of BMI and GWG. Overall, only 128 women (55.7%) can correctly evaluate their BMI status and 9 women (3.9%) underestimated and 45 women (19.6%) overestimated their BMI status. As many as 20.9% were unable to evaluate their BMI status. For self-evaluation of GWG, majority of the women (62.2%) were unable to evaluate their GWG and only 28 (12.2%) correctly estimated their GWG. On the other hand, 36 women (15.7%) underestimated and 23 women (10%) overestimated

their GWG. Majority of underweight women overestimated their BMI (48.8%) while majority of normal (68.1%) and overweight or obese women (45.1%) correctly identified their BMI status. Only 11.8% of overweight and obese women underestimated their BMI status. With regard to GWG, only 14.6%, 13%, and 7.8% of underweight, normal weight, and overweight or obese women correctly knew their recommended GWG. As many as 25.5% of overweight or obese women overestimated their GWG.

Table 2. Self-evaluation of BMI status and expected GWG according to BMI status (N=230).

Self-evaluation	BMI status			p value*
	Underweight N=41	Normal N=138	Overweight/Obese N=51	
BMI				< 0.001
Underestimated	0 (0%)	3 (2.2%)	6 (11.8%)	
Correct	11 (26.8%)	94 (68.1%)	23 (45.1%)	
Overestimated	20 (48.8%)	13 (9.4%)	12 (23.5%)	
Did not know	10 (24.4%)	28 (20.3%)	10 (19.6%)	
Expected GWG				< 0.001
Underestimated	10 (24.4%)	22 (15.9%)	4 (7.8%)	
Correct	6 (14.6%)	18 (13.0%)	4 (7.8%)	
Overestimated	0 (0%)	10 (7.2%)	13 (25.5%)	
Did not know	25 (61.0%)	88 (63.8%)	30 (58.8%)	

BMI: body mass index, GWG: gestational weight gain

* Chi square test

Table 3 shows the results of perception and knowledge of GWG. Approximately half of the women (55.7%) answered GWG is similar in all women, 28.7% answered that there is no need to control their weight during pregnancy, 36.5% answered they should double their meals during pregnancy. While 41.7% answered greater GWG results in healthier infants, 43.5% answered lower GWG results in unhealthier infants, and 63% and 45.2% answered too much GWG could result in pregnancy and infants'

complications. While 73.5% answered regular exercise can result in better health and help controlling GWG, still 16.1% answered exercise can harm both mothers and infants.

Table 4 shows the results regarding information about GWG. Only 40% of women had ever heard about information on GWG and among them, 47.8% reported they received information via online sources and only 26.1% received such information from medical personnel.

Table 3. Perception about weight gain during pregnancy (N=230).

Questions	Agree	Do not Agree	Do not know
1. Weight gain during pregnancy is similar in every woman	128 (55.7%)	32 (13.9%)	70 (30.4%)
2. Pregnant women do not need to control weight gain during pregnancy	66 (28.7%)	130 (56.5%)	34 (14.8%)
3. Pregnant women should eat twice as usual	84 (36.5%)	93 (40.4%)	53 (23.1%)
4. Greater weight gain during pregnancy results in healthier infants	96 (41.7%)	62 (27.0%)	72 (31.3%)
5. Lower weight gain during pregnancy results in unhealthier infants	100 (43.5%)	51 (22.2%)	79 (34.3%)
6. Too much weight gain during pregnancy can result in pregnancy complications	145 (63.0%)	12 (5.2%)	73 (31.8%)
7. Too much weight gain during pregnancy can result in infant complications	104 (45.2%)	24 (10.4%)	102 (44.4%)
8. Regular exercise during pregnancy is recommended for better health and better control of weight gain	169 (73.5%)	14 (6.1%)	47 (20.4%)
9. Regular exercise during pregnancy can harm both mothers and infants	37 (16.1%)	102 (44.3%)	91 (39.6%)

Table 4. Information the women ever received about weight gain during pregnancy (N=230).

Information about weight gain during pregnancy	N (%)
Ever heard about the information	92 (40%)
Source of information* (N=92)	
Medical personnel	24 (26.1%)
Family members	34 (37.0%)
Magazine, books, newspaper	22 (23.9%)
Online information	44 (47.8%)
Friends	25 (27.2%)

* More than 1 answers are allowed.

Various characteristics were compared between women with correct and incorrect self-evaluation of BMI and GWG and the results are shown in Table 5. Women who graduated Bachelor degree or higher were significantly more likely to correctly identify their BMI status (65.4% vs 47.6%,

$p = 0.007$) and GWG (15.4% vs 8.7%, $p = 0.019$). Women with normal weight were significantly more likely to correctly identify their BMI status ($p < 0.001$). Correct identification of GWG was not significantly related to actual BMI category and correct self-evaluation of BMI.

Table 5. Comparison of characteristics between women with correct and incorrect self-evaluation of BMI status and expected GWG.

Characteristics	Self-evaluation of BMI status		p value*	Expected GWG		p value*
	Correct N=128	Incorrect N=102		Correct N=27	Incorrect N=203	
Age			0.166			0.370
< 20 years	5 (37.5%)	9 (64.3%)		0 (0%)	14 (100%)	
≥ 20 years	123 (56.9%)	93 (43.1%)		27 (12.5%)	189 (87.5%)	
Parity			0.945			0.078
Nulliparous	81 (55.5%)	65 (44.5%)		13 (8.9%)	133 (91.1%)	
Multiparous	47 (56%)	37 (44%)		14 (16.7%)	70 (83.3%)	
Education			0.007			0.019
Bachelor degree or higher	68 (65.4%)	36 (34.6%)		16 (15.4%)	88 (84.6%)	
Below bachelor degree	60 (47.6%)	66 (52.5%)		11 (8.7%)	115 (91.3%)	
BMI category			<0.001			0.612
Underweight	11 (26.8%)	30 (73.2%)		5 (12.2%)	36 (87.8%)	
Normal weight	94 (68.1%)	44 (31.9%)		18 (13%)	120 (87%)	
Overweight/Obese	23 (45.1%)	28 (54.9%)		4 (7.8%)	47 (92.2%)	
Self-evaluation of BMI						0.416
Correct				17 (13.3%)	111 (86.7%)	
Incorrect				10 (9.8%)	92 (90.2%)	

BMI: body mass index, GWG: gestational weight gain

* Chi square test.

Discussion

The results of this study showed that only 55.7% of pregnant woman were able to correctly estimate their pre-pregnancy BMI status and as many as 20.9% did not know about the issue. Moreover, only 11.7% of pregnant woman could correctly estimate their expected GWG and as many as 62.2% did not know the

appropriate GWG. This reflected that knowledge about both pre-pregnancy BMI status and appropriate GWG is still limited. These rates were lower than those from some previous studies that reported 67% and 27% of the women correctly identified their BMI status and GWG, respectively^(12, 13).

Overweight and obese women were commonly

reported to underestimate their BMI status. A previous study has reported that as many as 74% rate of BMI underestimation among obese pregnant women⁽¹²⁾. However, another study reported a lower rate of only 14%⁽¹¹⁾, which was similar to 11.8% in this study. Although majority of normal weight women correctly identified their BMI status (68.1%) but the rate was still relatively lower than that from previous studies of over 85%^(11, 12). With regard to GWG, previous studies reported that overweight or obese pregnant woman commonly had poor knowledge about GWG and they also usually gained more weight than those with normal pre-pregnancy BMI^(11-13, 15). A previous study reported that 64% of obese women and 40% of overweight women overestimated their recommended GWG⁽¹²⁾. Another study reported that not only 27% of pregnant women correctly knew their appropriate GWG, but also more than 20% reported an amount of weight gain that is not recommended by the IOM for any woman of any weight category⁽¹³⁾. In this study, more than half of the women (62.2%) were unable to evaluate their GWG and only 12.2% correctly estimated their GWG. Among overweight or obese women, 25.5% overestimated their GWG.

Similar to other studies, this study found that significant factors associated with correct BMI estimation were being normal weight and higher level of education, while only higher education was associated with correct GWG estimation^(10, 11, 15). However, it should also be noted that, although rate of correct GWG was significantly higher in women with higher educational level, the rate in women with higher education was still low at only 15.4%.

Different results between studies might be from different population characteristics as well as socio-economic and cultural contexts. Perceptions regarding GWG was also explored in this study. More than half of the women (55.7%) thought that GWG should be the same to every pregnant woman. In addition, 36.5% thought they should double the meals during pregnancy and approximately 40% related GWG with health of the mothers and infants. This might also show that culture and beliefs could also play roles in addition to

knowledge. There are still beliefs among Thai women that they should increase their meals and weight gain for the health of their unborn infants as maternal weight gain directly relates to infant's health.

Only 40% of the women reported they have ever heard about GWG and almost half received the information via the online sources. Although online information is readily available, not all of them are correct and valid. Pregnant women might get such incorrect information that could mislead their perceptions, awareness, and knowledge regarding GWG. Although information from medical personnel would be the most reliable, it might sometimes not easily accessible and only 26.1% stated that they received information on GWG from this source. Similarly low rate (17%) of overweight or obese pregnant women who received GWG information from health care provider has also been reported⁽¹⁵⁾.

However, a recent review showed that 67% of pregnant women reported having received GWG advice from their obstetric providers, however, of those, only 54.1% reported that they followed the advice. In addition, those who reported following the advice had lower rate of excessive GWG⁽¹⁶⁾. Another recent review showed that while prevalence and content of GWG counseling varied between studies, counseling was often infrequent and inaccurate. Moreover, it was found that healthcare providers tended to focus more on overweight or obese women, as opposed to other BMI status⁽¹⁷⁾.

This study might have some limitations. Information bias could occur, as the information was self-reported. However, all the participants were informed that the questionnaire was anonymous and would not affect the care they received and a private space was provided to all the participants. In addition, sample size for comparison between groups were limited and could result in inadequate power to identify the differences.

As pre-pregnancy BMI and GWG have been reported to be associated with various adverse pregnancy outcomes⁽³⁻⁶⁾, pregnant women should master adequate knowledge regarding both their

pre-pregnancy BMI status and appropriate GWG to achieve. Such information is best to be provided before pregnancy. During pregnancy, women should also be counselled and informed about these important issues and weight gain should also be monitored throughout their pregnancies. This is to help pregnant women keeping their weight gain in recommended range in order to decrease risks of possible adverse outcomes. Awareness regarding GWG should also be raised among medical personnel, keeping in mind that pregnant women might not have adequate knowledge or have some misperceptions about GWG. Providing women with reliable online resources could also be helpful since majority of women rely on such resources.

Conclusion

In conclusion, pregnant women had limited knowledge about pre-pregnancy BMI status and appropriate GWG. Higher education level and being normal weight increased the rates of correct self-evaluated BMI and higher education level also increased the rate of correct self-estimated GWG. Further larger exploratory studies are needed to evaluate factors associated with knowledge on pre-pregnancy BMI and GWG and identify possible interventions to be implemented.

Potential conflicts of interest

The authors declare no conflict of interest.

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