

The Effect Of Pre-Pregnancy Body Mass Index, Gestational Weight Gain On Pregnancy Outcomes

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Abstract

Background: Nutritional status of women has been considered an important prognostic indicator of pregnancy outcomes. The study aims to show the effect of various pregnancy body mass index categories and corresponding gestational weight gain on pregnancy outcomes.

Materials and Methods: 270 women were included in the study. BMI was categorized and weight gain was divided into two groups normal and abnormal based on IOM's recommendation. Chi square and one way ANOVA were used in the univariate analysis of the association between weight gain and corresponding adverse outcome (cesarean, preterm labor, low birth weight). Adjusted odds ratios for adverse outcomes were determined by multiple logistic regression models, while controlling for the following factors: maternal, age, parity, education.

Results: For women with pre-pregnancy BMI<19, mean birth weight of newborn was significant low. (P<0.05)
The abnormal weight gain during pregnancy wasn't related to an increased risk of preterm labor or cesarean delivery but it was highly associated with LBW. (P<0.05)

Conclusion: Efforts should be made to attain appropriate weight gain to reduce the likelihood of low birth weight. Hence, special attention should be paid to women with low pre-pregnancy BMI.

INTRODUCTION

Maternal nutritional states is important for the health and quality of life of women. Maternal pre-pregnancy nutritional status and pregnancy weight gain also affect the survival and health of the newborn. Consequently, various recommendations about pregnancy weight gain have been made (1). For example, a gain of 11.5-16 kg is recommended for pregnant women who start pregnancy with a normal pre-pregnant BMI (i.e., 19.8-26).(2)

A report published in 1990, confirmed a strong association between pregnancy weight gains and infant size and provided target ranges of recommended weight gains by pre-pregnancy body mass index (BMI: kg/m²).

Almost 10 years since the IOM's (Institute of Medicine) report was published, a large body of literature has continued to appear, addressing not only birth weight but also other outcomes related to labor, delivery, and maternal postpartum weight status.(2)

The relationship between maternal obesity and adverse pregnancy outcomes has been well described in obstetric and public health literature.(3). On the other hand women with lower than normal maternal body weight have been shown to be at elevated risk for adverse prenatal outcomes such as prematurity and intrauterine growth restriction (IUGR).(4)

Low birth weight (less than 2500g) is an important determinant of infant mortality and morbidity. A strong relationship between maternal pregnancy weight gain and birth weight has been demonstrated consistently, and low maternal weight gain is considered one risk factor for LBW that may be susceptible to intervention.(5)

However, weight gain in most pregnant women is not within the IOM's range (2) Unfortunately, information on the patterns of weight gain in pregnant women from developing countries is scarce (1).

The purpose of this purpose was to describe patterns of

maternal weight gain during pregnancy and to know its effects on both maternal and neonatal outcomes in urban care setting. A better understanding of the complex interrelations between mother and fetus has led to many improvements in antenatal recommendations.

MATERIALS AND METHODS

Pregnant women who enrolled on health care center in urban area of Urmia were selected for a longitudinal study. First we selected eight health centers as cluster sampling and then chose 34 women consequently who entered for giving care in health care center.

Trained field workers visited the women in the health center at least every month during their pregnancies to conduct interviews and measured body weight and height. In the beginning of research, the date of the last menstrual period (LMP) was recorded and suspected pregnancies were confirmed with pregnancy test.

Women who were less than 60 day pregnant (based on LMP and sonography) were invited to participate in the stud. Between 2002 and 2003, a cohort of 270 newly pregnant women was enrolled. Body weights were measured with a calibrated scale accurate to 0.5Kg while subjects were wearing the lightest possible clothing.

We didn't have any special interventions during the pregnancy and health worker gave care as usual. We excluded complicated pregnancies such as preeclampsia, twin gestation, history of diabetes, cardiovascular and kidney diseases.

Pre-pregnancy weight was based on weight measured at least 2 month of pregnancy and confirm with maternal recall at the first visit. Several studies have reported that recalled pre-pregnancy weight reflects actual weight in women (6, 7)

The information were recorded on age, parity, education .Maternal pre – pregnancy weight for height were categorized based on 1950 metropolitan insurance standard of desirable weight (5) . Total pregnancy weight gain was estimated by subtracting the pre- pregnancy weight from the last measured weight before delivery .Weight gain was divided into two groups (normal and abnormal) based on their prepregnancy BMI and IOM's recommendation. The influence of pregnancy's weight gain on maternal and neonatal outcomes, including preterm delivery (PTD) (<37 weeks) , low birth weight (<2500) ,cesarean delivery were evaluated .

Chi square and one way ANOVA were performed as appropriate in two – tailed analyses. $P < 0.05$ was considered significantly.

Logistic regression analysis was also used to examine the relationship between weight gain and outcomes of pregnancy.

Weight gain was modeled as numerical variable (ideal or normal weight gain and abnormal as above or below recommendation). We entered all the variables (weight gain, education, age group, parity and pre-pregnancy BMI as potentially confounding variables, to obtain odds ratios, adjusted for the significant predictors of adverse outcomes (preterm delivery, low birth weight and cesarean delivery).

RESULTS

A total of 270 women participated in the study; the mean age of the women was 32.3 ± 4.9 years. 230(85.2%) were between 19-34 year, 7% less than 18 and 7.8% had more than 35 year. 21.9% were nulliparous , 79.1% were multiparous.

In total 24.1% had no education 60.7% had finished high school and only 15.2% educated in the university. Although about 60% of low educational subjects were recognized with abnormal weight gain we couldn't find any significant differences between weight gain and education levels. Pre-pregnancy BMI was categorized based on national academic recommendation. The mean of weight gain in four pre-pregnancy BMI group ($19.8 <$, $19.8-26$, $26-29$, >30) were 9.7 ± 3.5 , 9.3 ± 4.3 , 7.7 ± 3.5 , 11.2 ± 4.1 respectively.

The mean neonate birth weight was 3483 ± 425 g. 90.4% of newborn were ≥ 2500 g. The mean of newborn weight based on pre-pregnancy BMI was significant differences , subjects with $BMI < 19.8$ had 3102 ± 487 g mean of newborn weight in compare with $BMI > 30$ with 3469 ± 588 g of new born weight. In other word 16.7% of total birth in $BMI < 19.8$ were low birth weight, but out of 4% new born in forth group ($BMI > 30$) had weight under 2500 at birth. Risk of cesarean delivery in our study was 28.5%. Women with $BMI < 19.8$ had the lowest rate of cesarean section (13.3%) and the most cesarean intervention was done in forth grade BMI group. Incidence of preterm delivery was 5.9%

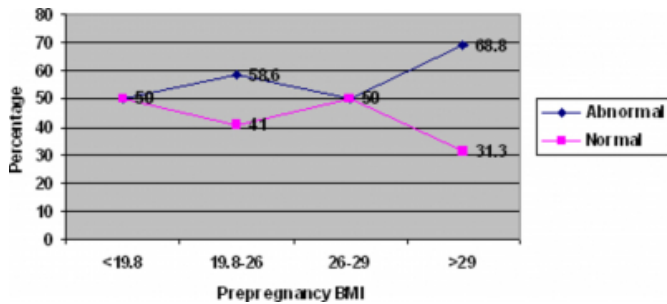
Totally, only (114) 42.2% of the women in the sample had a total weight gain that reached the recommended amount for women in their category of pre-pregnancy BMI.

Among women with a low pre-pregnancy BMI (< 19.8) and high pre-pregnancy BMI (≥ 29), 50% and 31.3% reached the

recommended total weight gain subsequently. (Figure 1).

Figure 1

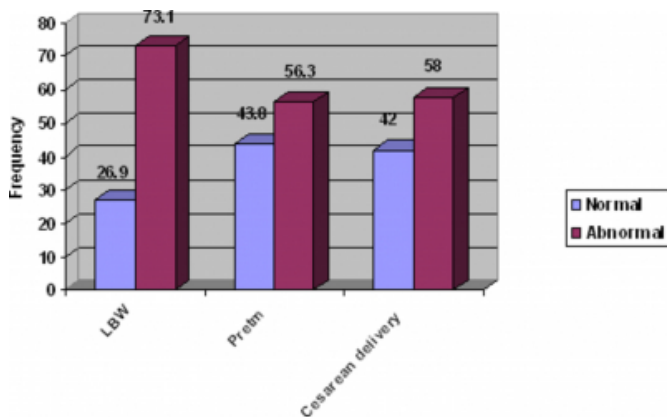
Figure1: Relation between prepregnancy BMI and normal weight gain



(Figure 2) shows the incidence of LBW, preterm delivery and cesarean delivery with normal and abnormal pregnancy weight gains (recommendations of the institute of medicine).

Figure 2

Figure 2: Incidence of LBW, Preterm delivery and cesarean delivery with normal and abnormal pregnancy weight gains (recommendations of the institute of medicine)



Only %26 of subjects with normal weight gain belonged to high risk age group (18 or >35), but did not differ significantly between age group and weight gain patterns. There is no relationship between parity and weight gain during pregnancy (p=0.875). The abnormal weight gain during pregnancy was not related to an increased risk of preterm labor (6.1 vs5.8) or cesarean delivery (30.7 vs26.9%). Alternatively, abnormal maternal weight gain during pregnancy was highly associated with LBW (12.2vs 6.1% p<0.05).

We used multiple logistic regression analysis to estimate the association between abnormal weight gain during pregnancy and the risk of adverse outcomes, while controlling for the effect of potentially confounding variables. A clear and significant relationship was seen between the abnormal

weight gains with low birth weight. OR: 2.37 CI:(1.7-3.2) (p<0.05). The data showed a steady decrease in the incidence of LBW as mean pregnancy weight gain increases.

There was no association between weight gain and preterm delivery and cesarean delivery , but low education level and pre-pregnancy BMI under 19.8 were associated significantly with cesarean delivery as adverse outcome OR : 1.39 and 1.72 respectively (p<0.05) .

DISCUSSION

Maternal BMI and pregnancy weight gain reflect nutritional status before and during pregnancy. Some evidences consider that weight gain have a significant relationship with poor pregnancy outcomes. However weight gain in most pregnant women is not within the IOMs ranges. (2)

Present study showed that only half of subjects had normal BMI (19.8-26). But 50% of women with normal BMI didn't reach to recommended weight gain. Abnormal weight gain was also seen in more than half of obesity women (BMI>29)

There was no difference between weight gain and level of BMI, it may be showed that health care workers and pregnant women should pay more attention to gain weight during pregnancy regardless their pre-pregnancy BMI. Although level of education didn't effect on weight gain significantly but illiterate subjects were more at risk for poor weight gain. Education about nutrition can be effective to improve their weight gain during pregnancy.

Many studies showed that pregnancy weight gain within the IOMs recommended ranges is associated with the best outcome for both mothers and infants (8,9). On the contrary some studies that retrospectively assessed the sensitivity and specificity of this indictor, concluded that maternal weight gain alone is neither a sensitive nor a specific predictor of poor pregnancy outcomes (2).Rasmussen (et.al) reported, that constitutional low weight for height is not a predictor of complications during delivery, and no special observation of this group is recommended.(10)

Because the amount of total weight gain is widely variable among women with good pregnancy outcomes and because the perinatal outcomes of interest are multi-factorial in origin, no one should expect that weight gain alone is perfect diagnostic or screening tool(3). Our study suggested that deviation in maternal weight gain can act as useful marker of newborn weight at birth and also prepregnancy BMI can predict fetal weight especial in women with <19.8.

Ogunyemi et al mentioned that normal BMI and ideal weight gain in pregnancy is associated with decreased perinatal complications and an optimum birth weight.⁽⁸⁾ Another study showed that being moderately underweight was not associated with increased risk of adverse pregnancy outcomes, but being severely underweight was an important risk factor for reduced fetal growth.⁽¹¹⁾

Many studies looked more closely at the association between pregnancy weight gain and rates of cesarean delivery. In our study, weight gain wasn't associated with cesarean rates, but the frequency of cesarean was significant differences among women with different level of prepregnancy BMI, obese women experienced the highest rate of cesarean. It can be explained because of high incidence of large infants in this group. Another study showed that overweight ($25.0 \leq \text{BMI} < 30.0$) and obesity ($\text{BMI} \geq 30.0$) are only weak predictors of labor complications⁽¹²⁾.

Steinfeld reported obese Hispanic and African American women were more likely than obese whites to deliver by cesarean ($P = 0.03$), therefore racial differences affect the complication rates in obese women, and may influence prenatal counseling and pregnancy management⁽¹³⁾,

The relation between low rate of pregnancy weight gain and increased risk of preterm birth was illustrated by Caminchael⁽¹⁴⁾.

Although the biological mechanism underlining this association is unknown, it appears that a rate of pregnancy weight gain below the lower limit of the IOMs recommended ranges, especially in late pregnancy, may be related to higher risk of preterm birth⁽²⁾, Other study found that risk of preterm birth was not associated with maternal BMI⁽¹¹⁾.

In our study there was no association between weight gain and preterm delivery. This may be because that we didn't analyze weight changes weekly, so we cannot indicate when the inappropriate weight gain was starting, so we assumed that if they didn't get weight in the first half of pregnancy, so it had little effect on increased risk of preterm labor. It is important to consider the underlying issues in controversy, as maternal anthropometry differs across ethnic groups, different recommendations should be made for specific populations.

CONCLUSION

In conclusion, Efforts should be directed to attain adequate pre-pregnancy weight and weight gain to reduce the likelihood of low birth weight babies. Hence, special attention should be paid to women with low pre-pregnancy BMI and abnormal weight gain in our society.

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