

Prepregnancy Body Mass Index and Pregnancy Weight Gain in Rural Regions of Guilan Province, Iran

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Abstract

Maternal nutritional status and weight gain throughout pregnancy affect the outcome of pregnancy. The objective of this study was to determine prepregnancy body mass index and total weight gain during pregnancy in women from rural areas of Guilan province, Iran. Prenatal and obstetrical records of 480 pregnant women who attended rural health centers between 2002 and 2003 including prepregnancy weights and pregnancy weight gains were analyzed. Prevalence of prepregnancy underweight and obesity was 7.9% and 27.3%, respectively. Total pregnancy weight gain was 9.3 ± 4.1 kg. More than 40% of women did not meet the international recommendation regarding weight gain for their prepregnancy body mass index. Maternal height and body mass index were related to low birth weight. More than one third of women in rural areas of Guilan province did not meet the international recommendation regarding pregnancy weight gain. The inclusion of nutritional education in the existing health education programs in local health centers of the Province would be of value in meeting the international recommendation regarding weight gain during pregnancy.

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Keywords • Pregnancy • body mass index • weight gain • Iran

Introduction

Pregnancy is a critical period. A healthy pregnancy is without health complications from the time of conception to the delivery of a healthy newborn. Intrauterine factors play essential roles in children's health. Birth weight is accepted as a single parameter that is directly related to the health and nutrition of a mother. It is an important determinant of the chances for a newborn to survive and experience healthy growth and development.^{1,2} Previous studies showed that healthy nutrition prior and during pregnancy was more important than the quantity and quality of nutrition during neonatal period in decreasing neonatal death.² Maternal nutritional status and weight gain during pregnancy have a significant effect on the risk of pre-term birth.³ Appropriate eating habits during pregnancy play an important role in the development of the fetus.^{2,3}

Prior to pregnancy, all women should strive for appropriate body weights. A woman who fails to gain adequate weight during pregnancy is most likely to give birth to a baby with low

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birth weight.^{1,2} On the other hand, obese women are urged to attain healthy weights before pregnancy. The infant of an obese mother may be larger than normal. Also, obese pregnant women more often suffer from gestational diabetes, hypertension, and infections after the birth than do women of normal weights.⁴⁻⁶

Various recommendations about weight gain during pregnancy have been made. According to the guidelines for weight gain during pregnancy, provided by Institute of Medicine (IOM), pregnancy weight gain is related to prepregnancy body mass index (BMI). Weight gain within the suggested range for each prepregnancy body mass category is associated with more favorable outcome than the weight gain above or below that range. Prepregnancy low weight women need more weight gain throughout their pregnancies.⁷ Pregnancy weight gain lower than IOM recommendation has accompanied by premature delivery and low birth weight infants,⁸⁻¹¹ whereas pregnancy weight gain higher than the IOM recommendation leads to infants with high birth weight and increases the rate of cesarean section.^{6,7} Pregnancy health care is a part of existing health programs in rural areas of Islamic Republic of Iran, but the data on pregnancy weight gain pattern are scarce in different regions. The purpose of this study was to identify prepregnancy nutritional status and total pregnancy weight gain according to the IOM recommendations among rural women in north of Iran.

Methods

In rural regions of Iran pregnant women regularly attend local health centers for health care. This study is a cross-sectional one conducted at rural health centers of Guilan province in north of Iran. Seven local health centers were selected by clustered multistage random sampling among 15 centers. Retrospectively prenatal and obstetrical records of 480 pregnant women who attended the health centers between 2002 and 2003 and delivered after 38th weeks of pregnancy were used to collect data on women's health indices. The health indices included age, height, parity, prepregnancy weight, level of education, working status, total pregnancy weight gain, type of delivery, and infant birth weight. Pregnancies resulting in still births or preterm deliveries, those complicated by pregnancy induced hypertension and diabetes, and those with twins were excluded. Weight of women up to the end of their first month of pregnancy was considered as prepregnancy weight. Pregnancy weight gain was defined as the weight at term minus the weight at the end of the first month of pregnancy. Body

mass index (kg/m^2) was calculated as weight (kg) divided by squared height (m^2).⁷

On the basis of BMI the subjects were divided into 4 categories such as low weight or undernutrition ($\text{BMI} < 19.6$), normal weight ($\text{BMI} = 19.6-26$), overweight ($\text{BMI} = 26.1-29$) and obese ($\text{BMI} > 29$) using IOM recommendation for total pregnancy weight gain.⁷ The levels of education were categorized based on the years of schooling as low education (< 5 years), intermediate education (5-12 years) and high education (> 12 years). Working status of subjects was considered as housewife or employed. Newborns with low birth weight (LBW) and normal birth weight (NBW) were defined as those with a body weight at birth of less than 2500 grams and more than 2500 grams, respectively.¹ Birth weight more than 4000 grams was considered as high birth weight (HBW).⁶

Statistical analysis

Data are shown as mean \pm SD. Pearson correlation coefficient test was used for the detection of association between total pregnancy weight gain, prepregnancy BMI, and prepregnancy weight. For comparison between prepregnancy BMI and type of delivery and birth weight Chi-square test was used. Total pregnancy weight gains in four groups of subjects were compared by analysis of variance test. Multiple logistic regression analysis was used to assess the association between birth weight and certain maternal variables such as age, height, parity, working status, educational level, and prepregnancy BMI. A $P \leq 0.05$ was considered statistically significant. We used spss ver. 11.5 for analysis of data

Results

The age, weight, height, and BMI of the women at the beginning of pregnancy were 26 ± 6 years, 65 ± 12.8 kg, 158 ± 7.5 cm, and 26.2 ± 5.2 kg/m^2 , respectively. Mean parity was 1.7 and in 50.8% of subjects this pregnancy was the first one. Of them 4.6% had low education, 91% had intermediate education and 4.4% had high education. Only 4.6% of women were employed and the rest were housewives. The rates of women stratified based on BMI are shown in table 1.

Table 1: The rate and number of women in rural areas of Guilan province, Iran based on body mass index (BMI) at the beginning of the pregnancy.

BMI categories	Rate (number)
Underweight (< 19.8)	7.9 (38)
Normal weight (19.8-26)	45.6 (219)
Overweight (26.1-29)	19.2 (92)
Obese (> 29)	27.3 (131)
Total	100 (480)

The rates of newborns with LBW, NBW or high birth weight were 10.8%, 84.8% or 4.4%, respectively. The average of total pregnancy weight gains was 9.3±4.1 kg (min=0, max=21kgs). Only one of the women didn't gain weight during the pregnancy. The pregnancy weight gains stratified according to the women's BMI are shown in table 2.

Table 2: Mean, SD, min and Max of Pregnancy weigh gain (PWG) in different prepregnancy body mass index (BMI) categories for women in rural areas of Guilan province, Iran.

BMI	PWG±SD(kg)	Min(kg)	Max(kg)
<19.8	11.6±3.4	3.7	21
19.8-26	10 ±4.0	2	21
26.1-29	7.6 ±3.3	0.5	16.5
>29	8.2±3.7	0	17

The pregnancy weight gains in low weight women were higher than in obese ones. Pearson correlation test showed an inverse relationship between prepregnancy BMI and weight gain during pregnancy (r=-0.26, P=0.01). There was also negative relationship between prepregnancy weight and pregnancy weight gains (r=-0.27, P=0.01).

More than 40% of participants did have pregnancy weight gain lower than the IOM recommendations. About 36% gained appropriate weight, and nearly 24% gained more than the IOM-recommended weight gain.

The weight gains in 57.9% of low weight, 67% of normal weight, and 44.6% of over weight women were lower than the IOM recommendation. None of the obese women gained weight lower than IOM recommendation, however, in 62.9% of them pregnancy weight gain was more than IOM recommendation. The pregnancy weight gains were significantly different between different BMI categories.

The rate of Cesarean delivery in obese women was significantly higher than non-obese women (table 3). Although not statistically significant, the rate of LBW in obese women was lower than that in non-obese ones. Multiple regression analysis showed significantly inverse association between maternal height and BMI with birth weight.

Table 3: the rate of Cesarean section and low birth weight (LBW) in different prepregnancy body mass index (BMI) categories for women in rural areas of Guilan province, Iran.

BMI	Cesarean section	LBW
<19.8	19.5	18.4
19.8-26	41.3	11.4
26.1-29	46.7	10.6
>29	60.7	4.5

Discussion

Nutritional status and weight gain during pregnancy have significant impact on pregnancy

outcome. This study showed 7.9% of women had low weight at the beginning of the pregnancy. The prevalence of under nutrition in the areas in which the study was performed was lower than that from some developing countries.^{1,10} An inverse association was confirmed between maternal BMI before pregnancy and total pregnancy weight gain. The pregnancy weight gain was higher in low weight women than in obese ones.

More than 40% of the participants except obese women did not have appropriate weight gain during pregnancy. Low weight gain was more noticeable in women, who had normal or low body weight at the onset of their pregnancies. The low weight gain during pregnancy contributes to adverse health outcomes for both mothers and their newborns.^{1,4,7-9}

Neonatal weights at birth are directly related to the health and nutrition of mothers. Incidence of LBW varies from 3% in developed countries to 30% in developing countries.¹ The rate of LBW in the present study was lower than some Asian and African countries.¹ The rate of LBW in obese women was insignificantly lower than that in underweight women. Obese mothers had higher rate of Cesarean section than non-obese women. This finding is similar to some other previous studies.^{4,6,8}

This study also showed that the birth weight was inversely related to mother's prepregnancy BMI and her height. However, other mothers' variables such as age, parity, working status, and educational level were not related to newborn weight. These findings are in agreement with previous reports indicating that variables such as maternal age and parity were not related to birth weight.^{12,13}

Conclusion

More than one third of women in rural areas of Guilan province did not meet the international recommendation regarding weight gain during pregnancy. The inclusion of nutritional education in the existing health education programs in local health centers of the Province would be of value in meeting the international recommendation regarding weight gain during pregnancy.

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