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The Effect of Pre-Pregnancy Body Mass Index on Gestational Weight Gain and Pregnancy Outcome in Gorgan, North Iran

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This study was performed to assess the role of pre-pregnancy BMI on gestational weight gain and birth weight. A prospective study was conducted in 315 pregnant women with the mean age of 26.6 ± 5.6 years who attended to two urban and rural health care centers in Gorgan, North of Iran. Patients with gestational diabete and pre-eclampsia were excluded. Data on pregnancy weight gain, height, age, smoking, parity, birth weight and mother's educational status were obtained by a trained health worker and some questionnaires. Then women were divided to four subgroups based on pre-pregnancy BMI as underweight, normal, overweight and obese. Participants were also divided to three subgroups on the basis of their educational status. Gestational weight gain was studied in each of these groups and compared in regard to pre-pregnancy BMI and educational status of the women. Weight gain below the lower cut-off of IOM was 47.7, 47 and 20.3% in underweight, normal and overweight groups, respectively. Normal weight gain according to IOM was 40.9, 34.7, 52.5 and 33.3% in underweight, normal, overweight and obese groups, respectively. Mean birth weight was significantly higher in women with normal pre-pregnancy BMI and the prevalence of LBW was much more in women with low pre-pregnancy BMI ($p = 0.002$). Also, highly educated women (>12 years of schooling) gained more weight during pregnancy significantly. This study showed a considerable proportion of women with underweight and normal weight in study area have lower gestational weight gain that recommended by IOM, which can be a cause for LBW neonates.

Key words: Body mass index, Iran, pregnancy, weight gain, low birth weight, BMI

INTRODUCTION

The Institute of Medicine (IOM, 1990) issued guidelines of weight gain during pregnancy. These guidelines, which recommended an optimal weight gain range for women based on their pre pregnancy Body Mass Index (BMI), are widely endorsed by obstetric organizations in the United States and many other countries. The guidelines have been validated by several studies demonstrating that weight gain in accordance with the guidelines is associated with optimal birth weight and obstetric outcomes. Women gaining either above or below IOM guidelines have higher risks of many adverse outcomes. (Several studies of USA Women have found that 30-40% of women gaining above or below the IOM guidelines, despite their widespread use (Cog Swell *et al.*, 1999).

Maternal nutritional status is important for health and quality of life in women and the fetus. Maternal pre-pregnancy nutritional status and pregnancy weight gain also effect survival of the new born (Winkvist *et al.*, 2002).

Over weight women are more likely to gain weight above the guidelines and under weight women are more likely to gain below the guidelines (Cogs Swell *et al.*, 1999).

There is evidence that Maternal weight gain during pregnancy influences birth weight women with the greatest risk -14% for delivering an infant weighing less than 2500 g when those with weight gain is less than 16 Ib (8 kg) (Martin *et al.*, 2002). The frequency of ante partum and intra partum complications, such as macrosomia was highest among women who gained more than 44 Ib (22 kg) during pregnancy (Thorsdothir *et al.*, 2002).

In Islamic countries, like Iran, underlying social and cultural behaviors related to pregnancy weight gain are different from western countries.

This study, was conducted to investigate pregnancy weight gain in relation to pre pregnancy BMI and birth weight in pregnant women who regularly attended the urban and rural centers for prenatal care in Gorgan, a capital city in Golestan province in northern Iran.

MATERIALS AND METHODS

We extracted data from prenatal and neonatal questionnaires for 315 women, which were routinely collected by our health centers in urban and rural areas in Gorgan, since June 2004 to June 2005.

A trained health worker interviewed each pregnant woman attending the health center and information relating to mother's height, age, parity, working status,

education, smoking and last menstrual period, were collected from questions in the questionnaire. Body weight was measured monthly to the nearest 0.1 kg using a balanced beam scale, wearing light clothing without shoes, height was measured to the nearest 0.5 cm under the same condition as the first visit for prenatal care.

Pre-pregnancy weight was self-reported by pregnant women. In this study women with multiple gestation pregnancies and gestational or overt diabetes were excluded.

The participants were grouped according to their pre-pregnancy Body Mass Index (BMI) (weight [kg]/height² [m]) and according to IOM recommendations for total pregnancy weight gain. Recommended total weight gain in pregnant women by pre-pregnancy BMI (in kg/m²) for low BMI (<19.8), normal BMI (19.8-26) and high BMI (29-29) are 12.5-18, 11.5-16 and 7-11 kg, respectively (Institute of Medicine, Report, 1990). The participants were also categorized according to educational status: Less educated (less than 5 years of schooling), educated to intermediate level (5-12 years of schooling) and highly educated (more than 12 years of schooling). In this study, women were either housewives or working. The study was approved by the Ethics Committee of the Gorgan University of Medical Sciences. All participants were informed about the study.

Comparisons of pregnancy weight gain in women with different levels of education, working status and pre-pregnancy BMI were carried by analysis of covariance. Post-hoc multiple comparisons between groups were undertaken by least significant difference. p-value less than 0.05 was considered significant. Analyses were carried out using the Statistical package for Social Science (SPSS-10).

RESULTS

Data were extracted from the files of 315 women. Most of them were between 20-34 years old. Twenty four (6.2%) LBW infants and sixteen preterm labour (10.2%) and no congenital anomaly were found in this study. Most of women had normal pre-pregnancy BMI (51%) and Also were in intermediate group regarding to their educational status (Table 1).

The comparison of total pregnancy weight gain with IOM recommended ranges showed about 50% of women in underweight and normal weight group had lower weight gain than that recommended by IOM. More than 50% of women in overweight group had normal weight gain according to IOM recommendations. In other hand most of obese women (66%) had weight gain more than recommended groups (Table 2).

Table 1: Pre-pregnancy BMI and educational status of pregnant women in our study

Pre pregnancy body mass index (kg m ⁻²)	No.
<19.6	404
19.6-26	164
26-29	59
>29	48
Educational level (years of schooling)	
Low (<5)	98
Intermediate (5-12)	204
High (>12)	13

Table 2: Comparative results of total pregnancy weight gain and pre-pregnancy BMI in 315 women

Pre-pregnancy BMI	Comparison with IOM guide lines			Total No.
	Low	Normal	High	
<19.6	21	18	5	44
19.6-26	77	57	30	164
26.29	12	31	16	59
>29	—	16	32	48
Total	110	122	83	315

Table 3: Mean birth weight and percentage of low birth weight in relation to pre-pregnancy body mass index in 315 pregnant women

Low birth weight (%)	No. birth weight (kg)	Pre pregnancy body mass index (kg/M ²)
4.2	46 (3.07±0.51)	<19.6
2.9	161 (3.28±0.52)	19.6-26
1.8	60 (3.23±0.66)	26-29
1.1	48 (3.26±0.43)	>29

*p = 0.002-0.003 the groups are different from each other

Prevalence of LBW was higher among women with low pre-pregnancy BMI (p = 0.002) and also mean birth weight was lower in this group of women (Table 3).

Poorly educated women had less weight gain during pregnancy than women with higher educational status, after adjusting for pre-pregnancy BMI and parity (p = 0.003).

Mean pregnancy weight were not independently related to working status in analysis of covariance.

DISCUSSION

This study might help to describe how total pregnancy weight gain varies in relation to pregnancy BMI and education level in this population.

The most important limitation of this study was inability to follow pregnant women throughout their pregnancy and relied on existing data in health records. In addition, information on the economic status of the study population was insufficient. The pre pregnancy BMI was determined by self report.

Particularly because over weight women tend to underestimate their body weight (Rowland, 1989; Sterens Simon *et al.*, 1992), if obese women were misclassified as normal weight, present findings would likely underestimate the relationship between BMI and actual weight gain. We found that pre pregnancy BMI

was a strong predictor of maternal weight gain. Women with low BMI had the highest risk for inadequate weight gain. Conversely, women with high BMI had the highest risk for excessive weight gain.

Women with less education were significantly more likely to have a weight gain below the IOM guidelines.

Research has shown that patients with poor health literally have lower health knowledge, health status and use of health services (Anonymous, 1999). Clinicians should pay special attention to patients with lower educational with regard to weight gain and nutritional counseling. More research is needed to examine potential cultural factors that may influence weight gain.

We found that, despite regular prenatal care, the prevalence of weight gain below lower cut-off recommended by the IOM in this population of pregnant women was three times higher than those in developed countries. Inadequate pregnancy weight gain is known to be risk factor for low birth weight (Aaronson and Mache, 1989; Kusin and Jansen, 1986; Varma, 1984).

Present data clearly show that the prevalence of LBW babies was more prevalent in the presence of lower-weight gain, implying that inadequate pregnancy weight gain might be an important risk factor for LBW in Iranian babies.

More than 90% of Iranian babies are exclusively breast fed during their first month of life. The rate is reduced to 72 and 55% at the end of 3 and 6 month of age, respectively. Inadequate Maternal fat reserve may contribute to such a down ward trend of breast feeding in Iranian babies, fewer than 6 months of age (Iranian Ministry of Health and Medical Education, 2000a, b).

Growth faltering, a problem that mostly appears between 4 and 6 months of age in many Iranian children from lower socio-economic groups, is perhaps due to decreased rate of breast feeding in the first 6 months of life as was mentioned before (Iranian Ministry of Health and Medical Education, 2000a, b).

This study indicates that deviation from recommended weight gain during pregnancy was less among highly educated women. This finding is in agreement with the findings of other studies, which showed that women from lower social classes were more prone to inadequate weight gain during pregnancy (Hickey, 2000).

There is evidence that about 27-33% of women receive no weight gain advice from their prenatal care provider (Cog Swell *et al.*, 1999; Naomi *et al.*, 2005). Cabana *et al.* (1999) described barriers to guideline adherence, including lack of awareness, familiarity and some agreement with guidelines. Optimal gestational weight gain remains controversial and some clinicians may disagree with the guidelines.

CONCLUSIONS

We concluded from this base-line study that greater public health efforts need to educate providers and the public about BMI-appropriate weight gain in pregnancy, particularly for women of moderately high or low pre pregnancy BMI.

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