



Weight Gain, Correlation with Obstetric Outcome

KEYWORDS

Prepregnancy BMI, Gestational weight gain

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ABSTRACT

This study was designed as a prospective observational study, carried out at a private hospital. Study population included 400 antenatal patients registered in 1st trimester. Aim of study was to correlate pre-pregnancy BMI, gestational weight gain and maternal outcome. In our study antenatal cases registered in 1st trimester of pregnancy were enrolled. Maternal pre-pregnancy BMI was calculated using the formula, $BMI = \frac{\text{Pre-pregnancy weight (in Kg)}}{(\text{height in meter})^2}$. Patients were categorized into 3 categories of low (<19.8), normal (19.8-26), high (overweight=26.1-29 & obese >29) BMI according to Institute of Medicine (IOM) guidelines. Development of complication in the form of pre-eclampsia, abnormal glucose tolerance, Intrauterine growth restriction (IUGR), preterm birth were noted. Total gestational weight gain calculated by subtracting pre-pregnancy weight from weight just before delivery. Patients were divided into 3 categories of normal, inadequate or excessive weight gain according to IOM (Institute Of Medicine) recommendations. We found significant association between gestational weight gain and development of maternal complication. There was no significant association between gestational weight gain and mode of delivery. From this study we concluded that pre-pregnancy BMI and gestational weight gain are good predictors of maternal outcome.

INTRODUCTION

Aim of antenatal care is to assist women to remain healthy, finding and correcting adverse conditions when present and thus aid health of newborn.^{1,2} It has long been the feeling in the practice of obstetrics that a definite relationship exists between maternal weight gain and pregnancy outcome.³ Gestational weight gain has been thoroughly studied as a predictor of adverse pregnancy outcome mainly because of the fact that it is potentially modifiable after conception.⁴

It has been explicitly recognized that both pre-pregnancy Body Mass Index and gestational weight gain are associated with outcome of pregnancy.

Institute Of Medicine(IOM) published its landmark report, 'Nutrition During Pregnancy' which included recommended ranges in the amount of weight that women in various pregnancy weight categories should gain in order to achieve healthy pregnancy outcome.^{5,6}

Data on pregnancy weight gain patterns in developing countries are scarce, owing to difficulties in collecting data throughout pregnancy. Maternal and neonatal complications associated with BMI and gestational weight gain are of public health importance because they add to disease burden in women and children.⁴

We wished to study pre-pregnancy BMI and gestational weight gain as oldest, simple, cost effective method of antenatal surveillance to assess its usefulness and effectiveness in this modern era of highly sophisticated methods of obstetrical surveillance. This will enable even paramedical workers to suspect high risk pregnancy cases and refer them to higher centers, in time to improve obstetric outcome.

MATERIAL AND METHODS

The present study was conducted at a private Hospital and Research Centre, Pune as a Hospital based prospective observational study Total 400 cases were studied.

Inclusion Criteria:

Antenatal cases registered at Hospital in first trimester who were followed up subsequently in second and third trimester

and then delivered at same Hospital.

Exclusion Criteria:

- * Antenatal cases registered at Hospital in later gestation.
- * Antenatal cases with preexisting Diabetes Mellitus, Hypertension, and Anemia.
- * Multiple gestation.

Methodology:

Main objective of this study analysis was to correlate pre-pregnancy BMI, gestational weight gain and maternal outcome. Pre-pregnancy weight was based on recall of patient as recalled pre-pregnancy weight reflects actual weight in women^{9,10}. Standing height was measured with stadiometer. Maternal pre-pregnancy BMI was calculated with the formula:-

$$BMI = \frac{(\text{Pre-pregnancy weight in Kg})}{(\text{Height in meter})^2}$$

Maternal pre-pregnancy BMI were categorized into 4 categories based on guidelines recommended by Institute Of Medicine in 1990.

Later at each visit, the clinical data with measurement of weight was noted. Electronic digital weighing machine was used for measurement of weight. Development of any complication in relation to pregnancy was noted. Total gestational weight gain was estimated by subtracting pre-pregnancy weight from last measured weight before delivery. Gestational weight gain was divided into 3 groups of normal, inadequate, excessive based on IOM recommendations.

IOM recommendations⁵:

Weight for height category		Recommended total weight gain during pregnancy	
Category	BMI	Kg	Lb
Low	<19.8	12.5-18	28-40
Normal	19.8-26	11.5-16	25-35

Overweight	26-29	7-11.5	15-25
Obese	>29	>7	>15

Accordingly influence of gestational weight gain on maternal outcome was evaluated. Maternal outcome was evaluated in terms of mode of delivery (vaginal or cesarean section), development of preeclampsia, abnormal glucose tolerance, preterm birth, development of IUGR.

RESULTS

The present study was a prospective observational study of 400 cases. In our study, 53% cases belonged to normal pre-pregnancy BMI category (table 1) and 51.3% had adequate gestational weight gain (table 2). In our study while correlating the relation between gestational weight gain and obstetric outcome, we observed that:-

- There is significant association between gestational weight gain and development of pre-eclampsia, abnormal glucose tolerance, IUGR, preterm birth. (Table 4,5,6)
- We did not find correlation between gestational weight gain and maternal outcome in terms of mode of delivery (p=0.52). (Table 7)
- There is definite association between pre-pregnancy BMI and gestational weight gain, as among 400 studied population, majority of patients having adequate gestational weight gain are from normal pre-pregnancy BMI category (p<0.05). (Table 3)

DISCUSSION

Maternal complications associated with pre-pregnancy BMI and gestational weight gains are of public health importance because they add to the disease burden in women and children and increase medical costs⁴. We studied 400 antenatal cases for weight gain in pregnancy with respect to pre-pregnancy BMI. We studied correlation of the gestational weight gain and pre-pregnancy BMI to maternal outcome.

In our study, 53% of population belonged to normal BMI category while 28.8% to low and remaining 18.3% to high BMI (overweight + obese) category. The result correlated with results of Zahra Yekta et al⁸ study where 50% of study population belonged to normal BMI category.

In our study, significant association was noted between pre-pregnancy BMI and gestational weight gain (P<0.001). It suggests that patients from normal pre-pregnancy BMI gained adequate weight while that from low BMI gained inadequate weight and high BMI showed a tendency towards high weight gain. These findings were similar to that of findings of Institute Of Medicine recommendations⁵. In our study we found no association between abnormal gestational weight gain and vaginal or caesarean delivery (38% Vs 40.6%). The result correlated with study of Zahra Yekta et al⁸. Although many studies observed this correlation, small sample size could be the possible limitation of our study to prove this association.

In present study, there was a strong association between gestational weight gain and development of pre-eclampsia (p<0.001) i.e. development of pre-eclampsia was associated with excessive weight gain in pregnancy which correlated with study by Ellen A Nohr et al⁴. For pre-eclampsia, high total weight gain most likely reflects pathologic fluid retention as part of disease and it may be present before other, more severe symptoms develop⁴.

Strong association was observed between excessive gestational weight gain and abnormal glucose tolerance. The result correlated with study of Hedderson M M et al study⁷

In our study of 400 antenatal cases, 27 had preterm delivery and of them majority belonged to inadequate gestational weight gain. The statistical significance suggests association between gestational weight gain and preterm birth. Similar result was found in study by Carmichael et al.¹¹ Biological

mechanism underlying this association is not known, it appears that the rate of pregnancy weight gain below lower limit of IOM recommendations especially in late pregnancy is related to preterm birth.⁸

Among 400 studied population, 45 developed IUGR of which majority belonged to inadequate weight gain, these findings correlated with study by Ellen A Nohr et al⁴.

After analyzing the data, we found that both pre-pregnancy BMI and gestational weight gain are good predictors of healthy maternal outcome. The study by Ellen A Nohr⁴ found that pre-pregnancy BMI is the strongest predictor of outcome while study conducted by E Ward et al¹² proved gestational weight gain as good predictor of obstetric and perinatal outcome. Overall the data support that for women who begin pregnancy with a normal BMI, pregnancy weight gain within the IOM's recommended ranges is associated with the best outcome for both mother and fetus.

CONCLUSION

1. Abnormal pre-pregnancy body mass index (low and high) predisposes to adverse maternal outcome.
2. Adequate weight gain in the range of IOM (Institute Of Medicine) recommendations ensures healthy obstetric outcome.
3. Pre-pregnancy BMI and gestational weight gain both are good predictors of obstetric outcome.

OBSERVATION TABLES

Table 1: Distribution of patients with respect to pre-pregnancy BMI Categories.

BMI Categories	Number of Patients	Percentage (%)
Low (<19.8)	115	28.8
Normal (19.9-26)	212	53.0
Overweight (26.1-29)	46	11.5
Obese (>29)	27	6.8
Total	400	100.0

Table 2: Distribution of patients with respect to gestational weight gain (kgs).

Gestational weight Gain	Number of patients	Percentage (%)
Inadequate	124	31.0
Normal	205	51.3
Excess	71	17.8
Total	400	100.0

Table 3: Association of Body Mass Index (BMI) with gestational weight gain

BMI	Gestational weight gain			Total	p-value
	Inadequate	Normal	Excess		
Low	55	58	2	115	<0.001
Normal	64	123	25	212	
High	5	24	44	73	
Total	124	205	71	400	

Table 4: Association of gestational weight gain with pre-eclampsia

Total wt Gain	Pre-eclampsia		Total	p-value
	Yes	No		
Inadequate	10	114	124	<0.001
Normal	26	179	205	
Excess	23	48	71	
Total	59	341	400	

Table 5: Association of gestational weight gain with glucose tolerance

Total wt Gain	Glucose tolerance		Total	p-value
	Normal	Abnormal		
Inadequate	115	9	124	<0.001
Normal	185	20	205	
Excess	50	21	71	
Total	350	50	400	

Table 6: Association of gestational weight gain with IUGR

Total wt Gain	IUGR		Total	p-value
	Yes	No		
Inadequate	32	92	124	<0.001
Normal	8	197	205	
Excess	5	66	71	
Total	45	355	400	

Table 7: Association of gestational weight gain with pre-term birth

Total wt Gain	Preterm Birth		Total	p-value
	Yes	No		
Inadequate	21	103	124	<0.001
Normal	3	202	205	
Excess	3	68	71	
Total	27	373	400	

Table 8: Association of gestational weight gain with mode of delivery

Gestational weight gain	Mode of delivery				Total	p-value
	Normal	Forceps	Ventouse	LSCS		
Inadequate	56	8	7	33	104	0.052
Normal	89	11	24	77	201	
Excess	23	3	5	37	68	
Total	168	22	36	147	373	

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