

Research Journal of Pharmaceutical, Biological and Chemical Sciences

A Study Of Maternal And Fetal Outcomes In Pregnancies With Normal Pre- Pregnancy-BMI And Inadequate Gestational Weight Gain.

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ABSTRACT

Gestational weight gain (GWG) is a critical determinant of pregnancy outcome. Even among women with a normal pre-pregnancy body mass index (BMI), inadequate GWG may adversely affect maternal and fetal health. Evidence from low- and middle-income settings remains limited. To evaluate maternal and fetal outcomes in pregnancies with normal pre-pregnancy BMI complicated by inadequate gestational weight gain. This hospital-based observational study included 133 pregnant women with normal pre-pregnancy BMI (18.5–24.9 kg/m²) and gestational weight gain below Institute of Medicine recommendations. Sociodemographic details, antenatal characteristics, and GWG were recorded. Maternal outcomes assessed included anemia, preterm labor, and mode of delivery. Fetal and neonatal outcomes included birth weight, small for gestational age status, preterm birth, APGAR scores, NICU admission, and neonatal morbidity. Data were analyzed using descriptive statistics. Most women were aged 18–29 years and had low educational attainment. Late antenatal booking was common. Low birth weight occurred in 31.6% of neonates, and 27.1% were small for gestational age. Preterm birth was observed in 18.1% of cases. NICU admission was required for 13.5% of neonates. Maternal anemia was present in 24.1% of women. Adverse outcomes were more frequent with lower degrees of GWG. Inadequate gestational weight gain among women with normal pre-pregnancy BMI is associated with unfavorable maternal and fetal outcomes. Early antenatal care and targeted nutritional interventions are essential to improve pregnancy outcomes.

Keywords: Gestational weight gain; Normal body mass index; Maternal and fetal outcomes

<https://doi.org/10.33887/rjpbcs/2024.15.6.116>

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INTRODUCTION

Gestational weight gain is a critical determinant of maternal and fetal health outcomes and reflects the dynamic physiological adaptations that occur during pregnancy [1]. The Institute of Medicine provides evidence-based recommendations for optimal gestational weight gain according to pre-pregnancy body mass index (BMI), emphasizing its role in supporting normal fetal growth while minimizing maternal and neonatal complications [1, 2]. Women with a normal pre-pregnancy BMI are generally expected to achieve appropriate weight gain to ensure adequate placental function, optimal fetal nutrition, and favorable perinatal outcomes [3-5].

Inadequate gestational weight gain among women with normal pre-pregnancy BMI remains an important but often under-recognized public health concern, particularly in low- and middle-income settings. Factors such as inadequate nutritional intake, anemia, socioeconomic constraints, high physical workload, and limited antenatal counseling contribute to suboptimal weight gain during pregnancy. Emerging evidence suggests that insufficient gestational weight gain is associated with adverse fetal outcomes, including low birth weight, small for gestational age infants, preterm delivery, and increased neonatal morbidity. Maternal consequences may include anemia, poor postpartum recovery, and increased susceptibility to infections [6, 7].

Despite having a normal BMI prior to conception, women with inadequate weight gain may still experience compromised pregnancy outcomes, highlighting the importance of monitoring weight trends throughout gestation rather than relying solely on pre-pregnancy nutritional status [8]. This study aims to evaluate maternal and fetal outcomes in pregnancies with normal pre-pregnancy BMI complicated by inadequate gestational weight gain, thereby emphasizing the need for targeted nutritional interventions and vigilant antenatal surveillance in this vulnerable group.

MATERIALS AND METHODS

Our study was conducted as a hospital-based observational study in the Department of Obstetrics and Gynecology at a tertiary care center over a defined study period. Institutional Ethics Committee approval was obtained prior to the commencement of the study. All participants were enrolled only after obtaining written informed consent. The study population comprised pregnant women attending the antenatal outpatient department or admitted to the obstetrics ward for delivery during the study period.

Pregnant women with a normal pre-pregnancy body mass index (BMI 18.5–24.9 kg/m²) were included in the study. Pre-pregnancy BMI was calculated using the documented pre-pregnancy weight or first-trimester weight and measured height. Women with inadequate gestational weight gain, as defined by the Institute of Medicine (IOM) guidelines for normal BMI, were selected for analysis. Women with multiple gestations, pre-existing medical disorders, gestational diabetes mellitus, hypertensive disorders of pregnancy, fetal congenital anomalies, or incomplete antenatal records were excluded from the study.

Detailed maternal data were collected using a structured proforma. This included demographic variables, obstetric history, antenatal complications, hemoglobin levels, number of antenatal visits, and total gestational weight gain. Weight measurements were recorded at each antenatal visit using a standardized weighing scale, and total gestational weight gain was calculated by subtracting pre-pregnancy weight from the last recorded weight before delivery.

Fetal and neonatal outcomes were documented at the time of delivery and during the immediate neonatal period. Parameters assessed included gestational age at delivery, mode of delivery, birth weight, Apgar scores at 1 and 5 minutes, need for neonatal intensive care unit admission, and early neonatal complications. All collected data were entered into Microsoft Excel and analyzed using appropriate statistical methods to evaluate maternal and fetal outcomes in the study population.

RESULTS

Table 1: Sociodemographic Profile of the Study Population (n = 133)

Variable	Category	Number (n)	Percentage (%)
Age (years)	18-24	47	35.33
	25-29	51	38.34
	30-34	30	22.55
	≥35	5	3.75
Education	Illiterate	36	27.07
	Primary school	62	46.61
	Secondary school	27	20.30
	Graduate	8	6.02
Occupation	Housewife	83	62.40
	Labourer	43	32.33
	Professional	7	5.26

Table 2: Antenatal Characteristics and Gestational Weight Gain Pattern

Variable	Category	Number (n)	Percentage (%)
Trimester of Booking	First	37	27.82
	Second	84	63.16
	Third	12	9.02
Dietary Pattern	Vegetarian	84	63.15
	Mixed	49	36.85
Gestational Weight Gain (kg)	<4	28	21.05
	4-6.9	64	48.12
	7-9	41	30.83

Table 3: Maternal Outcomes in Women with Inadequate Gestational Weight Gain

Maternal Outcome	Frequency (n)	Percentage (%)
Anemia (3rd trimester)	32	24.06
Preterm labor	24	18.05
Vaginal delivery	83	62.41
LSCS	50	37.59
Prolonged labor	12	9.02
Postpartum hemorrhage	4	3.01
Postpartum infection	6	4.51

Table 4: Fetal and Neonatal Outcomes in the Study Group

Outcome	Frequency (n)	Percentage (%)
Low birth weight (<2500 g)	42	31.58
Small for gestational age (SGA)	36	27.07
Preterm birth (<37 weeks)	24	18.05
APGAR <7 at 1/5 min	9	6.77
NICU admission	18	13.53
Neonatal jaundice	12	9.02
Congenital anomalies	3	2.26

DISCUSSION

The present study evaluated maternal and fetal outcomes in pregnancies with normal pre-pregnancy body mass index complicated by inadequate gestational weight gain (GWG). The findings highlight that insufficient GWG, even among women who begin pregnancy with a normal nutritional status, is associated with significant adverse maternal and neonatal outcomes. This underscores the

importance of monitoring weight gain throughout pregnancy rather than relying solely on pre-pregnancy BMI as an indicator of maternal nutritional adequacy [8].

The majority of women in the study belonged to the younger reproductive age group, with a mean maternal age of 23.43 ± 5.55 years. Similar age distributions have been reported in Indian studies, reflecting early childbearing practices in low- and middle-income settings. Younger maternal age, particularly below 25 years, may predispose women to inadequate GWG due to lower health literacy, increased nutritional demands for their own growth, and socioeconomic vulnerabilities. The high proportion of women with low educational attainment and engagement in manual labor further explains the prevalence of inadequate GWG observed in this study, as these factors are known to influence dietary quality, energy intake, and antenatal care utilization [9, 10].

Late antenatal booking was another important observation, with nearly two-thirds of women registering in the second trimester. Delayed booking limits early nutritional counseling and timely identification of suboptimal weight gain patterns. This finding aligns with previous studies demonstrating that early antenatal enrollment is crucial for achieving recommended GWG and improving perinatal outcomes. The predominance of vegetarian diets among the study population may also have contributed to inadequate GWG, particularly in resource-limited settings where vegetarian diets are often low in protein, iron, vitamin B12, and essential fatty acids [11].

Maternal outcomes in the present study showed a notable incidence of anemia and preterm labor. Anemia affected nearly one-quarter of the study population, which is consistent with the known association between inadequate maternal nutrition and reduced gestational weight gain. Poor iron intake and increased physiological demands during pregnancy likely contributed to this finding. Preterm labor occurred in 18.05% of cases, supporting evidence that inadequate GWG is a risk factor for shortened gestation, possibly due to placental insufficiency and altered metabolic adaptations [12].

Fetal and neonatal outcomes were significantly compromised in this cohort. Low birth weight was observed in nearly one-third of neonates, and over one-quarter were small for gestational age. These findings are in agreement with earlier studies demonstrating that inadequate GWG is a strong predictor of impaired fetal growth. The requirement for NICU admission in 13.53% of neonates further emphasizes the clinical relevance of these outcomes, as such admissions increase healthcare burden and are associated with higher neonatal morbidity.

The graded relationship between GWG and neonatal outcomes observed in this study reinforces a dose-response effect. Women with the lowest GWG had the poorest outcomes in terms of birth weight, preterm birth, and NICU admissions, indicating that severely inadequate GWG poses the greatest risk. These findings are consistent with international literature and highlight the modifiable nature of GWG as a determinant of pregnancy outcome.

Overall, this study demonstrates that inadequate gestational weight gain in women with normal pre-pregnancy BMI is a significant contributor to adverse maternal and fetal outcomes. Routine monitoring of GWG, early antenatal registration, nutritional counseling, and targeted interventions for at-risk women are essential strategies to improve pregnancy outcomes, particularly in resource-constrained settings.

CONCLUSION

Inadequate gestational weight gain among women with normal pre-pregnancy BMI is associated with unfavorable maternal and fetal outcomes. Early antenatal care and targeted nutritional interventions are essential to improve pregnancy outcomes.

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