

Correlation between Maternal Weight Gain and Neonatal Birth Weight-A Cross Sectional Study**Sardar Vikram Singh Bais¹, Amrita Sinha², Shabd Singh Yadav³, Jayendra Arya⁴**¹Senior Resident, Department of Pediatrics, Shyam Shah Medical College, Rewa, M.P²Senior Resident, Department of Pediatrics, AIIMS, Patna, Bihar³Professor, Department of Pediatrics, Shyam Shah Medical College, Rewa, M.P⁴Senior Resident, Department of Pediatrics, GRMC, Gwalior, M.P

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Abstract**Background:** Maternal weight gain is one of the most important independent predictors of infant birth weight. Normal weight gain of pregnancy 11kg weight gain should be according to pre-pregnancy BMI. Patients with BMI > 25 should gain weight of 7kg patient with normal BMI should gain 11kg weights.**Material & Methods:** This was a prospective study conducted in the Department of Pediatrics in government's medical hospitals Rewa, M.P.ANC registered Full term (>37 weeks) pregnant women were included. Total pregnancy weight gain was estimated by subtracting weight at 12 weeks from last measured weight before delivery. The neonatal Birth weight will be taken by electronic weight machine calibrated by ±10 gm**Results:** Out of total 100 full term pregnant women majority of them (85%) were 20-30 years of age group. 68% were rural. Half of the maternal pre pregnant weight were <50kg, 26% was >55kg and 24% were 50-55kg. Out of 100 neonates, 59% were male & 41% were female. AGA, SGA, LGA, IUGR were 58%, 38%, 1%, 3% respectively. Half of the neonates weighed range of 2.5-3.89 kg, 46% of neonates weight were 1-2.49 kg. The result shows positive correlation between maternal weight gain and neonatal birth weight, relation was statistically significant.**Conclusion:** Adequate maternal weight gain independently influences birth weight of the baby. Thus, mother's nutritional care should be appropriate to maintain adequate weight gain.**Keywords:** full term pregnancy, Low birth weight, maternal weight gain, neonatal birth weight.

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Introduction

Maternal weight gain during pregnancy period can offer the good means of assessing the health status of the pregnant mother and hence her baby. Inadequate antenatal weight gain is a significant risk factor for intra-uterine growth restriction (IUGR), preterm delivery and low birth weight (LBW) in newborn. On the other hand, Obesity and excessive weight gain can lead to adverse maternal and foetal outcomes [1]. A woman's weight normally increases during pregnancy because of the growth of fetal and maternal tissues and fluids [2]. Weight gain during pregnancy, among the important indicators of pregnancy maternal nutrition, is also a good measure of intra-uterine fetal nutrition [3, 4]. Thus, sub-optimal gestational weight gain (GWG) is associated with various adverse pregnancy outcomes. These outcomes may include, but are not limited to: high birth weight (HBW), low birth weight (LBW), pregnancy-induced hypertension, gestational diabetes, preterm births, caesarean delivery, and delayed initiation of breastfeeding [4, 5]. Foetal size and weight at birth

are also influenced by the placental volume and the rate of placental growth and this effect is mediated by the prepregnancy maternal weight and gestational weight gain [6]. According to the World Health Organization (WHO), neonates with birth weights of less than 2500 gram are considered as low birth weight (LBW) irrespective of gestational age. The LBW subdivisions include very low birth weight, which is less than 1500 gram, and extremely low birth weight, which is less than 1000 gram [7]. Many maternal factors have been postulated to determine the birth weight of the babies. These include sociobiological factors of mother and many other factors. Important among these factors are maternal age, weight, height, education, parity, antenatal care, maternal habits like smoking, sex of the baby and maternal comorbidities [8]. Among these various maternal factors influencing birth weight of the child maternal weight gain during pregnancy is very important factor determining birth weight of the baby [9]. There is a rising prevalence of obesity, a

variant of the original Barker hypothesis has been formulated, wherein over nutrition during pregnancy and high birth weight may cause obesity and related conditions in adulthood [10]. Excessive maternal body weight or weight gain in pregnancy perturbs the intrauterine environment during fetal development, producing permanent changes in the hypothalamus, pancreatic islet cells, adipose tissue or other biological systems that regulate body weight [11].

Aims & Objectives

This study was conducted to observe the total weight gained by the pregnant women and their correlation with the birth weight of their infants.

Materials and Methods

This was a hospital based prospective study conducted in the Department of Pediatrics in government’s medical hospitals and any other peripheral health care center, Rewa, M.P, from April 2020 to March 2020 (01 years).

Inclusion Criteria

- ANC registered Full term (>37 weeks) pregnant women.
- Follows routine visit at 2nd& 3rd trimester of pregnancy in ANC clinic and Aaganwadi Kendra
- Who willing to delivered in labor room GMH Rewa and any peripheral health care labor room.
- Pregnant women provide written informed consent for the study.

Exclusion Criteria

- Patient with hypertension (PIH/Pre-eclampsia/Eclampsia) or pre-term women

- Patients with congenital malformations, diabetes, cardiovascular, kidney disease, RH negative pregnancy. Diabetes Mellitus (GDM)
- Twin / multiple pregnancies.
- Women who do not provide consent for the study

The subjects were taken from antenatal clinic after a detailed history and physical examination investigations, USG and were followed till delivery. The information was recorded on the basis of age, parity, education, urban/rural, status of subjects.

Total pregnancy weight gain was estimated by subtracting weight at 12 weeks from last measured weight before delivery. The neonatal Birth weight will be taken by electronic weight machine calibrated by ±10 gm. The weight machine will be placed on plane surface. Birth weight will be taken by Doctor or nursing staff at the Labour room of various health care facilities

Statistical Analyses

We used the Statistical Package for the Social Sciences “SPSS version 24. Data was presented as mean with standard deviation or proportions as appropriate. Mean, median, standard deviation and variance was calculated and following statistical significance tests were applied. P-values of <0.05 were considered significant.

Results

A total of 100 full term pregnant women who want to deliver in our study hospital were enrolled and analysed. Out of total majority of them (85%) were 20-30 years of age group. 68% were rural & 32% were urban population. Half of the maternal pre pregnant weight were <50kg, 26% was >55kg and 24% were 50-55kg.

Table 1: Socio-demographic parameters of pregnant women

Demographic Characteristics	No. of patients (n=100)	Percentage
Maternal age	< 20 year	8
	20-30 year	85
	>30 year	7
	Mean ±SD	25.25 ± 3.62 years
Locality	Rural	68
	Urban	32
Maternal Pre Pregnancy Weight	< 50 kg	50
	50– 55 kg	24
	>55 kg	26
	Mean ± SD	52.52 ± 6.28 kg

Out of 100 neonates, 59% were male & 41% were female. AGA, SGA, LGA, IUGR were 58%, 38%, 1%, 3% respectively. Half of the neonates weighed range of 2.5-3.89 kg, 46% of neonates weight were 1-2.49 kg

Table 2: Neonatal demographic parameters

Neonatal parameters		Frequency(n=100)	Percentage
Gender of Neonates	Male	59	59%
	Female	41	41%
Neonatal Birth Weight	≥3.9 kg	4	4%
	2.5 – 3.89 kg	50	50%
	1 – 2.49 kg	46	46%
	Mean ± SD	2.46 ± 0.55	
Weight for gestation age	AGA	58	58%
	SGA	38	38%
	LGA	1	1%
	IUGR	3	3%

The result shows positive correlation between maternal weight gain and neonatal birth weight, relation was statistically significant (p<0.05)

Table 3: Correlation between neonatal birth weights with maternal weight gain

Pregnancy duration	Neonate Birth weight (kg)	Maternal Weight gain in (kg)	P value	Correlation
2 nd trimester (Mean±SD)	2.46 ± 0.55	5.54 ± 0.85	<0.001	Positive correlation
3 rd trimester (Mean±SD)	2.46 ± 0.55	11.59 ± 1.56	<0.001	Positive correlation

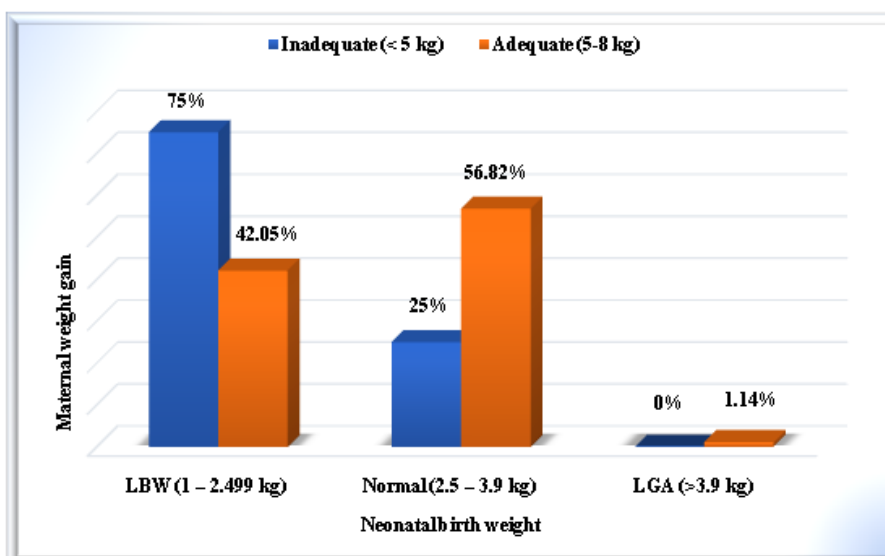


Figure 1: Association of weight gain in pregnancy and neonatal birth weights in 2nd trimester

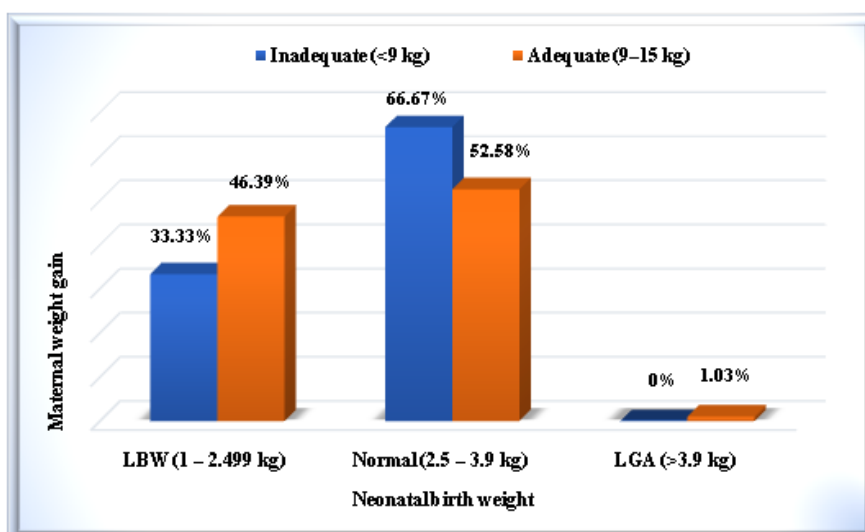


Figure 2: Association of weight gain in pregnancy and neonatal birth weights in 3rd trimester

Discussion

Maternal weight also plays an important role in deciding birth weight of the baby. Mothers with less than 40 kg are known to produce low birth weight babies. Ideally during pregnancy a mother should gain weight of 9 to 11 kg. Weight gain during pregnancy has been associated with birth weight and measures of adiposity early in life.

In our study majority of the women were 20-30 years age group, belong to rural area, in agreement with the S. Lumbanraja et al [12] and Bilwal BK, et al [13].

Incidence of low birth weight neonates in this study was 46%, concordance finding reported by Laurence et al [14] and Ahmadu BU, et al [15].

A study was conducted by S Monte et al [16] shown a linear relationship between both pre-pregnancy weight and gestational weight gain with neonatal birth weight of and associated health risks.

Present study shows positive correlation between birth weight of neonates and weight gain in 2nd trimester of pregnancy, but their relation was statically not significant ($p > 0.05$), similar finding also observed by Chandrakala P et al [17] and Lumbaraja S, et al [18].

The current results shows positive correlation between neonatal birth weight and maternal weight gain in 3rd trimester of pregnancy and also their relation was statically significant with p -value [$p < 0.001$], our results consistent with the other studies: David S. et al [19] and Tela FG, et al [20].

A study done by Sunil Gavhane et al [21], reflect that there was a direct proportion between birth weight and pre-pregnancy weight as well as between birth weight and gestational weight gain.

Inadequate maternal weight gain during pregnancy was significantly associated with the low birth weight neonates in the present study, our finding comparable with the Bowers K, et al [22] and Viswanathan M, et al [23].

A study was done by Danielle E Durie, et al [24] found that suboptimal 2nd & 3rd trimester rates of gestational weight gain in the most obese women, do not increase the probability of SGA neonates. Excessive rates of gestational weight gain increase the probability of LGA neonates to born regardless of BMI.

Conclusion

Pre-pregnancy weight of mother has been an important determinant of birth weight of baby. Birth weight is not only an indicator of child growth and development but also valuable indicator of maternal health, nutrition and quality of life. Adequate maternal weight gain during

pregnancy independently influences birth weight of the baby.

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