

Maternal Nutrition and Birth weight of Infant- a Prospective Study

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Abstract: This study was aimed at finding out the correlation between anthropometric measurements of mother, mainly weight, weight gain during the ante-natal period, and the influence of previous obstetric history on the birth weight of the infant. A hundred patients were followed up from the beginning of gestation until delivery. The average weight gain in our study was 8.31 kilograms. The average pre-gestational weight of mothers in our study was 43.71 kgs. Pre-gestational weight appears to have a greater effect on birth weight than even weight gain in pregnancy and when the weight gain is above 7 kgs. The birth weight was invariably above 2.5 kgs. A definite conclusion needs a very extensive study and the number of cases in our study are insufficient for drawing conclusions. Hence it is concluded that pre-gestational weight and weight gain are of profound value in influencing birth weight of the infant. Parity and previous obstetric history as well contribute towards the infant's birth weight.

Key words: fetal weight, maternal weight, obstetric history, pregestational weight, weight gain

I. Introduction

Obstetric interest in weight gain during pregnancy and pre-pregnant weight dates back just over a hundred years. Study of nutrition in pregnancy has been concerned almost exclusively with the neonate. Perinatal mortality has been known to be particularly high in low birth infants, and in those infants who survive, a higher frequency of congenital defects, mental retardation and sub-normal growth is evident.

In very early pregnancy, especially around the time of conception, severe under nutrition of the mother can result in congenital malformations due to deficient embryogenesis or it may affect the Zygote's capacity for survival and further development. Under nutrition in the latter part of pregnancy usually results in retardation of growth of the infant.

Various studies have been undertaken to find the effect of severe and moderate undernutrition on birth weight of the infant. The effect of pre-gestational weight of the mother (prior nutritional status) and weight gain during pregnancy (present nutritional influence) have been the subject of study by many authors. In our study, a portion of the hospital population, from the lower socio-economic group have studied in relation to pre-gestational weight and weight gain during pregnancy and the influence of such factors on birth weight of the infant.

II. Aim Of Study

This study was intended to find out the correlation between anthropometric measurements of mother, mainly weight, weight gain during the ante-natal period, and the influence of previous obstetric history on the birth weight of the infant.

III. Materials And Methods

The study has been conducted in the out-patient Department and Labour rooms of the Coimbatore Medical College Hospital. A hundred patients were followed up from the beginning of gestation until delivery. Their weight was recorded when they reported for a missed period and this was taken as the pre-pregnancy weight. The patients received the usual immunisation schedule and oral iron and folic acid tablets. They were all from the lower socio-economic status, with an average monthly income of Rs.3250/-. None of the patients received any calorie or protein supplement from the Hospital. Cases of pregnancy induced hypertension with or without oedema, who gain weight abnormally were not taken up for study. All the mothers were housewives, involved in the moderately heavy household work. Only uncomplicated cases were taken up for study.

The influence of prior obstetric history and parity on the birth weight of the infant is also studied. Prior premature births are of greater significance to birth weight of the present infant than abortions. Nutrition of the mother was assessed by recording the Pre-pregnancy weight, height, and haemoglobin level. All the mothers had a haemoglobin level above 9 grams % and therefore, were not anaemic according to our standards. The babies were weighed immediately after birth, after a wash and APGAR scores were noted. Any other anomalies

were also taken note of. All the mothers in the study carried the pregnancy to term and there were no preterm deliveries. The average weight of these mothers was 43.71 kgs. The average weight gain was 8.31 kgs.

IV. Results And Observations

The following were the observations made in our study. Tables show the distribution of gravida, age groups, nature of labour, distribution of cases by weight gain, distribution of cases by pre-pregnant weight, association between weight gain and birth weight, association between pre-pregnant weight and birth weight, association between pre-pregnant weight and birth weight, association between pre-pregnant weight and weight gain, height, previous obstetric history, and perinatal mortality.

Table 1 Distribution Of Gravida

	PrimiGravida	Gravida II	Gravida III	Gravida IV	Gravida V
No.	28	28	22	13	9
%	28 %	28 %	22 %	13 %	9 %

The maximum number of patients were either primigravida or second gravida. 22% of them were third gravid and 13% were fourth gravid. The remaining were grand multigravidas.

Table: Ii Distribution Of Age

	Less than or 20 Years	21 – 24 Years	25 – 30 Years	30 Years or more
No.	14	43	24	19
%	14 %	43 %	24 %	19 %

The maximum incidence of pregnancy was among the 21 to 24 age-groups since the fertility rate is highest in this group. 24% occurred in the 25 to 30 age group. 19% of patients were above 30 and 14% of patients were below 20.

Table 3 distribution Of Labour

	Labour Natural	Forceps	LSCS
No.	94	1	5
%	94 %	1 %	5 %

Majority of patients had a normal vaginal delivery. One patient was assisted with outlet forceps. Five patients underwent a lower segment caesarean section.

Table 4 Distribution Of Weight Gain

Weight gain kgs.	Number	Percentage
6.0 – 6.5	12	12 %
6.6 – 7.0	14	14 %
7.1 – 7.5	12	12 %
7.6 – 8.0	10	10 %
8.1 – 8.5	1	1 %
8.6 – 9.0	31	31 %
9.1 – 9.5	1	1 %
9.6 – 10.0	16	16 %
10.1 – 10.5	2	2 %
10.6 & Above	1	1 %

Majority of patients, (31%) gained an average of 8.6 to 9.0 kilograms. A gain in weight of 6 to 8 kilograms occurred in the majority of the remaining patients (48%), Of the remaining, 16% gained weight in the range of 9.6 to 10 kgs. However, only two patients gained more than 10.1 kgs, one gained more than 10.6 kgs. One patient gained weight in the 8.1 to 8.5 kgs range and finally one in the 9.1 to 9.5 kgs group. So, the majority of weight gain was in the 6 to 8 kgs group (48%) and to 8.6 to 9 kgs group with 31 patients.

Table – 5 Distribution Of Pre-Pregnancy Weight

Pre-Pregnant Weight	Number	Percentage
Less than 47 kg.	71	71 %
47 – 50 kg.	13	13 %
51 – 55 kg.	9	9 %
56 – 60 kg.	3	3 %
61 – 65 kg.	3	3 %
66 – 70 kg.	1	1 %
More than 70 kg.	--	--

An arbitrary weight of 47kg was chosen and patients below this were categorised as underweight pre-gestationally. Nearly three-fourths of patients were under 47kg. 13% weighed in the group between 47-50 kg. And 9% weighed in the group between 51-55 kg. Three each in groups 56-60 kg. 61-65 kg. And one in the 66-70 kg. None of the patients weighed above 70 kg.

Table 6 Association Between Weight Gain And Birth Weight

Weight Gain in kg.	Less than 2500 gm.	2500 – 3000 gm	More than 3000 gm.
6.0 – 6.5	10	2	--
6.6 – 7.0	7	7	--
7.1 – 7.5	3	7	2
7.6 – 8.0	2	6	2
8.1 – 8.5	--	--	1
8.6 – 9.0	--	23	81
9.1 – 9.5	--	--	13
9.6 – 10.00	--	3	2
10.1 – 10.5	--	--	1
10.6 and above	--	--	--

Weight gain is seen to correlate well with the birth weight of the infant. Low weight gain is associated with low birth weight babies below 2500 gms. When the weight gain is high the babies invariably weighed 3000 grams and above.

Table 7 Association Between Pre-Pregnancy Weight And Birth Weight

Pre-Pregnant Weight	Less than 2500 gms.	2501 – 3000 gms.	More than 3000 gms.
Less than 47 Kg.	20	33	18
47 – 50 Kg.	--	8	5
51 – 55 Kg.	2	4	3
56 – 60 Kg.	--	2	1
61 – 65 Kg.	--	--	3
66 – 70 Kg.	--	--	1

It has been proved conclusively by many authors that higher the pre-pregnant weight, higher the birth weight of the infant, 71% of our patients weighed less than 47kgs. Of these patients 33 produced babies weighing between 2501-3000 gms. 20 babies weighed less than 2501 gms. The rest were above 3000 gms. When the pre-pregnant weight was above 47 kgs, the incidence of low birth weight infants reduced. There were only two babies in this group (51-55 kgs.) and incidentally both these mothers had a low weight gain of 7 kgs.

Table 8 Association Between Pre-Pregnant Weight And Weight Gain

Pre-Pregnant Weight	Number	Weight Gain
47 kg.	71	8.36 kgs.
47 – 50 kg.	13	8.03 kgs.
51 – 55 kg.	9	7.77 kgs.
56 – 60 kg.	3	7.50 kgs.
61 – 65 kg.	3	9.70 kgs.
66 – 70 kg.	1	8.58 kgs.

There has been a steady decline in the weight gain with increasing pre-pregnant weight upto 60 kgs.

Table 9 Incidence Of Low Birth Weight In Gravida Weighing less than or equal to 47 kgs. by weight gain

Weight Gain in kgs.	Number	Birth Weight Less than 2501 gms	
6.0 – 6.5	10	10	45.45
6.6 – 7.0	5	5	22.72
7.1 – 7.5	3	3	18.63
7.6 – 8.0	2	2	9.07
8.6 & above	(Expressed as a % of the total number of low birth weight infants)		

With the pre-pregnant weight is held constant at 47 kgs. The number of low birth weight infants have been noted. The total number of low birth infants were 22. Of these 20 are in the 47 kgs. Or less group (90.9%). If follows that only 9.1% of low birth weight infants were in the above 47 kgs. Group. The maximum number of low birth weight infants in the patients weighting less than 47 kgs. Is found in those gaining 6-6.5 kgs.

Table – x incidence of birth weight below 2501 gms. In gravida with a weight gain of less than 6.5 kgs. By pre pregnant weight

Pre-Pregnant Weight (kgs.)	Number	%
47	10	45.5
48 – 50	(Expressed as a % of total number if kiw birth weight infants)	
51 – 55		
56 – 60		
61 & above	--	--
	--	--

Weight gain of less than 6.5 kgs. Occurred only in patients weighing less than 47 kgs. Almost 45.5% of low birth weight infants occurred in this group of patients weighing less than 47 kgs. And gaining a 6.5 kgs. Throughout pregnancy.

Table – Xi Distribution Of Height

Height (in.)	56	57	58	59	60	61	62	63
Number	12	10	17	15	25	8	7	6

Average height was 47 inches. The average height for Indian women is 60 inches. The Ponderal index in our patients is 12.9 (Normal 12.1 – 13.3) PI = Ht. In inches /3 wt. In Lbs.

Table – Xii Influence Of Abortions On Birth Weight

Number of cases with abortion/s	Birth Weight 250 gms	Perinatal deaths
12	4	3

Incidence of abortion was 12%. Various authors have said that incidence of low birth weight increased with a history of one prior preterm birth and at least one prior abortion. Greater number of cases are needed to correlate such findings.

Table – 13 Influence Of Parity Low Birth Weight

Group	Number	2501 gms.	2501 gms.	%
Primigravida	28	7	21	25
Multigravida	63	13	50	20.6
Grand Multi	12	2	7	22.3

The incidence of low birth weight is lowest in the multigravida, compared to primipara, to rise again in the grand multigravida.

Table – 14 Analysis Of Perinatal Mortality

Number	Birth Weight		Perinatal Death	
	2501 gms	2501 gms	Stillbirth	Neonatal Death
7	6	1	1	6

Perinatal mortality was undoubtedly higher in the low birth weight group. One baby with a birth weight of more than 2501 gms. Was a still birth due to meconium aspiration. All the six neonatal deaths occurred in the low birth weight infants. The main causes of death were asphyxia and sepsis.

V. Conclusion And Inferences

A Study has been attempted to find interplay of factors innolved in determination of the birth weight of the infant. Various factors have been considered. Of prime importance are the weight gain during pregnancy and pre-gestational weight. Parity definitely influences birth weight. Influence of previous pre-mature births and abortions have been studied in great detail by various authors, their conclusions being, an increased incidence of foetal under nutrition when there were three or more prior premature births. In our study the relationship between abortions and foetal low births weight seems significant but due to the paucity of numbers, definite conclusions cannot be drawn.

Weight Gain

The average weight gain in our study was 8.31 kilograms, weight gain was measured as the difference in weight at conception and at delivery. Greater gain in weight was associated with babies which weighed more than 2.5 kgs. At birth. The reverse was also true, lower weight gain being associated with greater number of low birth weight infants, for example, 45.45% of low birth weight infants in the group gaining 6-6.5 kgs. And only a 9.07% in the group gaining 7.6 – 8 kgs. When the weight gain exceeded 8 kgs. None of babies were below 2.5 kgs.

Pre-gestational weight:

The average pre-gestational weight of mothers in our study was 43.71 kgs. This weight was taken to be the weight of the mother when she attended the hospital to confirm pregnancy. A definite correlation exists between pre-gestational weight and birth weight of the infant. Lower the pre-gestational weight, greater the number of low birth weight infants, for example 90.91% of low birth weight infants occurred in the less than 47 kgs. Group and only 9.09% occurred in the more than 47 kgs. Group. Pre-gestational weight appears to have a greater effect on birth weight than even weight gain in pregnancy.

Inter-relationship between weight gain and pre-gestational weight :

A pattern emerges when the relations between weight gain and pre-gestational weight are analysed. These two factors seem to have a compensatory effect in some cases and an additive effect in others. For example greater weight gain in poor pre-gestational weight mothers, seems to reduce the number of low birth weight infants and when pre-gestational weight is high, even a low weight gain results in babies weighing more than 2.5 kgs. When both pre-gestational weight and weight gain are low the babies are invariably below 2.5 kgs. When pre-gestational weight is above 47 kg. And weight gain above 7 kgs. The birth weight was invariably above 2.5 kgs.

Parity:

The incidence of low birth weight infants is least in second, third and fourth gravida. It is higher among primi gravid and grand multigravida.

Obstetric history:

Incidence of abortion among our patients was 12%. Of the 12 infants 4 weighed less than 2.5 kgs. And three among them were lost. Hence 33.3% of babies born to mothers who had a prior abortion were low birth weight. A definite conclusion needs a very extensive study and the number of cases in our study are insufficient for drawing conclusions.

Hence it is concluded that pre-gestational weight and weight gain are of profound value in influencing birth weight of the infant. Parity and previous obstetric history as well contribute towards the infant's birth weight.

References

- [1]. Arthur Leader, Kevin H. Wong And Mervyndietl, *Maternal Nutrition Obstet. Gynaecol. Surv.* 37 : 229, 1982.
- [2]. Barbara Luke, *Maternal Nutrition*, Little Brown & Company, Boston, 1982.
- [3]. Charles H. Peckham, Roberts E, Chritianson, *Relationship Between Pre-Pregnant Weight And Certain Obstetric Factors*, *Am. J. Obstet. Gynaecol.* 111 : 1, 1971.
- [4]. Eastman, N.J., & Jackson E., *Weight Relationships In Pregnancy* *Obstet. Gynaecol. Surv.* 23 : 1003, 1968.
- [5]. Funderburx S.J., Guthrie D. And Meldrum, D., *Suboptimal Pregnancy Outcome Among Women With Prior Abortions And Premature Births*. *Am. J. Obstet. Gynaecol.* 126:55, 1976.
- [6]. Gopalan C., *Et Al Dietary Allowances For Indians*, ICMR, Special Reports Series, No. 60, National Institute Of Nutrition, 1980.
- [7]. Hytten F.E., *Weight Gain In Pregnancy : 30 Years Research* *Obstet, Gynaecol. Surv.* 37 : 162, 1982.
- [8]. Kerr A., *Weight Gain Pregnancy And Its Relation To Weight Of Infants And To Length Of Labour*. *Am. J. Obstet. Gynaecol.* 45 : 950, 1943.
- [9]. Kusum P. Shah, *Maternal Nutrition In Deprived Populations*, Adapted From A Report Prepared For The Fourth Meeting Of The Consultative Group On Maternal And Young Child Nutrition, UN Administrative Committee On Co-Ordination – Sub Committee On Nutrition, Geneva, 106-13 August 1981.
- [10]. Love, E.J. Kinch, R.A.H., *Factors Influencing The Birth Weight In Normal Pregnancy*, *Am. J. Obstet. Gynaecol.* 91 : 342, 1965.
- [11]. Matsuto Mochizuki Et Al, *Effects Of Smoking Of Foeto Placental Maternal System During Pregnancy*, *Am. J. Obstet. Gynaecol.* 149 : 413, 1984.