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MATERNAL NUTRITION AND WEIGHT GAIN AFFECTING OUTCOME OF PREGNANCY

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Abstract

Poor nutritional status and inadequate food intake during and prior to pregnancy not only affect Women's health but also have negative impact on growth and development of fetus. The birth weight of an infant is a powerful predictor of growth and survival of infant and is dependent on maternal health and nutritional status, pre-pregnancy weight and general weight gain are all strongly associated with fetal growth and development. So, improving maternal nutrition prior to conception and during pregnancy are potential strategies to improve birth weight. The Present study has been carried out to discuss the circumstances under which the effect of maternal nutrition on birth weight can be observed, and to determine the specific contributors of calories and protein to birth weight.

Materials and methods: The present study has been carried out at Teaching Medical College and hospital to find out correlation between various factors responsible for maternal weight gain and nutrition with birth weight of baby and to standardize diet chart for pregnant mothers in rural area. The study included 100 women who were followed up from 8 to 10 week of pregnancy till delivery. Anthropometric measurements including maternal weight, height and total weight gain in pregnancy and infant's birth weight were recorded and all mothers were interviewed for their bio-social variables.

Results: The mean birth weight is below 2.4 kg in age <19 years and in 30 years and above, it is >2.5 kg. The mean birth weight in primipara is 2.4 kg and then it gradually increased maximum up to 2.6 kg in multipara. The mean birth weight in 2.4 kg in mothers below 145cm.Above that till 160 cm there is steady increase in birth weight up to 3.08 kg. The mean birth weight was lowest in cases where maternal weight is below 40 kg and it reached maximum 3 kg in weight group 60-69 kg. The mean birth weight is 2.4 kg in weight gain between 5-9 kg and maximum up to 3 kg in weight gain between 15-19 kg. The mean birth weight is 3.2 kg in high socioeconomic group and 2.2 kg in low socioeconomic group.

Conclusion: There is definite relation between maternal age, parity, height, pre-pregnancy weight, weight gain during pregnancy, socioeconomic status and daily dietary intake per day and birth weight of baby. So health policies should be aimed at early detection and effective management of under nutrition to reduce the burden of low birth weight babies and there is a need to focus attention on better maternal nutrition and education on birth spacing, early pregnancy and family planning.

Introduction:

Even in absence of systemic maternal disease and intrinsic fetal disease, there is considerable variation in birth weight of infant in a same patient from pregnancy to pregnancy, in the same institute from patient to patient, in same town from one group to another and in same country from one region to another,

The variables that determine the infant weight at birth is multiple and interrelated, those include maternal age, parity, height, socioeconomic status, nutrition to mention few.

Pre-pregnancy weight and maternal weight gain during pregnancy in absence of medical and/or obstetric complications may be considered not only as indirect evidence of maternal nutritional state, but also as an indicator of birth weight.

A mother who has been well nourished prior to conception enters pregnancy with a reserve of several nutrients that can meet the needs of a growing fetus without affecting her own health. The mother's diet during pregnancy has a direct influence on fetal growth and hence the size and health of newborn.

One of the major nutritional problems in our study is low birth weight babies. About 30 % of babies born in India are Low Birth Weight as compared to 4 % in some developed countries.

Aims and Objectives: -

1. To screen out undernourished mothers.

2. To assist in maintaining normal physiology of pregnancy

3. To make the mother physically and psychologically strong so that she can bear the stress of labour with good fetal outcome.

4. To standardize the diet chart of a pregnant women in rural circumstances in Indian scenario.

Materials and Methods:

The study included 100 pregnant women who were followed up from 8 to 10 weeks of pregnancy to delivery. Total patients selected were 120, 20 patients were subsequently omitted from the study due to either abortion, multiple pregnancy, development of PIH, Premature labor, stillbirth or loss of follow up.

In first visit detailed history, ANC checkup, weight, height, hemoglobin estimation, Blood group, Urine for albumin and Sugar, BSL (Random), VDRL, HBS Ag, HIV testing is done after counseling the patient.

At Each Visit Weight was recorded by same individual on same electronic weighing scale, without footwear in 10 antenatal visits as per ANC schedule.

Weights of newborn were recorded on electronic weighing machine after cutting the umbilical cord followed by ligation of cord and cleaning the baby.

Iron, Calcium, Folic acid, and multivitamins were prescribed to meet increased demand during pregnancy as per ANC Schedule. Anemia and vitamin deficiency were corrected. The standard diet chart plan was formulated according to social and cultural habits which met the nutritional values during pregnancy.

In this study of 100 patients 71 were complaint with this standard diet and 29 were non-compliant due to their personal, social and economic problems. For this study, patients were divided into following groups,

1. 1001-1500 Kcal/Day
2. 1501-2000 Kcal/day
3. 2001-2500 Kcal/Day
4. 2501-3000 Kcal/day
5. 3001-3500 Kcal/day

A Chi square test was used to determine whether there was a significant association between maternal age, parity, height, pre-pregnancy weight, net weight gain in pregnancy, socioeconomic status nutrition of the mother during pregnancy with birth weight of infant.

Observations and discussion:

Table 1: Age of the mother

Age in year	Birth weight in grams				Total in each group	Mean Birth weight in grams	Standard deviation
	2001-2500	2501-3000	3001-3500	3501-4000			
15-19	15(60%)	41($0%)	Nil	Nil	25	2470	253
20-24	16(35%)	25(55%)	4(8.8%)	Nil	45	2540	291
25-29	7(28%)	8(32%)	7(28%)	3(12%)	25	2970	549
30 and above	1 (20%)	4(30%)	Nil	Nl	5	2500	156
Total	39	47	11	3	100		

The mean birth weight is below 19 yrs, reaches its peak between 25-29 years and the declines again. The correlation co efficiency between mother's age and birth weight of baby is 0.18 and is significant (P<0.05)

This Study shows optimum child bearing age between 20-29 yrs is in agreement to Nair and Thankam Bhatt et al and Saigal et al

Table 2: Parity

Parity	Birth weight in grams				Total in each group	Mean Birth weight in grams	Standard deviation
	2001-2500	2501-3000	3001-3500	3501-4000			
Primipara	19(61%)	12(39%)	Nil	Nil	31	2492	1435
Second Para	11(36%)	14(53%)	2(6.8%)	1(3.4)	30	2580	1746
Multipara	9(23%)	19(50%)	9(23%)	2(5%)	39	2630	305
Total	39	47	11	3	100		

The Correlation coefficient between birth weight and parity is 0.21 which is significant (P<0.05), Chi Square test was applied to table between the parity and birth weight in grams and that was highly significant.

Doughery and Jones showed that difference of 104 grams between multipara and primipara which is similar to our series. The Bhat et al (3) series showed same conclusions as in our series.

Table 3: Height of the mother

Sr. No.	Height of mother in cm	Birth weight in grams				Total in each group	Mean birth weight in grams	Standard deviation
		2001-2500	2501-3000	3001-3500	3501-4000			
1	141-145	9(64%)	5(35%)	Nil	Nil	14	2420	245
2	146-150	21(47%)	22(50%)	1(2.3%)	Nil	44	2475	251
3	151-155	7(31%)	13(60%)	2(9%)	Nil	22	2605	281
4	156-160	2(18%)	5(45%)	3(28%)	1(9%)	11	2800	369
5	161-165	Nil	2(22%)	5(55%)	2(22%)	9	3085.5	392
Total		39	47	11	3	100		

The Difference in mean birth weight between maximum and minimum recorded is 665.5gm. Correlation coefficient between maternal height and birth weight is 0.50 which is highly significant (P<0.001).

The Mean birth weight in our series is comparatively higher than those in Bhatt's Series but lesser than those of Godfrey series and is quite similar to those with Jayalaxmi Seires.

Table 4: Pre-pregnancy weight of the mother

Sr. No.	Pre-pregnancy weight in kg	Birth weight in grams				Total in each group	Mean Birthweight in grams	Standard deviation
		2001-2500	2501-3000	3001-3500	3501-4000			
1	30-39	25(66%)	12(32%)	1(2.6%)	Nil	38	2437	246
2	40-49	12(31%)	25(66%)	1(2.6%)	Nil	38	2500	252
3	50-59	2(12%)	8(47%)	6(35%)	1(6%)	17	2910	397
4	60-69	Nil	2(29%)	3(42%)	2(29%)	07	3000	353
	Total	39	47	11	3100			

There is a significant correlation between the mother's pre-pregnancy weight and birth weight.
The Coefficient of correlation being 0.55(P<0.001). Chi Square test is highly significant.
Sachet (1994) showed definite correlation between low pre-pregnancy weight with low birth weight babies .Catalana (1998) found that maternal pre-gravid weight is related to neonatal body composition. Kirchengast(2003) showed that maternal somatic features like pre-pregnancy weight was significantly associated

Table 5: Net Weight gain during pregnancy

Sr. No.	Net weight gain in kg	Birthweight in grams				Total in each group	Mean Birth weight	Standard deviation
		2001-2500	2501-3000	3001-3500	3501-4000			
1	5	24(69%)	10(29%)	1(3%)	Nil	35	2400	232
2	10-14	15(28%)	35(64%)	4(&%)	1(2%)	55	2625	222
3	15-19	Nil	2(20%)	6(60%)	2(20%)	10	3000	353
Total		39	47	11	3	100		

There is significant correlation between net weight gain of mother and mean birth weight of baby. The Coefficient of correlation is 0.58(P<0.001) which is highly significant.
In 1994 King and Sachet and Negger found correlation exists between maternal health reproductive performance and fetal outcome and weight gain during pregnancy.

Table 6: Socioeconomic status of mother

Sr. No.	Socioeconomic status	Birth weight in grams				Total in each group	Mean Birth weight	Standard deviation
		2001-2500	2501-3000	3001-3500	3501-4000			
1	Class-I	Nil	4(36%)	5(45%)	2(13%)	11	3258	408
2	Class-II	Nil	12(72%)	4(24%)	1(6%)	17	2925	264
3	Class-III	10(32%)	20(64%)	1(3.2%)	Nil	31	2600	220
4	Class-IV	16(60%)	10(37%)	1(4%)	Nil	27	2290	251
5	Class-V	13(93%)	1(7.2%)	Nil	Nil	14	2450	262
	Total	39	47	11	3	100		

The mean birth weight is 3250 gms in high socioeconomic status and it is 2290 gms in low socioeconomic status. The coefficient of correlation is 0.81(P<0-001) which is highly significant.
Tiwari and Ray in, Godfrey et al 1997 shown that lower socioeconomic class had smaller infants, a definitive correlation exist between maternal nutrition and growth of fetus.

Table 7: Nutrition of mother during pregnancy

Sr. No.	Dietary Intake Kcal/Day	Birth weight in grams				Total in each group	Mean Birthweight
		2001-2500	2501-3000	3001-3500	3501-4000		
1	1001-1500	10(100%)	Nil	Nil	Nil	10	2250
2	1501-2000	19(100%)	Nil	Nil	Nil	19	2252
3	2001-2500	10(20%)	37(74%)	3(6%)	1(7.2%)	50	2650
4	2501-3000	Nil	10(71%)	3(21%)	1(7.2%)	14	2750
5	3001-3500	Nil	Nil	5(71%)	2(29%)	07	
	Total	39	47	11	3	100	

The Correlation Coefficient is 0.48(P<0.001) which is highly significant and shows positive correlation between increase intake of calories per day and mean birth weight of the baby. Mora et al series have shown that un-supplemented groups and low dietary intake groups have low birthweight babies as compared to supplemented and high dietary group.

Table 8: Relationship of compliance to standard diet chart to birthweight of the baby.

Sr. No.	Compliance with standard diet(Kcal/day)	Birth weight in grams				Total in each group
		2001-2500	2501-3000	3001-3500	3501-4000	
1	1001-2000	29(100%)	Nil	Nil	Nil	29
2	2001-3500	10(14%)	47(66%)	11(15%)	3(4%)	71
	Total	39	47	11	3	100

This table shows that all cases In group of mothers who consumed less than 2000 kcal/day weighed their infants less than 2500 gms, while 18% cases consumed more than 2001 kcal/day and in 66.3% cases babies weighed between 2500-3000 gms while only in 14.1% cases babies weighed < 2500 gms.

Summary and Conclusions:

The factors studied were maternal age, parity, height, Pre-pregnancy weight, weight gain during pregnancy, socioeconomic status, daily dietary intake per day during pregnancy and birth weight of of baby and its relationships with these factors.

1. There is a definite relation between age of the mother and babies birth weight. The mean age in the study is 22.3 yrs. Maximum birth weight gain in age group 25-29years.There exists significant correlation between age and birth weight (r=0.18, p<0.05)
2. With the progressive increase in parity of mother, the mean birth weight progressively increases. Minimum birthweight 2492gms in primiparas and maximum birthweight 2630 gms in multiparas. Correlation coefficient between parity and birthweight(r=0.21) which is significant(P<0.001)

3. The minimum mean birth weight is 2420 gms between 141-145 cms of height. It progressively increases with height and reaches to 3085.5 gms in the height between161-165.The correlation coefficient is 0.50 (P<0.0010) which shows significant relation between birthweight and maternal height.
4. Mother who weighed 30-39 kg of weight produce babies of mean birth weight 2437 gms which progressively increases with increase in weight, mothers weighing 60-69 kg, the mean birth weight is 3000 gms (r=0.55, p<0.001)
5. Mothers gaining 5-9 kg weight produce babies with mean birth weight 2400 gms while those gaining 10-14 kg of weight produce babies with 2625 gms and the mothers gaining 15-19 kg produce babies with 3000 gms. Definite correlation exists between mother's weight gain and birth weight of baby (r=0.58.P<0.001)
6. Maximum Birthweight is 3250 gms in class I And II and minimum birth weight in 2290 gms in class IV and V. The correlation coefficient being 0.81 with p<0.001 which is significant.
7. Mothers consumed less than 2000 Kcal/day has mean birth weight of 2250 gms which progressively increases with consumption of more calories per day and in mothers consumed more than 3000 kcal/day produced baby of 3250gm. The correlation coefficient is 0.48, p<0.001.
8. Cases who were compliant with standard diet chart had high mean birthweight (2950gms) and who were non-compliant produced low birth weight babies(<2500 gms)

Bibliography:

1. ACOG Technical Bulletin no. 179. Nutrition during pregnancy. Int.J.gynecol obstet. 43:67-74;1993.
2. Bhatt.R.V.et al. Pattern of weight gain in normal pregnancy. J.of obst.and gynecol India vol 22:631-35;1972.
3. Catalano,P.M.Drago N.M.Amini S.B. Factors affecting fetal growth and body composition. Am. J. obstet gynecol,172:1459-63,1994.
4. Dougherty,C.R.S.Jones,A.D. The determinant of fetal weight. Am. J. obstet genecol. 144:190-98,1982.
5. Eastman J.N. and Jackson.E. The bearing of maternal weight gain and pre-pregnancy weight on birth weight in full term pregnancies. Obstet and Gynec. Surgery, 23:1003-25;1968.
6. Fiona, Mathews, Patricia Yudkin, Andrew Neil. Influence of maternal nutrition on outcome of pregnancy. J. Hum.Nutr. diet: 1999;11,151-161.
7. Godfrey ,K.M.Barker D.J.P,Robinson S.,Osmand C. Maternal birth weight and diet in pregnancy in relation to the infants thinness at birth: Br. J.Obstet. gynecol 104,663-667,1997.
8. Jaylaxmi,V.Vohra,S.Bharti,A Study of correlation between maternal weight gainduring pregnancy ,height and serial protein estimation with fetal outcome .Journal of Obstet and gynecol:31,418-23;1981.
9. King, J.C.Sachet,P.Maternal nutrition: New developments and implications:CERIN,1994.
10. Kirchengast,S.Harmann.Impact of maternal age and maternal somatic characterstics on newborn size J.HumanBiol.2003 Mar-Apr:15(2) 220-228.
11. Krammer.M.S.Effets of energy and protein intake on pregnancy outcome : An Overview of the research evidence from controlled clinical trials.Am.J.Clin.Nutr.:58;627-635:1993.
12. Mckeown,T.and Record,R.G.The Influence of prenatal environment on correlation between birth weight and parental height. Am.J. Human Genetics 6:457,1959.
13. Mora J.O. et al. Nutritional Supplementation and the outcome of pregnancy. Birth Weight J.Clin.Nutr.32:455-462,1979.
14. Neggers,Y.H.,Goddenberg,R.I.,Tamurs,T.Clive r,S.P.,Hoffman H.J. The relationship between maternal dietary intake and infant birth weight. Acta Obstet Gynecol.scand. 76: 71-75,1997.

15. Prasad,B.G. Changes proposed in the social classification of Indian families. J.Indian M.1998-1999.

16. Pritchard J.A. and MacDonald P.C.,Williams: Obstetrics.Ed.16 ,Newyork,1980 Appleton Country Cryts,310.

17. Robinson,S.,Godfrey,K Osmond C.Cox, V,Barker,D .Evaluation of food questionnaire used to assess nutrient intakes in pregnant women. E. Journal of Clin.Nutr.: #02-308,1998.

18. Tiwari,P. Roy B. The birth weight and related factors. Journal of Obstet and Gynec: 27;911-915;1976.