Research Paper Medical Science

The Study of Efect Of Maternal Body Mass Composition And Hb% At Term Gestation On Birth Weight And Apgar Score of The Newborn

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ABSTRACT

Back ground: During gestation alterations in maternal metabolism provides nutrients for fetal growth in addition to maternal and fetal energy requirements . presumably the outcome of pregnancy and infant's birth weight depend on various other factors like socio economic status, literacy etc

Material and methods: A total of 150 patients delivering at term at Katuri Medical College and Hospital, Guntur during one year were taken into the study. The subjects were randomly recruited from the general population of women without any known medical or obstetric problems during the index pregnancy.

Results : It was observed that very significant number i.e. 84.67% of patients were anaemic has less BMI4, body fat, body fat free mass and delivered low birth weight of babies with less ponderal index compared with women who are mildly anaemic . Apgar scores did not show relationship with income, literacy, parity , age1 of the mother and birth weight .

Conclusion : The incidence of LBW was highest in severely anaemic patients. The Nutritional status as represented by ANW, body fat, body fat free mass, BMI3 was poor in anaemic patients. They all inturn had affected birth weight. Apgar scores showed no significant correlation with maternal age, parity1, birth weight, maternal income and literacy.

KEYWORDS | Body fat free mass , Body mass index, Hemoglobin percentage, APGAR score.

AIMS AND OBJECTIVES :

a) To assess the relative influence of maternal body fat[5] and fat free mass at term gestation on birth weight[13]

b) To study the effect of maternal anemia on birth weight[10] and APGAR scores.

INCLUSION CRITERIA :

Patients were eligible only if they had a certain LMP or an ultrasonographic examination before 20 weeks gestation

All of the subjects had normal 1 – hour glucose screening test for gestations diabetes.

EXCLUSION CRITERIA :

Patients were considered ineligible if they had pre elcampsia[14] , diabetes mellitus or any other medical and obstetric disorders complicating pregnancy like congenital rheumatic heart disease, chronic renal disorders, chronic hypertension, oligohychomnios, polyhydromnios, antepartum haemarrhage, post term and pre term deliveries etc. patients with congenital anomalies in the babies and patents with edema were also excluded.

TECHNIQUE :

Information obtained from each subject included age[1], literacy status, total monthly family income, parity[1] and smoking.

Gestational age was calculated from LMP and by early ultrasound examination[7]. Patients hemoglobin was measured by spectro photometric method maternal nutritional anthropometric measurements were taken 2 to 3 days before EDD (or) after completion of 38 weeks by ultra sonography.

The various anthropometric measurements taken were

1) Mid Arm Circumstance (MAC); It was measured at the point halfway down the left arm between the tip of aeromion and olecranon to the nearest 0.1cm.

2) Skin fold thickness – all measurements were taken with the subject seated on a stool, on the left side of the body with the Harpenden skin fold calcipers. Four sites were selected.

a) Biceps region over the midpoint of the muscle belly with the arm resting supinated on the subjects thigh

b) Triceps region over the midpart of muscle belly, midway between the olecranon and the tip of the acrominion with the upper arm hanging vertically.

c) Subscapular region first below the tip of the inferior angle of the scapula at an angle of 45 degrees to the vertical

d) Suprailiac region just above the iliac crest in the mid axillary line.

At these four sites, the skin fold was pinched up firmly between the thumb and forefinger and pulled away slightly from underlying tissues before applying the calipers for the measurement.

Maternal weight[6] was measured using the same standard hospital equipment before and after delivery to the nearest 0.5kg.

Maternal height was taken by a standard height rod to the nearest 1cm

BMI[3] as defined by qutlet was computed as follows

BMI = weight in kg/ [height in mts]^2 maternal body fat was calculated by the standard anthropometric formula.

$$\text{Body fat mass} = \frac{WB}{100} x \left[\left(\frac{522.5}{DB}\right) - 480.5\right]$$

WB = body weight

DB = Body density

Body density was calculated by the standard formula C-M x log of sum of skin folds ; where C & M are constant

C = 1.1549

M = 0.0678

Maternal fat free mass was calculated by subtracting body fat mass from the total body weight. Maternal Hemoglobin by spectrophoto metric method.

Neonatal data included :-

- Birth weight was recorded with in 24 hrs after birth on a pre-zeroed electronic weighing balance with the baby

naked to the nearest 5 gms
- Length of the baby was measured using as infantometer to the nearest of 0.1cm
- Ponderal index was calculated by the formula weight in gm x 100/ length in cm^3
- APGAR score was estimated at 5 minutes.

RESULTS:

It was observed that very significant number i.e.,84.67% of patients were anaemic whose HB% was below 11gms. 12.6% of women belongs to severly anaemic group with HB% levels of lessthan 7 gms depicting poor nutrition.It was observed in our study that patient with moderate and severe anaemia had less BMI, body fat,body fat free mass and delivered low birth weight babies with less ponderal index compared with women who are mildly or not anaemic.

Similar observations were made by the study done by Cedergren M. Effects of gestational weight gain and body mass index on obstetric outcome in Sweden. International Journal of Gynaecology and Obstetrics. 2006; 93(3) 269-274.

Also, babies born to women with severe anaemia had lower apgar scores.However there was no correlation of apgar scores with anaemia in other groups.

When effects of components of material weight,that is fat and fat free mass on birth weight were considered, it was observed in the present study that body fat free mass has a significant influence on birth weight (P value of 0.001).Similar observations were made by the study done by Franscisco-mardones and Gabiella Salazar et al. and other studies done in western countries which concluded that maternal FFM was the most important variable, influencing birth weight followed by maternal fat mass.

The indian women constitutionally and genetically are of smaller built and also have a poor nutritional intake.These three factors are responsible for the low birth weight babies. The first two factors being unmodifiable, the only means to increase the birth weight of babies born to these women is to improve their nutritional status by increasing the quality and quantity of their deitary intake.

Maternal mid arm circumference which indicated the fat and muscle mass also had a positive corelationn with birth weight.

A significant number women (35%) who are pregnant for the first time were very young (below 20 years).

This has been aptly brought out in the present study where in it was shown that most of these young primi gravidas were anaemic had lower BMI, had less fat and fat free mass and delivered LBW babies with low PI.

40% of the studied patients were primi gravidas and 60% were multi gravidas.

The percentage of LBW babies in primis was 21.6% where as it was 16.6% in multis.

It was observed that 55% of babies born to women of lower income group were of low birth weight, with low PI and lower apgar scores (mean 8.8) and most of these women were anaemic with a mean haemoglobin of 7.9gm.About 13.07% of babies born to better income group were of LBW,with better apgar scores and PI.The babies of these patients were heavier by about 400gms.The mean haemoglobin of these women was about 9.7gms.Thus it was observed that

family income had a strong influence on maternal anemia, birth weight, apgar score and PI.

Compared with low income group, the mothers of better income group had more BMI,more body fat and body fat free mass which indicate better nutritional status. It was observed that a considerable number of mothers (31.34%) were illiterate. None of the iliterate pregnant women had haemoglobin of above 11gm/dl.

Postnatal weight measured with in 48 hrs after delivery was used for BMI.This was taken to represent the pregnancy BMI. It was seen that 52% of babies born to women of BMI of lessthan 20 and compared to 12% of babies born to women with BMI of greater than 20.This clearly indicates the strong influence of maternal height and weight on neonatal birth weight.

The only significant difference of apgar scores was observed between severly anaemic and not anaemic groups.Severe anaemia causes chronic hypoxia which increases during the intrpartum period effecting the baby adversely.

DISCUSSION:- A total of 150 patients delivering at term at Katuri Medical College, Guntur who met the criteria for eligibility were included in the study during one year period. All patients delivered within one week after taking into the study and were between 38 and 40 weeks.

The patients were classified into 4 groups depending on their Hb levels as determined by spectrophoto metric method, as described in table 1.

TABLE – 1
Haemoglobin distribution

Group	HB%	No	%	Mean Hb%
Group I	≤ 7gm	19	12.67	6.163
Group II	7.1 – 9gm	34	22.67	8.282
Group III	9.1 – 11gm	74	49.34	10.220
Group IV	> 11gm	23	15.34	11.93

The comparision between four groups done – which was depicted in Table – 2.

TABLE – 2
HAEMOGLOBIN DISTRINUTION

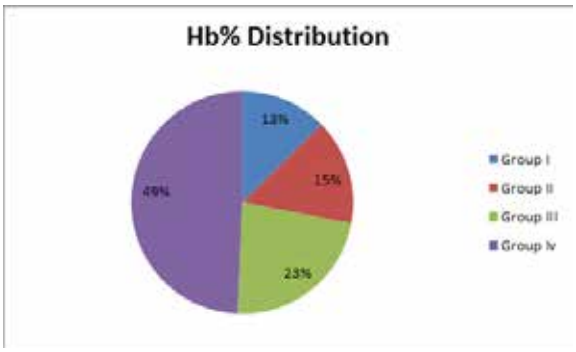
	GROUP-I	GROUP-II	GROUP-III	GROUP-IV
Parameter	≤ 7% (19)	7.1-9% (34)	9-11%(74)	>11% (23)
ANW	51.55 ± 5.35	55.14±6.22	59.062±7.7	64.9±8.31
BMI	19.99 ± 2.11	22.066 ± 2.44	23.317 ± 2.59	25.099 ± 2.92
MAC	22.876 ± 1.924	24.476 ± 2.13	25.075 ± 2.10	26.43 ± 2.02
Body fat	9.7 ± 2.32	14.2 ± 6.88	14.3 ± 3.71	16.3 ± 3.69
Body fat%	18.972 ± 3.77	23.885 ± 4.81	24.115 ± 3.73	16.3 ± 3.69
Body FFM	41.193 ± 3.55	41.868 ± 3.8	44.227 ± 5.066	47.663 ± 5.37
Birth weight	2.334 ± 0.19	2.642 ± 0.27	2.835 ± 0.26	3.286 ± 0.402
PI	2.070 ± 0.15	2.338 ± 0.179	2.415 ± 0.161	2.515 ± 0.185
Apgar	8.63 ± 1.38	9.35 ± 1.011	9.35 ± 0.94	9.3 ± 0.97
% of LBW	10%	5.34%	2.67%	0.67%

All the parameters improved as the HB% improved except for the apgar scores comparisons between group I and group II and group III, group III and group IV, and group I and group IV were made and the following results obtained. Body fat free mass, birth weight and ponderal index had significant correlation with HB% when comparison is made between Group I and Group II. Between group II and group III there was not much difference in the parameters except for the birth weight.

Only body fat free mass, birth weight and ponderal index had significant correlation with HB% between Group III and Group IV.

All the parameters7 were significantly correlated with HB%

when comparison is made between severely anaemic and not anaemic groups and it is depicted in HB% distribution pie diagram



Also babies born to patients with severe anemia had lower apgar scores. It was observed that in the present study body fat free mass of mother has a significant influence on neonatal birth weight.

Upto 49% of the mothers belonged to the group III and a significant (35.32%) number of mothers had Hb% levels of <9. This indicates the poor nutrional status pregnant women in our population.

Maternal age[1] ranged from 17 years to 32 years about 1/4th of the mothers were young[22] (<20yrs).

They were classified into two broad groups based on age[1], parity[1], literacy and body mass index[2]. Only two groups were made for simplicity and to highlight the differences between the extremes.

The mean birth weight of babies born to severely anemic mothers (Hb < 7 gm) was lowest and that of babies born to mothers with normal haemoglobin values was highest

Teenage women22 had significantly lower mean value of ANW, BMI, HB%, Body fat FFM23, Birth weight, MAC and PI. However difference in apgar scores of the baby were not significant.women belonging to better income group had statistically significant higher HB%, gave birth to babies with statistically significant higher birth weight and PI. Although the ANW, FFM, Apgar, BMI are higher in better income group, they did not have statistical significance.There was a significant influence of body mass index of the mother over the different maternal and fetal parameters7.

Lower birth weight babies had significantly lower mean levels of ANW, BMI, HB%, BF, FFM, PI and MAC compared with babies of normal weight. How ever difference in apgar scores were not significant.

Mean values of ANW, BMI, MAC, FFM, birth weight13 and HB% were significantly

Higher in women with babies of PI of > 2.3. Although apgar scores are higher in women of good PI it is not statistically significant.

Higher mean values were obtained for all the maternal and fetal parameters10,7 in literacy group except for the apgar scores.

CONCLUSION:-

1. The incidence of LBW was highest in severly anaemic[17] patients. They had lower apgar scores and low ponderal index. The mean birth weight increased as hemoglobin increased.

2. The nutritional status as represented by ANW, body fat, body FFM,BMI was poor in anemic patients. They all inturn had affected birth weight.

3. Apgar score was low in babies born to severely anemic mothers,in other groups apgar had correlation with anemia.

4. Most of the teenage pregnant women[22] were anemic and delivered LBW babies.

5. Birth weight as well as the nutritional status of the babies[19,23] was better in mothers belonging to better income group & in literate mothers.

6. None of the illeraterate women had Hb of more than 11gms.

7. There were no sugnificant difference in birth weight. Apgar, Hb%, bodyfat, lean body mass between primipara[5] and multiparous women.

8. Apgar scores showed no significant correlation with materanal age[1], parity[1] , birth weight, maternal income and literacy.

REFERENCES

1. Abdul Shah : Birth weight co-related to mother's age and parity. Jo BGI, Aug.96.
2. Amorim AR, Rossner S, Neovius M. Lourenco PM Linne Y : Does excess pregnancy weight gain constitute a major risk for increasing long-term BMI? Obesity (Silver Spring). 2007; 15(5) : 1278-1286.
3. Arendas K, Qlu Q, Gruslin A: Obesity in pregnancy: pre- conceptional to postpar-tum consequences. Journal of Obstetrics and Gynaecology Canada. 2008; 30(6): 477-488.
4. Baker JL, Michaelsen KF, Sorensen TI, Rasmussen KM: High prepregnant body mass index is associated with early termination of full and any breast feeding in Danish Women. American Journal of Clinical Nutrition. 2007; 86 (2): 404-411.
5. Bhattacharya S, Campbell DM, Liston Wa, Bhattacharya S : Effect of body mass, index on pregnancy outcomes in nulliparous women delivering singleton babies. BMC Pblic Health 2007, 7:168-176.
6. Bianco AT, Smilen SW, Davis Y, Lopez S, Lapinski R, Lockwood CJ. Pregnancy outcome and weight gain recommendations for the morbidity obese women. Obstetrics and Gynaecology, 1998; 91 (1); 97-102.
7. Bilardo CM, Wolf H, et al : relationship between monitoring parameters and perinatal outcome in severe, early FGR, Ultrasound Obst. Gynaecol 2004: 23: 119-125.
8. Bodnar LM, Catov JM, Klebanoff MA, Ness RB, Roberts JM: Prepregnancy body mass index and the occurrence of severe hypertensive disorders of pregnancy. Epidemiology 2007; 18 (2): 234-239.
9. Brown JE, Scholesser PT: Prepregnancy weight status, prenatal weight gain, and the outcome of term twin gestations, American Journal of Obstetrics and Gynaecology, 1990, 162(1): 182-186.
10. Brown J.E., Kalin SB : Maternal nutrition and the outcome of pregnancy, A renaissance in research clinics in perinatology 1997 (2) 433-48.
11. Brennand EA, Dannenbaum D, Willows ND: Pregnancy outcomes of First Nations women in relation to pregravid weight and pregnancy weight gain. Journal of Obstetrics and Gynaecology Canada. 2005; 27 (10); 936-944.
12. Briese V, Voigt M, Wisser J, Borchardt U, Straube S : Risks of pregnancy and birth in obese primiparous women : an analysis of german perinatal statistics. Arch Gynecol Obstet 2010.
13. Butte NF, Ellis KJ, Wong WW, Hopkinson JM, Smith EO:H Composition of gestational weight gain impacts maternal fat retention and infant birth weight. American Journal of Obstetrics and Gynaecology. 2003; 189 (5): 1423-1432.
14. Callaway LK, McIntyre HD, O'Callaghan M, Williams GM, Najman JM, Lawlor DA: The association of hypertensive disorders of pregnancy with weight gain over the subsequent 21 years: findings from a prospective cohort study. American Journal of Epidemiology. 2007; 166 (4): 421-428.
15. Catalano PM: Increasing maternal obesity and weight gain during pregnancy the obstetric problems of plantitude. Obstetrics and Gynaecology. 2007; 110(4): 743-744.
16. Carmichael S. Abrams B, Selvin S: The association of pattern of maternal weight gain with length of gestation and risk of spontaneous preterm delivery. Paediatrics and Perinatal Epidemiology. 1997; 11(4); 392-406.
17. Caroline HDf, Yajnik CS, Raso et al : Supplementation nutrition as a preventive strategy against adverse pregnancy outcomes plico- nutrients and fetal growth J. Nutr. May 2003 133: 17478-1756S.
18. Catalano PM, Ehrenberg HM: The short-and long-term implications of mater-

nal obesity on the mother and her offspring. British Journal of Obstetrics and Gynaecology, 2006; 113(10); 1126-1133.
19. Cedergren M. Effects of gestational weight gain and body mass index on obstetric outcome in Sweden. International Journal of Gynaecology and Obstetrics. 2006; 93(3) 269-274.
20. Cedergren MI : Optimal gestational weight gain for body mass index categories. Obstet Gynecol 2007, 110:759-764.
21. Choo V: Who ressesses appropriate body mass index for Asian populations. Lancet 2002, 360:235.
22. Chabra, S.Perinatal outcome in teenage mothers JOBGI, 41:31, 1991.
23. DeVader SR, Neeley HL, Myles TD, Leet TL: Evaluation of gestational weight gain guidelines for women with normal prepregnancy body mass index. Obstetrics and Gynaecology. 2007; 110(4); 745-751.
24. De Onis, M. Villar, J.K. Gulmazoglu, M. (1998) : Nutritional interventions to prevent intra uterine growth retardation: evidence from randomized controlled trials, Eur. J. Clin. Nutri. 52: 83-93.
25. Dott and Fort. Medical & Social factors affecting early teenage pregnancy Am. J. Objg. 125-532, 1976.