

MATERNAL WEIGHT GAIN BIOSOCIAL CHARACTERISTICS AND PERINATAL OUTCOME IN JOS NIGERIA

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ABSTRACT

Objective: Maternal weight gain in pregnancy can offer a good means of assessing the well being of the pregnant mother and by inference, her baby. The cross-sectional prospective study was carried out between November 1996 and December 1997, in Jos University Teaching Hospital to assess the influence of biosocial characteristics on maternal weight gain and the effect of weight gain on perinatal outcome.

Methods: 210 informed healthy pregnant women average age 25.2 ± 5.1 (Mean \pm SD) were recruited from the antenatal clinic over a fourteen-month study period. Variables such as maternal age, parity, social class, booking weight and gestational age were studied in relation to maternal weight gain and perinatal outcome. The Student t-test was used to calculate significant difference between the means and the level of significance was set at 5%.

Results: The mean maternal weight gain in pregnancy was 8.58 ± 3.61 kg. The rate of weight gain was about 0.25 kg per week between the gestational ages of 6 and 40 weeks. Young mothers gained more weight than older ones though the difference was not statistically significant. The primigravida statistically gained more weight than para 1-4 ($p < 0.05$) and the grandmultiparous patients ($p < 0.001$). The mean weight gain decreased with increasing social class as shown by social classes I and IV, ($p < 0.05$) and III and V ($p < 0.01$) respectively. Even though no definite relationship between booking weights of the mothers and their weight gains were seen, women with low booking weight however gained more weight than others. Similarly there was no definite relationship between maternal weight gain and fetal birth-weight in different maternal weight groups. There was no significant difference in the fetal weight whether the mother gained below or above the mean weight gain in pregnancy. Two perinatal deaths occurred, with a perinatal mortality rate of 9.52/1000. Their mother's weight gains were not attributable to the deaths.

Conclusion: The study has shown that parity and social class significantly affect maternal weight gain in pregnancy. Even though the mean weight gain in this study was 8.58 ± 3.61 kg. This did not affect the fetal performance immediately after delivery. Further more, maternal weight changes in pregnancy can range from a loss to a gain of up to 23 kg or more. Normal fetal outcome is possible throughout the range.

KEY WORDS: *weight gain; biosocial factors, fetal outcome*

INTRODUCTION

The history of the obstetrician's interest in weight changes in pregnancy is a long one; which arose as a result of clinical complications known to be associated with extremes of weight changes in pregnancy¹. Routine weighing to monitor maternal nutrition during pregnancy began in London clinics in 1941 and since then, weight has become one of maternal characteristics that is most often recorded during pregnancy even when resources for antenatal care are very limited^{2,3}. A positive correlation between maternal anthropometric variables and infant birth weight has been demonstrated in many studies of population with different social and economic characteristics, mostly in developed countries^{3,4}. Monitoring of maternal weight during pregnancy has been

advocated as a means of predicting the risk of low birth weight baby and an adverse perinatal outcome^{5,6}. Unfortunately studies of these relationships in developing countries are few⁷⁻¹⁰. That notwithstanding these studies are of special importance in developing countries where nutritional deficiencies are common and women often combine pregnancy with heavy workload, and where low infant birth weight is an important determinant of perinatal morbidity and mortality.

In most antenatal clinics in Nigeria today, weighing machines are conspicuously displayed in strategic locations and records of weight occupy a prominent place on the antenatal card. Is there any need for such scenario?

The pride of place accorded weight changes record on the antenatal card, is not without adverse effects. Weighing generates anxiety in patients particularly elites and require explanation as any other screening procedure. Also, it is said that the false

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assurance given to women who gained a "normal" amount of weight is as wrong as the worry caused by "low" or "high" weight gain². There is therefore a changing attitude towards routine weight recording in pregnant women in developed countries². Can developing countries and particularly Nigeria, afford not to take weight changes in pregnancy seriously? High technology gadgets to monitor maternal and fetal well-being are readily available in the developed parts of the world, unlike in developing countries. Maternal weight gain could offer a good means of assessing the well being of the pregnant mother and by inference her baby in developing countries. Also, in such countries, weight changes in pregnancy may be the only means of evaluating maternal well being particularly in rural areas. From the foregoing, it becomes obvious that data derived from weight gain studies could be of immense value and relevance to our community. The few publications on weight gain in pregnant Nigerian women were from the southern part of the country⁹. This study, coming from the city of Jos, in Northern part of the country, therefore, aims at determining the pattern of maternal weight gain and perinatal outcome in a Northern Nigerian City.

MATERIALS AND METHODS

310 healthy pregnant women who signed informed consent were recruited from the antenatal clinic of Jos University Teaching Hospital (JUTH), Jos, Plateau State. Out of this number, 210 (67.74%) had complete data and they formed the subjects of analysis. 56 (18.06%) women delivered before 37 weeks of gestation.

Criteria for inclusion into the study were:

1. Pregnancy not more than 15 weeks of gestation at recruitment
2. Singleton pregnancy
3. No medical complications such as severe vomiting, pre-eclampsia/eclampsia, hydramnios, diabetes mellitus
4. Patient must be willing to deliver in JUTH

Each patient was weighed using a standard scale with fine adjustment. Lever balance Detecto model was used. The accuracy of the lever balance was periodically checked by the author assisted by a technician from the instrument department of the hospital. Each patient removed her clothes, shoes and bangles and was given a pre-weighed uniform to wear before being weighed by the author. The weight of the patient was recorded in kilograms at the time of recruitment into the study and during each antenatal visit follow up. The length of gestation was calculated from the last menstrual period and corroborated by ultrasonic scan at recruitment into the study. Fetal birth weights were measured after the initial resuscitative measures were completed in the labour ward and within 10 minutes of delivery. Rotation balance made by Waymaster, England was used. The patients received antenatal follow up by the author throughout pregnancy. They were seen at monthly interval till 28 weeks of gestation, every two weeks till 36 weeks and thereafter weekly until delivery. All the information obtained during the study was recorded on a prepared protocol. Statistical analysis was with Student t test. The level of significance was set at 5%.

RESULTS

The age distribution of the study group ranged from 14 to 39 years with a mean and standard deviation (SD) of 25.2 ± 5.1 years. The age group 16 to 30 years constituted about 83% of the

study population. The parity ranged from 0 to 9. The mean \pm SD was 2.54 ± 1.95 . 40.95% were primigravidae, parity 1-4 constituted 50% and grandmultiparous patients were 9.05%. 22.86% of the population had primary education. 49.05% attended secondary schools and about 8.57% were graduates while 19.52% did not attend any school (Table 1).

Table 1: Characteristics of the 210 patients

Characteristics	Number	Percentage
Age group (years)	2	0.95
11-15	40	19.05
16-20	78	37.14
21-25	56	26.67
26-30	29	13.81
31-35	5	2.38
36-40		
Parity distribution	86	40.95
Primigravida	105	50
Para 1-4	19	9.05
Grand multipara		
Educational level		
Primary	48	22.86
Secondary	103	49.05
University	18	8.57
No schooling	41	19.52

The social class was determined using classification suggested by Olusanya et al, by combining the wife's educational attainment with her husband's occupation¹¹. Social classes I and II constituted 5.7% and 14.29% respectively. Social classes III, IV and V were 31.43%, 31.91% and 16.67% in that order. Many ethnic groups were represented in the study. The main ones were Ibo (22.38%), Hausa (16.19%), Yoruba (15.24%) and Berom (11.90%). Other ethnic groups constituted 34.29%.

Maternal weight gain between gestational age 6 to 40 weeks ranged from 2.27kg to 20.45kg; with a mean \pm SD of 8.58 ± 3.61 kg. Young mothers gained relatively more weight than the older ones as shown in Table 2. There was no statistical significant difference in weight gain, between different age groups.

Table 2 showed the distribution according to maternal parity and weight gain. The mean weight gain \pm SD for primigravidae were 9.65 ± 3.63 kg, parity 1-4 gained 8.45 ± 3.75 kg, while grandmultiparous patients gained 7.08 ± 3.50 kg. The primigravida statistically gained more weight than para 1-4 ($t=2.22$; df 189; $p<0.05$) and grandmultiparous patients ($t=28.12$; df 103; $p<0.001$). For all patients the rate of weight gain in pregnancy was about 0.25kg per week between 6 and 40 weeks of gestation.

The primigravidae consistently gained more weight than the multiparous patients. Little weight gain was observed before 12 weeks of gestation, subsequently weight gain rapidly increased to peak at 21-24 weeks. More weight gain occurred in the 2nd half of pregnancy. Most of the women lost weight towards the end of pregnancy especially after 36 weeks (figure 1).

Fig 1. Weight gain in each parity group and gestational age

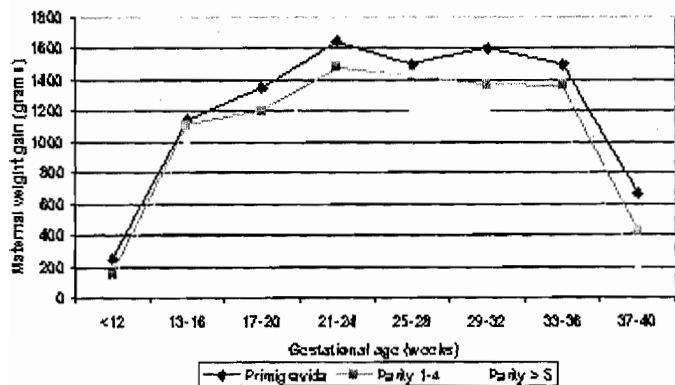


Table 2: Weight gain pattern according to age, parity and social class

Characteristics	Mean weight gain \pm SD (kg)
Age	
11-15	9.28 \pm 1.80
16-20	8.42 \pm 3.41
21-25	8.17 \pm 3.51
26-30	8.02 \pm 4.00
31-35	8.03 \pm 3.13
36-40	7.85 \pm 4.14
Parity	
Primigravida	9.65 \pm 3.63
Para 1-4	8.45 \pm 3.75
Grand multipara	7.08 \pm 3.50
Social class	
I	9.65 \pm 1.99
II	9.57 \pm 3.05
III	8.60 \pm 3.67
IV	7.33 \pm 3.43
V	7.31 \pm 3.36

Weight gain decreased with increasing social class (Table 2). There was no significant difference ($t = 0.08$; $df 40$; $p > 0.9$) between the mean weight, gained by women in social class I, (9.65 ± 1.99 kg) and II (9.57 ± 3.05 kg) on one hand and social classes IV (7.33 ± 3.43 kg) and V (7.31 ± 3.36 kg) on the other hand ($t = 0.03$; $df 100$; $p > 0.9$). However there was significant difference between the mean weight, gained by patients in social classes I and II and those in classes IV and V respectively ($t = 2.27$; $df 77$; $p < 0.05$ and $t = 2.83$; $df 63$; $p < 0.01$).

15 patients (7.14%) were underweight at the time of booking for antenatal care (weight < 45 kg)^{12,13}, while only 2 (0.95%) weighed up to 90kg. Though there was no definite relationship between booking weight and weight gain. Women with low booking weight, gained more weight than others. Mean weight for underweight women was 8.61 ± 2.61 kg, while those with normal

Table 3: Maternal booking weights and their mean weight gains in pregnancy

Booking weight (kg)	Number of patients	Mean weight gain \pm SD (kg)
30-39	3	9.45 \pm 4.04
40-49	30	9.15 \pm 3.10
50-59	74	9.39 \pm 5.57
60-69	64	8.72 \pm 3.33
70-79	32	8.52 \pm 3.61
80-89	5	7.85 \pm 3.64
90-99	2	8.27 \pm 6.94
<45	15	8.61 \pm 2.61
>45	195	8.20 \pm 3.63

Table 4: Maternal weight gains in 210 patients and their babies' weights

Maternal weight gain (kg)	Number of patients	Mean fetal birth weight \pm SD (kg)
1-5	44	3.09 \pm 0.39
6-10	108	3.06 \pm 0.46
11-15	52	3.17 \pm 0.38
16-20	6	3.09 \pm 0.49
Mean weight gain		
<8.58	118	3.08 \pm 0.38
>8.58	92	3.10 \pm 0.45

weight gained 8.20 ± 3.63 kg (Table 3). There was no significant difference between the two groups ($t = 0.43$; $df 208$; $p > 0.7$).

The fetal birth weights ranged from 2.0kg to 4.5kg with a mean \pm SD of 3.06 ± 0.44 kg. There was no definite relationship between maternal weight gain and fetal birth weight in different maternal weight groups. Similarly, there was no significant difference in the fetal birth weight when the mother gained below or above the mean weight gain in pregnancy ($t = 0.35$; $df 208$; $p > 0.8$) (Table 4).

In mothers who gained 1-5kg and 6-10kg; 13.64% (6) and 15.74% (17) of their babies had low Apgar scores (< 7). Amongst mothers who gained between 11-15kg and 16-20kg; 15.38% (8) and 16.67% (1) of their babies had low Apgar scores respectively. There was no difference in the performance of babies at birth whether or not the mother gained more or less than the average weight gain in pregnancy. There were two perinatal deaths with a perinatal mortality rate of 9.52/1000. The mothers of the babies gained 8.0kg and 12.50kg respectively. The weights of the babies were 2.8kg and 3.2kg respectively. The first baby was delivered by caesarean section due to fetal distress in the first stage of labour and the second baby had assisted breech delivery. The causes of the deaths were unlikely to be related to the weight gain in pregnancy. There was no maternal mortality among the mothers studied.

DISCUSSION

The mean age of 25.19 years in this study was similar to 25 years reported in other studies^{3,14} and slightly lower than 26.6 years reported by Dawes et al^{2,15}. Ethnic group distribution essentially showed that JUTH antenatal clinic cares for different ethnic

groups inhabiting Jos and its environs. This study was not confined to any ethnic group. Maternal stature and weight gain in pregnancy are, however affected by ethnic groups¹.

The mean weight gain in pregnancy for all patients in this study was 8.58kg. This was not significantly different from 8.5kg, 8.9kg and 8.76kg reported for Philippines, Thai⁸ and Lagos, Nigeria⁹ respectively. The mean was however higher than 7.3kg and 6kg quoted for Gambian and Tanzanian women^{3,7}. Generally maternal weight gain in developing countries is lower than in developed ones^{3,9,15}. Hytten in 1991 reviewed data over 20 years and observed that total weight gain throughout pregnancy in healthy primigravidae eating without restrictions is approximately 12.5kg. Dawes et al (1991) reported an average weight gain of 10.71kg among women attending antenatal clinic in a London hospital. The higher maternal weight gain in pregnancy in developed countries may be due to better nutrition and reduced physical activity¹⁶. Chronic infection or recurrent febrile illness such as malaria during pregnancy in developing countries may also lessen weight gain because of impaired appetite and high calorie demand of tissue repair¹⁶.

Weight gain in pregnancy, is said to be affected by age and young women have been reported to gain more weight than older ones². Young women gained more weight than older ones in this study, though there was no statistical significant difference in weight gain between different age groups. Dawes et al¹⁵, however reported that the mean maternal weight gain was less in young (<20years) women than in older (>25years) women. Primigravidae had been reported to gain more weight during pregnancy than multipara^{1,17}. This was supported by the findings in this study, where primigravidae gained an average of 9.65kg compared with parity 1-4 (8.45kg) and grand multipara (7.08kg) respectively. There is no clear evidence to show whether smaller average gain of multigravidae as compared to primigravidae is due to higher number of pregnancy per se or age or both variables^{1,9}. It has been reported that little or no weight is gained during the first trimester of pregnancy^{1,9}. This was the case in this study where in primigravidae only about 250grams was recorded before 12weeks of gestation. Hytten and Leitch 1971 and Petitti and coworkers (1991)¹⁸, quoted a value of 0.32kg/week from 8 to 20weeks. After the initial low weight gain, the weight rapidly increased to reach a peak around 21-24 weeks gestation and then decreased. This was in agreement with the findings of Hytten and Leitch and other authors^{1,15}. Most women lost weight towards the latter part of pregnancy especially after 36weeks. This observation was in agreement with the findings of some earlier authors and may be due to reduction in amniotic fluid volume that occurred around this time^{15,19}. There appears to be lack of consensus on the effect of maternal pre-pregnancy weight on weight gain in pregnancy. Agboola et al found that thin underweight women gained more weight than their overweight counter, while other authors^{12,15}, reported that underweight women gained less than other women. This study showed that women, who were underweight at booking, gained slightly more weight than those who had normal weight. The explanation for this probably lies in the fact that overweight mothers have more adipose tissue and thus greater calorie reserves on which the fetus can draw than the underweight pregnant women.

Social class had no significant effect on weight gain in pregnancy¹². However in this study, women in social classes I and II, gained significantly more weight than those in social classes IV and V. The effect of social class on obstetric performance including weight gain in pregnancy in a developing country like Nigeria cannot be over emphasized. Women in social classes I and II are usually educated ones whose husbands are the top echelons of their careers, hence accounting for the significant difference in weight gain during pregnancy between the well nourished elites and their less fortunate counterparts.

The mean fetal birth weight of 3.06kg in this study was similar to previous reports^{14,21}. The weight was however smaller than that reported by other authors^{2,9}. Maternal weight gain had no significant influence on fetal birth weight in this study. This is in agreement with reports in the literature^{2,9}. Some other authors however reported a poor correlation between weight gain and fetal birth weight^{1,3}. A committee of National Academy of Science, through the institute of Medicine²², recommended weight gain of 12.5kg to 18kg for underweight women, 11.5 to 16kg for normal weight women and 7 to 11.5kg for overweight women. Based on these criteria, some authors²³⁻²⁵ found less weight gain to be associated with low birth weight infants, while excessive weight gains were linked to large for gestational age babies and increased caesarean section rates²⁶.

Maternal weight gain per se did not significantly affect fetal performance immediately after delivery in this study. The perinatal mortality rate of 9.52/1000 might not be due to pathology of weight in pregnancy because of the circumstances surrounding the deliveries. These findings were in consonance with the observation that clinical normality is possible with maternal weight changes in pregnancy ranging from a loss to a gain of up to 23kg or more¹. Although the incidence of clinical complications rises at the extremes of the ranges, normal fetal outcome is possible throughout the range.

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