ALTERATION OF MATERNAL BODY WEIGHT IN PREGNANCY AND POSTPARTUM

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ABSTRACT

Pregnancy and delivery is one of the main causes in the female body weight alteration, especially with obesity. This alteration in body weight has a significant effect not only for a feminine beauty standpoint, but also for more important reproductive functions in postpartum. For the actual condition of the maternal body weight alteration and its clinical significance, we made the various analysis on the most recent data available at our OB & GYN Dep. of Keio Univ. Hospital, and obtained the following results.

1. The average maternal weight gains by pregnancy is 11.7 kg. Immediately after delivery, the maternal weight gains are on average 5.9 kg compared with pre-gestational period.
2. Maternal weight gains over 12 kg (which are disadvantageous at delivery) have no significance in fetal growth.
3. 25% of puerpera maintains weight heavier than that of pre-gestational period for four months in postpartum. The group with obesity in postpartum shows the higher rate of anovulatory state compared with the group who recovers the normal body weight in postpartum.
4. Maternal weight alterations is mostly correlated with the cholesterol level change among serum lipids levels.

INTRODUCTION

In Japan today, the pregnant women gain approximately 10 kg on average in their 10 months gestational period. We, at the OB & GYN Dep. of Keio Univ. Hospital, have our own figure of 11.7 kg in weight gains during this period.

In obstetrics, weight measuring is one of the simplest checks we could make into pregnant women. It has a very significant meaning not only for a mere nutrition point of view, but also for its correlation with fetal weight and such
important factors as toxemia of pregnancy (especially edema), maternity bleeding, obesity in postpartum and secondary sterility due to anovulation.1

Now, we will start off with our observation of the alteration of maternal weight having been conducted at our Department of Keio Univ. Hospital, and also would like to make some analytical comments on the significance of this body weight alteration in pregnancy and postpartum.

MATERIALS AND METHODS

1) Alteration of Body Weight

2000 cases were weighed weekly at all gestational period and for four months in postpartum at the OB & GYN Dep. of Keio Univ. Hospital.

2) Re-appearance of Ovulation in Postpartum

Basal body temperature (BBT) of all cases, LH-RH test and endometrial biopsy for an inspection of endometrial dating of partial cases, were examined on 365 delivery cases at Keio Univ. Hospital, for one year after delivery.

3) Lipids Metabolism

In 297 delivery cases, serum cholesterol (by auto-analyser method),2 triglyceride (by Fletcher's method),3 phospholipid (by Phospholipids-Test Wake),4 were examined at all gestational period and for four months in postpartum.

RESULTS

1. The Maternal Body Weight Alteration Chart in Pregnancy and Postpartum

Fig. 1 shows the characteristic patterns of weight alteration at first trimester, second trimester, immediately before and after the delivery and in postpartum, obtained from 2000 cases at our hospital. These data are at somewhat higher counts than those already reported by Eastoman5 on the same subject in 1969. But, when comparing these two different data, we have to bear in mind that the body weights change by the race, the environments they live in, different age groups even in the same race and the maternal physique at the time and age they live in.

(1) In pregnancy

The maternal body weight from 10 through 12 weeks of gestation generally does not differ from that of pre-gestational period. Fig. 2 shows the average weight reduction of approximately 200 g among the 2,000 cases up to 8 weeks of
gestation due to emesis. However, the recovery of this lost weight is made by the second half of third month of gestation. At the same time, the maternal body weight keeps a gaining proportionately from 12 through 36 weeks of gestation. The increase ratio was within 500 g per week, and the average gain was 250 to 350 g per week (Fig. 2).

The maternal body gains the largest weight in the seventh month of gestation by 500 g per week. During the 4th, 5th, 6th, 8th and 9th month of gestation, the average weight gains were 300 g per week. The gestational periods up to the 3rd month and of the 10th month marked the lowest gains at 100 to 200 g per week.

Any larger weight gains at each gestational period should be considered as either over-nourishment or possible EPH-gestosis with edema as main symptom.

(2) Before and After Delivery

The maternal body loses approximately 6 kg by delivery. The maternal body has the average weight gains of 11.7 kg before giving birth. However, by completion of delivery, it loses on average 5.8 kg with fetus, placenta, amnion and umbilical cord removed, and at the same time, coupled with accompanying bleeding, insensible loss, feces and temporary diet control. Therefore, a simple arithmetic calculation of 11.7−5.8=5.9 leads us to the fact that the maternal body has
the weight gains of 5.9 kg immediately after the delivery compared with pre-gestational period.

(3) In Postpartum

As just mentioned above, the body weight reduction of 5.8 kg occurs at delivery. Additionally, 3.5 kg are being lost in the first month of postpartum. This is believed to be caused by the continuing lochia after delivery of fetus and also of fetus-related objects, less in-take of calories than when in pregnancy, breast feeding and a higher consumption of calories due to infant nursing.

Our study revealed that 69.6% of total cases returned to ±2 kg range of their pre-gestational body weight level in four months in postpartum.

At the same time, 6.2% showed the weight gain tendency compared with the maternal body weight immediately after delivery, and 18.4% showed at least more than 2 kg weight gain compared with the pre-gestational body weight. However, 5.8% showed more than 2 kg weight losses compared with the pre-gestational body weight.

2. Obesity and Ovarial Function in Postpartum

To confirm reappearance of ovulation serves as one of the indicators in order to be acquainted with ovarial function recovery after delivery. Therefore, we have made studies into the correlation between the reappearance of ovulation and maternal body weight alterations on 110 women by keeping the patterns of
their BBT in postpartum (Fig. 3). Correlation of the reappearance stage of ovulation in postpartum on BBT and body weight alterations (which are compared with those of pre-gestational period) are shown on Fig. 3. By analyzing this figure, we have learned the general trend that an ovulation reappearance after delivery coincides with the timing when body weights return to their respective normal weight in pre-gestational period. Moreover, we have observed the earliest reappearance of ovulation among the group who recovered the normal body weight. Those group who suffered either obesity or emaciation in postpartum showed more delayed recovery of ovarian function.

When we compared the BBT of obese women (Obesity Index (O.I.) over 10) with the BBT of normal body weight women (O.I. less than ±10) at 12th month in postpartum, only 35.1% of the obese group showed ovulatory cases, while it was 65.2% in the group of normal body weight (Fig. 4). We made the same comparison among general gynecological out-patients at our Hospital with age bracket of 20 to 29 years old. By checking their obesity and BBT, we have found that 47.9% of obesity group showed ovulatory cases, whereas it was 81.2% in the group of normal body weight. In the emaciation group, 68.2% showed ovulatory cases. From these data, we could easily understand the resultant effects of large scale alteration of body weight in pregnancy and immediately after delivery,
especially that of obesity in postpartum. These also help us to detect the possible secondary sterility due to anovulation.

3. Feto-Maternal Weight Correlation

Fig. 5 shows the feto-maternal weight correlation in 500 normal deliveries. In the group with maternal weight gains between 5 to 12 kg, the fetal weight
Alteration of Maternal Body Weight

59

increases in correlation with the maternal weight increase \((r=0.59)\). In the group with maternal weight gains of over 12 to 16 kg, no alteration was observed in the feto-maternal weight correlation. In the group with maternal weight gains of 17 kg or over, there were both fetal weight gains and losses, and no correlation existed in them. In other words, in the cases with maternal weight gains of over 12 kg, the feto-maternal weight correlation was showing \(r=0.31\) \((n=500)\), thus a very low correlation coefficient.

Assuming that average birth weight at full maturity for a male baby is 3,105 g and that of female baby 3,070 g, the maternal weight gains in pregnancy of 7 to 12 kg are sufficient. Any weight gains over those amounts have no significance from the fetal growth viewpoint. In the cases with maternal weight gains of less than 7 kg, the birth weight of a baby is on average below 2,700 g, and in the cases with weight gains of less than 5 kg, the birth weights are on average below 2,500 g which are classified as immature. Therefore, the ideal maternal weight gains at delivery are somewhere between 8 to 12 kg, or on average 10 kg.

4. Lipids Metabolism and Body Weight Alteration in Pregnant Women

As a barometer in body weight alteration in pregnancy, we observed lipids movements. At each gestational period and in postpartum, we measured the cholesterol, phospholipid, and triglyceride levels in the serum taken each time from pregnant women when their stomachs are empty. What correlates most with maternal weight alteration among these lipids levels is the cholesterol level. Therefore, when a high cholesterol level was observed in pregnancy, a proper diet care should be adapted to prevent the possible obesity in postpartum (Fig. 6, 7, 8 & 9). And all of maternal lipids levels also correlated with the lipids levels in the serum of umbilical cord.

5. Obesity and Anovulation

In regard to the influence on the urinary excretion of estrogens, the steroids which may be closely related to the obesity, the reduction therapy brought about the significant increase in estrogen levels in 8 of 10 cases with the first grade amenorrhea, while the level remained unchanged after the treatment in all of the amenorrhea with the second grade.

The following is a case of an obese anovulator who responded with spontaneous ovulation by the weight reduction therapy. In this case, the obesity with anovulatory amenorrhea occurred for two years after delivery. According to the weight reduction, the urinary excretion of estrogen level increased, and the serum cholesterol decreased, while the state of the Smear Index and cervical mucus show the estrogen surge to the target organs (Fig. 10).
Fig. 6 Serum cholesterol in pregnancy & postpartum.

Fig. 7 Serum phospholipids in pregnancy & postpartum.
Alteration of Maternal Body Weight

Fig. 8 Serum triglycerides in pregnancy & postpartum.

Fig. 9 Serum lipids in pregnancy & postpartum, classified by body weight change.
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