



## The Relationship between Primary Body Mass Index and Maternal Weight Gain During Pregnancy with Birth Weight

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### Abstract

**Background:** One of the most important factors affecting the outcome of pregnancy and the birth weight of the baby is the body mass index (BMI) of the mother and her weight gain during pregnancy. Since mothers enter this period at the onset of pregnancy with different BMI, this index, along with the amount of weight gain, plays an important role in predicting weight, the next stages of growth and even the mortality rate of neonates. The aim of this study was to determine the relationship between BMI and maternal weight gain during pregnancy with birth weight.

**Materials and Methods:** This analytical and cross-sectional study was carried out using a questionnaire and based on records of pregnant women covered by educational and health centers in Chalus, 102 cases during the period from September to March 2017. Variables such as age, weight, height, BMI at start of pregnancy, weight gain during pregnancy and birth weight were recorded in a questionnaire. Data was analyzed by SPSS software after coding. Correlation and regression analysis was used to determine the relationship between data.

**Results:** The mean weight gain of mothers during pregnancy was 9.55 kg, the highest rate in mothers with normal BMI ( $25.9 \pm 19.8$ ) and the lowest in mothers with BMI equal to or greater than 29. The birth weight of the newborns was significantly correlated with the BMI of the mothers as well as the weight gain of the mother during pregnancy ( $P < 0.05$ ), with the highest macrosomia (birth weight  $> 4$  kg) in mothers with BMI  $> 26$ .

**Conclusion:** The weight of the baby's birth weight has a direct relationship with the mother's primary BMI and its weight gain during pregnancy so that, whichever is more favorable, the birth weight of the baby will be more appropriate.

**Keywords:** Body Mass Index; Weight Gain; Birth Weight; Macrosomia

### Introduction

One of the main concerns during pregnancy is how to increase the weight of the mother so that the outcome can be the best effect. According to the recommendation of the medical associations, mother's weight gain in pregnancy is based on body mass index or BMI, according to the American Institute of Medicine's (IOM) table for BMI is including :BMI less than 18.5: 18 - 12.5 kg - BMI 18/5 -24/9 : 16 - 11.5 kg - BMI 25- 29/9: 11/5 - 7 kg and for BMI equal or more than 30 mother's weight gain is recommended 5-9 kg [1].

Precautionary care during pregnancy can prevent many complications, such as low birth weight and newborn problems, and one of the important parameters in this care is to control mother's weight gain during pregnancy. Furthermore, excessive weight gain in mother lead to problems such as high baby weight [2].

Weight gain lower than the recommended maternal rate is accomplished with complications such as the risk of preterm delivery and low birth weight that lead to anemia and death of the baby [3].

It has been shown that weight gain lower than the optimal level lead to complications such as intrauterine growth retardation, and there is a significant relationship between weight gain Pregnancy and fetal development [4].

The pre-pregnancy body mass index and the weight gain of the respective period have direct proportion with the birth weight [5].

The weight of the baby has a direct correlation with the weight gain suggested in pregnancy [6].

The most important factors associated with neonatal morbidity and mortality is neonatal weight [7].

Birth weight has a determinant effect on the next stages of growth and even the death of a newborn [8].

High BMI has a direct relationship with pregnancy problems, such as diabetes and hypertension, and high birth weight is affected by overweight during pregnancy [9].

High weight before pregnancy and the presence of overweight are associated with inappropriate delivery events (over the excessive weight gain in pregnancy), and insufficient overweight during pregnancy is associated with many problems [10].

Despite the fact that in many studies, there is a direct relationship between weight gain and birth weight, but in some studies, it is showed that in women with a normal BMI before pregnancy excessive weight gain had no significant effects on fetal development and pregnancy time [11].

**Materials and Methods**

This study was an analytical and cross-sectional study. 102 pregnant women were surveyed in Chalus city health centers during the second half of 2017 (October-March 2017). Variables such as age, weight, height, BMI (weight of body weight divided by height squared) at the beginning of pregnancy, weight gain during pregnancy and birth weight were recorded in the questionnaire. Women with high blood pressure or eclampsia, diabetes mellitus, cigarette smokers, over-the-counter pregnancy and other abnormal pregnancies were excluded. Only pregnant women with normal pregnancy and single pregnancy were under control until the end of pregnancy. The data were analyzed by SPSS-12 software after collecting and coding. Correlation test was used to determine the correlation between the data and the Inter regression test was used to determine the coefficient of influence.

**Results**

In this study, 102 pregnant women were studied. Most of them were in the age group of 35-18 years old (n=88, 86.3%) and were housewives (n=82, 80%). Regarding the type of delivery, 90 women (88.2%) had normal delivery and 12 cesarean delivery. Biographic characteristics is showed in table 1.

In terms of the distribution of the body mass index (BMI), the status of mothers was as follows:

BMI less than 18.5 (n= 3 ,2.9%) - BMI 18.5 - 24.9 (n=35 ,34.3%) - BMI 25 -29.9, (n=33,32.4%) and BMI equal to or greater than 30 (n=31,30.4%).

Parameter	Average
Age of mothers (years)	29/25
Maternal Weight (kg)	71/25
Mother’s height (cm)	163/71
Weight gain of mothers (kg)	9/55
Primary BMI of mothers (kg / m 2)	27/21
Weight of birthday of infants (kg)	3/42

**Table 1:** Average biographical parameters, BMI, maternal weight gain and birth weight.

Thus, the highest numbers were in BMI of 24.9 - 18.5 and the lowest in BMI less than 18.5.

The average weight gain of mothers during pregnancy was 9.55 kg, the highest rate in mothers with BMI 18.5 - 24.9 and the lowest in mothers with BMI equal to or greater than 30.

In terms of birth weight of babies, 17 of them were born with a weight of more than 4 kg (macrosomia). Most were seen in women with primary BMI 25 and above (n=15, 88.2%). Two macrosomal infants were born from mothers with BMI 18.5 - 24/9 (11.8%).

Birth weight of infants had significant relationship with primary maternal BMI (P = 0.019), as well as maternal weight gain during pregnancy (P = 0.025) (in both cases P <0.05), so that most macrosomal cases were in mothers with BMI higher than 25 (Tables 2 and 3).

		Baby weight (kg)		
		<2/5 N (%)	2/5-4 N (%)	>4 N (%)
BMI (Kg/m <sup>2</sup> )	<18/5	0 (0)	3 (100)	0 (0)
	18/5-24/9	1(2/9)	31(91/2)	2(5/9)
	25-29/9	0(0)	26(78/8)	7(21/2)
	≥30	2(6/2)	22(68/8)	8(25)
sum		3(2/9)	82(80/4)	17(16/7)

**Table 2:** Frequency distribution of birth weight neonates by primary BMI of pregnant women.

		Weight gain (kg)			
		<7	7-10	10-15	15-18
Weight of birthday(kg)	<2/5 N (%)	1(33/3)	0(0)	2(66/7)	0(0)
	2/5-4 N (%)	19(23/2)	39(47/6)	21(25/6)	3(3/7)
	>4 N (%)	1(5/9)	8(47)	6(35/3)	2(11/8)

**Table 3:** Frequency distribution of birth weight neonates by weight gain during pregnancy.

### Discussion

According to the findings of this study, more pregnant women were with normal BMI (24.9 -18.5) and the same group of women had the highest weight gain (about 10kg). On the other hand, this group of women took the majority of the number of normal-born babies according to their birth weight, all of which indicated that there is a definite relationship between primary BMI and weight gain during pregnancy with birth weight, which is similar to the results of other studies, including the study of Hosseini [2] and Murakami [3].

There is a significant correlation between the primary BMI and birth weight (P <0.05) and it is concluded that the primary BMI of the mother is closer to the normal state (24.9 to 18.5), the birth weight is more than that It will be in its natural range (2.5-2.4 kilograms). On the other hand, the higher BMI is, the higher the birth rate of the macrosomal baby (more than 4 kilograms). This has been proven in other studies, including the study of Murakami [3] and Chang [5], and they showed in their studies that there is a close relationship between maternal BMI and birth weight.

There was a significant relationship between maternal weight gain during pregnancy and birth weight (P <0.05). Women who had better weight gain had the most weight gain babies and women with the weight gain of 7-10 kg had the highest birth weight of 2.5-4.5 Kg. Merchant., *et al.* showed that maternal weight gain during pregnancy is a predictor of birth weight and intrauterine growth [12].

Nahar., *et al.* also achieved similar results and showed that the best predictor of birth weight of newborns is maternal weight gain during pregnancy [13].

### Conclusion

According to the results of this study, there is a significant relationship between the primary BMI and the birth weight of the baby. Women who have more BMI and more optimum, more likely to have baby with higher birth weight.

Meanwhile, there is a significant relationship between maternal weight gain during pregnancy and baby birth weight, and recommended weight gain in mother proportional to BMI has a direct relationship with the weight of the baby's birth.

Considering the importance of weight gain during pregnancy, it is recommended that women at their onset of pregnancy have optimal BMI until weight gain during pregnancy is a positive outcome on the birth weight and can be greatly prevented from low birth weight or macrosomial infants.

### Conflict of Interest

The author has declared no conflict of interest.

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