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Obesity at conceivement interferes with placental weight but not birth weight

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Abstract

Objective: Obesity is a well-known risk factor for the pregnancy outcome. We aimed to assess the relationship among pre-conceptional obesity, birth weight and placental weight.

Methods: Regularly followed-up 259 women were divided into two groups according to their pre-conceptional body mass index (BMI). There were 177 patients in the non-obese group who had BMI below 25 and 82 patients in the obese group who had BMI equal to or above 25. Babies and placentas were weighted, placental weight to birth weight ratio (PW/BW) were calculated.

Results: While birth weight did not differ between the groups significantly (3294±420 vs. 3389±425), mean placental weight was significantly higher in the obese group (610±114 vs. 659±128) (p=0.004). There was a strong relationship between PW/BW ratio and maternal pre-pregnancy body mass index (BMI). This ratio was higher in the obese group when compared to the non-obese patients (18.63±3.11 vs. 19.44±2.95) (p=0.054).

Conclusion: Our findings may be interpreted as the obesity causes ineffective nutrition of the baby so that relatively bigger placentas are needed by the fetus to reach its potential size. Further studies must be done to clarify the relationship between placental sufficiencies of obese patients.

Key words: Birth weight, obesity, placenta, pregnancy.

Pre-konsepsiyonel obezite plasental ağırlığı etkilemekle birlikte doğum ağırlığını etkilememektedir

Amaç: Obezite gebelik sonuçlarını etkileyen risk faktörlerindendir. Bu çalışmada konsepsiyon öncesi obezite ile doğum ağırlığı ve plasental ağırlık arasında ilişki olup olmadığını araştırmayı amaçladık.

Yöntem: Düzenli takip edilen 259 gebe pre-konsepsiyonel vücut kitle indeksine (VKİ) göre iki gruba ayrılmıştır. Hastaların 177'sinin VKİ 25'in altında, 82'sinin ise 25 veya üzerindedir. Doğum sonrası bebekler ve plasentalar tartılmıştır ve plasental ağırlığın bebek ağırlığına oranı (PA/DA) hesaplanmıştır.

Bulgular: Gruplar arasında doğum ağırlıkları açısından anlamlı fark izlenmezken (3294±420 vs 3389±425), ortalama plasental ağırlık obez grupta anlamlı olarak daha yüksektir (610±114 vs 659±128) (p=0.004). PA/DA ile pre-konsepsiyon dönemindeki VKİ arasında güçlü bir ilişki mevcuttur. Bu oran obez grupta kontrol grubuyla karşılaştırıldığında daha yüksektir (18.63±3.11 vs 19.44±2.95) (p=0.054).

Sonuç: Bulgularımız maternal obezitenin etkin olmayan bir beslenmeye neden olduğu ve fetüsün potansiyel boyutuna ulaşması için rölatif olarak daha büyük plasentaya gereksinim duyduğu şeklinde yorumlanabilir. Obez insanlardaki plasental yetmezliğin açıklığa kavuşması için başka çalışmalara da ihtiyaç duyulmaktadır.

Anahtar sözcükler: Doğum ağırlığı, gebelik, obezite, plasenta.

Introduction

Multidirectional relationships among mother, placenta and fetus are very complex and more appropriate interactions among them result in a healthier mother and a baby.

It is known that there is a correlation between placental weight, birth weight and gestational age. Placental localization, maternal weight gain, age, lying position of the mother, sex of the fetus might affect the neonatal birth weight.[1,2] Many studies have considered

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that the anthropometric characteristics of the parents have an influence on birth weight.[3,4]

Placental weight is also affected by many factors such as maternal anemia, gestational week of birth, maternal systemic diseases, fetal anomalies, abnormal placental forms and placentation.[5] Dietary changes also result in changes in placental weight as well as birth weight.

It is well-known that maternal obesity is strongly related to the poor obstetric outcomes.[6] Pre-pregnancy obesity is shown to be related to increased birth weight previously.[7] Although pre-pregnancy obesity is shown to be related to increased inflammation in placenta,[8] the relationship between pre-conceptional obesity and placental weight has not been clarified yet.

The objective of our study is to assess the relationship among maternal pre-conceptional obesity, birth weight and placental weight.

Methods

We conducted our study in the department of gynecology and obstetrics of a university hospital between 2009 and 2011. Local ethical committee approval was taken for the study.

All patients that were followed-up regularly in our hospital and delivered after 37th week of gestation were included into the study. The patients who had systemic diseases such as hypertension, diabetes, anemia, cardiac disease and respiratory system disease and complicated pregnancies such as hyperemesis gravidarum, gestational diabetes, pregnancy induced hypertension, multiple pregnancies, fetal anomalies were excluded from the study. Informed consent forms were received from the patients. The patients with missing data were also excluded. Totally 259 women were included in the study.

Soon after the delivery, babies were weighted by the same digital scale without any clothes after shortening the umbilical cord by the nurses.

After the spontaneous removal of the placenta it was evaluated if it was complete. Then they were weighted on a digital scale by the nurses as soon as possible with its membranes and cord. PW/BW ratio was calculated by dividing placental weight to birth weight and multiplying the result by 100.[9]

To calculate body mass index (BMI) from the follow-up charts of the patients, we determined the height and pre-pregnancy weight and calculate the BMI by dividing the weight (kg) of the patient to the square of her height (m). We calculated the weight gain throughout the pregnancy by subtracting the pre-pregnancy weight of the patient from her weight when she was hospitalized for the delivery.

For the statistical evaluation SPSS 11.5 package program (SPSS Inc., Chicago, IL, USA) was used. Descriptive statistics for continuous variables were defined as mean ± standard deviation and categorical variables were expressed as case number and per cent. $p<0.05$ was accepted as statistical significance. Backward regression analysis was done for adjusting the significance of the data.

Results

Study population (n=259) were divided into two groups according to their BMI. The normal group who had BMI below 25 consisted of 177 women and the obese group who had BMI equal to or above 25 consisted of 82 women.

While 94 (53.1%) of the patients in the non-obese group undergone more than 5 years of formal education, 29 of the patients of the obese group (35.4%) undergone more than 5 years of formal education (p=0.001). Thirty-five patients (19.8%) of control group and 8 (9.8%) of study population were employed (p=0.013).

Age, gestational week at birth, parity, sex of the baby, and hemoglobin levels of the groups were defined in **Table 1.**

While birth weight did not differ between the groups significantly, mean placental weight was significantly higher in the obese group when compared to the non-obese ones (**Table 2**).

Although it did not reach a significant level, there was a strong relationship between the PW/BW ratio and the maternal pre-pregnancy BMI. This ratio was higher in the obese group when compared to the non-obese patients (**Table 2**).

BMI ≥25 is significantly related to the placental weight. After adjusting for age, parity, education and employment, this relationship preserved its significance.

Placental localization and weight gain during the gestation did not change the birth weight, placental weight and PW/BW ratio significantly.

Table 1. The comparison of some parameters among groups.

Variables		BMI<25	BMI≥25	P
Age (year)		26.18±4.65	27.83±4.88	0.012
Gestational week at delivery		38.99±1.14	39.13±1.11	0.404
Parity		0.88±0.95	1.45±1.23	0.000
Gender of the baby	Female	65 (42.5%)	45 (54.9%)	0.07
	Male	88 (57.5%)	37 (45.1%)	
Hemoglobin level (mg/dl)		11.93±1.38	11.92±1.21	0.098

Table 2. Placental weight and birth weight according to BMI.

Variables	BMI<25	BMI≥25	P
Birth weight (g)	3294.02±420.00	3389.15±425.56	0.101
Placental weight (g)	610.99±114.72	659.10±128.71	0.004
PW/BW	18.63±3.11	19.44±2.95	0.054

Discussion

It was recently demonstrated that pregnancies with a greater weight gain of mother ends with a greater birth weight of newborn.[4] Albouy-Llaty et al.[1] showed that while birth weight and abdominal circumference of baby is related to the maternal BMI, femur length is related to both parents' height. Pre-pregnancy obesity is shown to be related to increased birth weight previously.[6] In our study, the obese patients had nearly 100 g heavier babies when compared to the non-obese patients. But this difference did not reach statistically significant levels. This might be because of the higher ratio of female babies in the obese group when compared to the non-obese group. Between the groups there was a non-significant but strong difference about baby's gender (p=0.07). It is well-known that the female newborns are relatively smaller than the male newborns.

Because of the difference of the methods of measuring placental weight, comparing the studies about this subject might be very difficult. So this is one of the limitations of our study as the other studies about this subject.

Like maternal diet, adipose tissue composition and physical activity are also related to the placental size.[10] Hasegawa et al.[5] showed that patients with low maternal BMI, preeclampsia, abnormal placental forms and short umbilical cords had smaller placenta in their retrospective study.

In the current study we found that the placentas of the patients with pre-pregnancy obesity were heavier than the placentas of the control group significantly. It was concordant with the literature.

In an uncomplicated pregnancy it is known that the lower the PW/BW ratio the higher the nutritional efficiency.[11] Maternal anemia and smoking increases this ratio by deteriorating placental circulation. We found that PW/BW ratio of the obese group was higher than that of the control group. This may be interpreted as the obesity causes ineffective nutrition of the baby so that relatively bigger placentas are needed by the fetus to reach its potential size.

In a study, it was shown that there were no correlations between placental position and birth weight or length.[12] In another retrospective study, no correlations between placental position and birth weight and perinatal outcomes were found.[13] We also could not find a relationship between placental location with either birth weight or placental weight. Although previous studies have shown a relationship between weight gain during the pregnancy and birth weight, we failed to show such a result perhaps because of the small size of our study.

Conclusion

Further well designed studies must be done for clarifying the effect of obesity on placental weight.

Conflicts of Interest: No conflicts declared.

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