Özgün Araştırma Original Article

Jinekoloji - Obstetrik ve Neonatoloji Tıp Dergisi
The Journal of Gynecology - Obstetrics and Neonatology

Effects Of Maternal Body Mass Index In The Early Weeks Of Pregnancy On Unfavorable Maternal Perinatal Outcomes

Gebeliğin İlk Haftalarındaki Maternal Vücut Kitle İndeksinin Olumsuz Maternal Perinatal Sonuçlara Etkisi

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ABSTRACT

Aim: The aim of this study was to investigate the association in pregnancy between increased body mass index (BMI) and unfavorable maternal perinatal outcomes.

Material and Methods: The medical records of 329 pregnant women who delivered singleton infants from January 2013 to July 2014 at our clinic were retrospectively evaluated. The pregnant women were grouped into 4 groups according to BMI measurements: Group 1, BMI ≤ 19.9 (underweight), Group 2, 20-24.9 (normal weight), Group 3, 25-29.9 (over weight), Group 4, ≥ 30 or more. Increased BMI and pregnancy outcomes according to gestational diabetes mellitus, pre-eclampsia, requirement of blood transfusion and fetal birth weight were compared.

Results: In all 329 participants, no association was determined between increased BMI and both fetal birth weight and risk of developing gestational diabetes mellitus. A positive correlation was determined between the risk of developing pre-eclampsia and requirement of blood transfusion and increased BMI.

Conclusion: Increased maternal BMI index can be considered to be related to increased pre-eclampsia and a need for blood transfusion during delivery. The refore, physicians should recommend that women of reproductive age who are planning to get pregnant should attain ideal weight in the pre-pregnancy period to avoid obesity-related maternal problems.

Key Words: Body mass index, maternal outcome, pregnancy.

ÖZET

Amaç: Bu çalışmanın amacı gebelikteki kötü maternal perinatal sonuçlar ve artmış vücut kitle indeksi(BMI) arasında ilişkiyi araştırmaktır.

Gereç ve Yöntemler: Kliniğimizde Ocak 2013 - Temmuz 2014 tarihlerinde tekil doğum yapan 329 gebe kadının tıbbi kayıtları retrospektif olarak değerlendirildi. Gebe kadınlar BMI' ne göre 4 gruba ayrıldı: grup 1-BMI 19.9 veya daha az (düşük kilolu), grup 2-BMI 20-24.9 (normal kilolu), grup 3- BMI 25-29.9 (aşırı kilolu), grup 4- BMI 30 veya daha fazla. Artmış BMI ile gestasyonel diabetes mellitus, preeklampsi, kan transfüzyon ihtiyacı gelişimi ve fetal doğum ağırlıkları karşılaştırıldı.

Bulgular: 329 hastada, artmış BMI'nin hem fetal doğum ağırlığı ve gestasyonel diabetes mellitus gelişme riski arasında ilişki saptanmadı. Preeklampsi gelişme riski ve kan transfüzyon ihtiyacı ile artmış BMI arasında pozitif korelasyon bulundu.

Sonuç: Artmış BMI, artmış preeklampsi gelişme insidansı ile ve doğum sırasında kan transfüzyonu ihtiyacıyla ilişkilendirilebilir. Bu nedenle, klinisyenler gebelik planlayan üreme çağı kadınlara gebelikte obezite ilişkili maternal problemlerden sakınmak için gebelik öncesinde ideal kilolarına ulaşmalarını önermelidir.

Anahtar Kelimeler: Vücut kitle indeksi, maternal sonuç, gebelik

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Geliş Tarihi/ Received: 29.10.2014
Kabul Tarihi/ Accepted: 09.11.2014

Introduction

Obesity is an one of the most significant public health problems, affecting approximately 300 million women worldwide and currently considered to be a worldwide epidemic (1,2). World Health Organization (WHO) reports in 2005 showed that about 1.6 billion adults were overweight and 400 million or more adults were obese. According to WHO and the National Institute of Health criteria, body mass index (BMI) is defined in the following criteria; ≤18.5 as underweight, 18.5-24.9 as normal weight, 25-29.9 as overweight, and ≥30 as obesity. Obesity is further classified as Class I at BMI of 30-34.9, Class II at 35-39.9 and Class III at ≥40(2).

Some studies have shown that obesity during pregnancy increases morbidities such as hypertension (3-5), gestational diabetes (4,6,7), pre-eclampsia (3,5,7) and postpartum hemorrhage(8,9).

The Confidential Enquiry into Maternal Deaths conducted in the UK reported that obesity was a significant factor in the increasing maternal mortality rates (10). The aim of this study was to investigate the association in pregnancy between increased body mass index (BMI) and unfavorable maternal perinatal outcomes.

Material and Methods

This retrospective study included 329 pregnant women who first presented for antenatal examination before the 8th week of pregnancy between January 2013 and July 2014. Height, weight and blood pressure values were routinely measured and recorded during early examinations and the infants were delivered in our clinic. Patients with multiple pregnancies and suffering from hypertension and diabetes mellitus before pregnancy were excluded from the study. The weeks and modes of delivery of the patients were not taken into consideration. A final evaluation was made of the data of 329 patients.

Patient data was retrieved from patient records and the computer-based information system. The women were assigned to 4 groups according to the BMI measurement in pregnancy as follows: underweight BMI <18.5 kg/m2, normal BMI 18.5–25.0 kg/m2, overweight BMI 25.1–30.0 kg/m2, and obese BMI >30.0 kg/m2.

The maternal outcome variables analyzed were pre-eclampsia, gestational diabetes mellitus, fetal weight gain and requirement of blood transfusion, regardless of gestational week at delivery and mode of delivery. Birth weights were divided into three groups as 2.5 kg, 2,5-3.5 kg and >3.5 kg. Women with normal BMI were designated as 'Controls' and overweight, obese or underweight women were designated as the 'Cases' for comparison purposes. The outcome variables were compared with each BMI group.

Approval for the study was granted by Kahramanmaraş Sütçü İmam University, Faculty of Medicine Research and Ethics Committee.

The Statistical Package for Social Sciences (SPSS) v.21 program was used for the analysis of the data. Parametric methods were used in the analysis of the variables with normal distribution and nonparametric methods for the analysis of the variables without normal distribution. One- Way Anova (Robust Test: Brown-Forsythe) and Kruskal-Wallis Tests were used for the comparison of multiple groups with each other while the non-parametric Miller post-hoc test (1966) was utilized for post-hoc analyses. In the comparison of categorical data, the analyses were tested with Linear-by-Linear Association results. Quantitative data were expressed as average ± standard deviation (SD) and median ± Interquartile Range (IQR) values in the tables. Categorical data were presented as number (n) and percentage (%). The data were analyzed at a 95% confidence level and a value of $p<0.05$ was accepted as statistically significant.

Results

A total cohort of 329 women was included in the study sample as four groups with their respective sample sizes and rate as follows: underweight, n=9 (2.7%); normal, n=71 (21.6%); overweight, n=140 (42.5%); obese, n=109 (33.1%). The mean maternal age was 29.54 ± 6.27 years (range,18-48 years), mean gravida was 2.80 ± 1.49 (range, 1- 9) and mean parity was 1.58 ± 1.25 (range, 0- 7).

The demographic characteristics of the patients according to the BMI groups are shown in table 1.

Table 1: Comparison of patient data according to BMI groups

		BMI (At the beginning of the pregnancy)				P Value
		Underweight (BMI<18.5)	Normal Weight (BMI= 18.5-25)	OverWeight (BMI= 25.1-30)	Obese (BMI> 30)	
		n(%)	n(%)	n(%)	n(%)	
Fetal birth weight	<2500 / [2500-3500] / > 3500 g	0(0%) / 6(66,7%) / 3(33,3%)	10(14,1%) / 47(66,2%) / 14(19,7%)	16(11,4%) / 93(66,4%) / 31(22,1%)	13(11,9%) / 75(68,8%) / 21(19,3%)	0,674
GDM	present/absent	8(88,9%) / 1(11,1%)	70(98,6%) / 1(1,4%)	139(99,3%) / 1(0,7%)	104(95,4%) / 5(4,6%)	0,063
Preeclampsia	present/absent	9(100%) / 0(0%)	69(97,2%) / 2(2,8%)	129(92,1%) / 11(7,9%)	94(86,2%) / 15(13,8%)	0,007
Need for transfusion	present/absent	9(100%) / 0(0%)	71(100%) / 0(0%)	137(97,9%) / 3(2,1%)	93(85,3%) / 16(14,7%)	<0,001

Linear-by-Linear Association Test
GDM: Gestational diabetes mellitus

The mean fetal weight, birth weight, maternal age and maternal hemoglobin levels at birth were compared between the four groups and no statistically significant difference was determined (p=0.1219, p=0.702, p=0.729 and p=0.806 respectively). The mean±SD of gravida and parity were determined to be statistically significant (p <0.001 and p <0.001 respectively).

Patient outcomes by BMI groups are shown in Table 2. Birth weights of >3500 gr in were seen at 33.3% in the underweight group, at 19.7% in the normal group, at 22.1% in the overweight group and at 19.3% in the obese group. When fetal weights were grouped as <2500 g, 2500-3500 g and >3500 g, no significant correlation was detected among increasing BMI for each of the three groups(p= 0.674).

Tablo 2. Patient outcomes by BMI groups

	BMI (At the beginning of the pregnancy)				P Value
	Underweight (BMI<18.5) =A	Normal Weight (BMI= 18.5-25) =B	OverWeight (BMI= 25.1-30) =C	Obese (BMI> 30) =D	
Fetal birth weight*	3.506,1±576,55	3.110,9±492,92	3.125,1±569,63	3.122,9±484,78	0,219
Gestation**	39,00±1,00	39,00±1,00	39,00±1,00	39,00±1,00	0,702
Maternalage*	30,2±9,01	30,4±6,42	29,3±6,43	29,2±5,75	0,729
Gravida (G)**	2,00±2,00	3,00±1,00	2,00±1,00	3,00±2,00	<0,001
	P(A-B)=0,971 , P(A-C)=1 , P(A-D)=0,066 , P(B-C)=1 , P(B-D)=0,067 , P(C-D)<0,001				
Parity (P)**	2,00±2,00	2,00±1,00	2,00±1,00	3,00±2,00	<0,001
	P(A-B)=1 , P(A-C)=1 , P(A-D)=0,169 , P(B-C)=1 , P(B-D)=0,072 , P(C-D)<0,001				
Maternal Hb levels at delivery**	9,80±3,40	9,70±3,10	9,35±3,00	8,90±2,80	0,806

OneWay ANOVA (Brown-Forsythe) - Kruskal Wallis Test Post Hoc Test: nonparametric posthoc test (Miller(1966) * : Mean±SD.(Standart Deviation)
**Median±IQR(Inter QuartileRange)
Hb: Hemoglobin

There was no relationship or statistically significant difference between maternal BMI and the risk of gestational diabetes mellitus. The reliability of theis analysis was estimated to be quite low because of the limited number of patients diagnosed with gestational diabetes mellitus.

The rate of diagnosed pre-eclampsia was detected in positive correlation with increased maternal BMI. As diagnosis of pre-eclampsia was not seen in the underweight group but was determined at 2.8% in the normal weight group, at 7.9% in the overweight group and at 13.8% in the obese group. Increased BMI was determined to be a statistically significant risk factor (p=0.007).

Requirement for blood transfusion was determined to have a statistically significant highly positive correlation with increased maternal BMI (p< 0.001).

Conclusion

Obesity and being overweight is a leading modern-day health problem worldwide, and has become a significant public health problem in developed countries in particular. To gether with the increasing prevalence of obesity in the general population, so increases have been noted in reproductive age women. Some studies in literature, most of which are from developed countries, have reported a relationship between maternal obesity and obstetric outcomes.

An association has been reported between hyperlipidemia and hyperin sulinemia and maternal obesity. Hyperlipidemia results in a reduction in the secretion of prostacyclin and enhancement of peroxidase production, which cause vasoconstriction and platelet aggregation and thereby an increased risk of preeclampsia (11,12). Some studies have strongly emphasised the association between morbid obesity and hypertensive disorders of pregnancy (4,13-16). In a meta-analysis investigating association between maternal MBI and the risk of preeclampsia, it was reported that the risk of pre-eclampsia doubled with every 5-7 kg/2 increase in BMI (17). Bhattacharya et al conducted a retrospective large cohort study in Aberdeen and reported that the risk of pre-eclampsia increased 3-fold in obese (BMI 30-39.9) and 7-fold in morbidly obese (BMI >40) primigravida women (18). Pre-eclampsia has been stated to cause 15% of preterm deliveries and a 5-fold increase in neonatal mortality (19). Obesity and pre-eclampsia together have been reported to cause premature delivery and intrauterine growth restriction (20) although several studies have demonstrated that the association between obesity and stillbirth is not fully explained by increases in gestational diabetes or hypertensive disorders (7, 21, 22).

Many studies have reported an increased risk of postpartum hemorrhage in obese mothers (7, 18). The results of the current study also determined a statistically significant increased risk of postpartum hemorrhage in obese women, which is consistent with other studies (p < 0.001). This risk was thought to be due to more difficult surgical intervention and longer operating time in patients with increased BMI and unknown factors such as bleeding, clotting and cytokines.

The increased incidence of macrosomic fetuses in this study may be due to increased glucose uptake to the fetus during the pregnancy with fetal hyperinsulinemia in cases of maternal obesity. There are many studies, supporting the view that rapid fetal growth arising from maternal hyperinsulinemia and placental insufficiency in obese women may cause fetal loss (13). Although a high incidence of macrosomia in obese women has been reported in some studies, no association was found in the current study between macrosomia and obese women (4,7,13,22). The risk of gestational diabetes determined from the results of the current study was seen to be similar to that of other studies, reporting a positive correlation between gestational diabetes and BMI (4,7,14,15,23).

A previous study of 50 non-diabetic obese women reported that gestational weight gain could be reduced with an intensive diet regime to within the lower range of gestational diabetes mellitus and pregnancy-induced hypertension (24).

The limitations of this study are that it was retrospective, not randomized or controlled, not systematic, and was conducted in a single center over a short

time period with a limited number of patients. There may also have been inconsistency in the patient data with unknown birth week or mode of delivery.

The results of this study showed that increased BMI is associated with an increased incidence of pre-eclampsia and requirement of blood transfusion, but not with gestational diabetes mellitus or fetal weight gain.

The most important factor in the development of obesity is lifestyle, which includes education about diet and exercise. All reproductive age women should be made aware of the benefits of regular exercise and suitable diet before conception. Pregnant females consulting a physician for prevention and early detection of complications due to obesity should be considered as high risk pregnancies.

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