



Original article

Effects of gestational weight gain and body mass index on obstetric outcome

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ABSTRACT

Abstract It is already known that maternal overweight, obesity, and morbid obesity are associated with adverse obstetric and neonatal outcomes. To assess the prevalence of overweight and obesity, and the impact of body mass index (BMI) on maternal and neonatal outcomes in Turkey. The study population consisted of 698 singleton pregnancies whose height and weight follow up were performed from the first trimester of pregnancy and whose deliveries were monitored in Trabzon, Turkey in July 2014–June 2015. The data obtained during the study were evaluated using SPSS 21 package program. The differences in variables were assessed by Chi-square-test for categorical data or by One-way Anova test for continuous data. The results were evaluated at a confidence interval of 95% and at a significance level of $p < 0.05$. According to the BMI of the women in the study, 68.8% were in normal weight, 20.6% were overweight, 3.9% were obese, and the majority was in the 20–29 age group and 8–15.9 kg. The rate of cesarean, instrumental delivery, induction, episiotomy, late breastfeeding, low apgar (<7 at 5 min), neonatal intensive care unit admission requirement, the newborn at 4000 g or more in overweight (BMI 25–29.9) and obese (BMI ≥ 30) pregnancies was higher and the first and second phases of labor were longer ($p < 0.05$). The study showed that as the pre-pregnancy body mass index and gestational weight gain increased the rates of cesarean section and interventional delivery increased and the neonatal need for neonatal intensive care unit increased.

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1. Introduction

It is reported that nowadays 15–20% of women start pregnancy as obese, 20–40% gain more gestational weight than recommended, and accordingly obesity increases among the women of childbearing age. According to the World Health Organization

(WHO) criteria, the prevalence of obesity among pregnant women (BMI $> 30 \text{ kg/m}^2$) is between 1.8% and 25.3%. In Turkey, 27.2% of pregnant women are reported to be overweight and obese (WHO, 2018; Daşkan and Kavlak, 2009). According to the WHO criteria, those whose BMI are lower than 18.5 kg/m^2 , between 18.5 and 24.9 kg/m^2 , between 25 and 29.9 kg/m^2 , and between 30 and 39.9 kg/m^2 are considered as thin, normal weight, overweight and obese respectively (Taşdemir et al., 2015; WHO, 2018). Based on the WHO's obesity classification, in 2009 the Institute of Medicine (IOM) recommended that thin, normal, mildly obese and obese pregnant women should gain 11.5–16 kg, 7.0–11.5 kg, 12.5–18 kg and 9 kg respectively (IOM, 2009; Akgün, 2013).

Excess gestational weight and maternal obesity cause gestational diabetes, hypertensive diseases, preterm labor, birth induction, difficult birth and birth complications, increase in cesarean birth, postpartum hemorrhage, thromboembolism, breastfeeding problems, depression (Lutsiv et al., 2015; Van Der Linden et al., 2016; Poston et al., 2016; WHO, 2018). Prematurity, stillbirth, congenital anomalies, macrosomia, and childhood obesity (Hilliard et al., 2012; Scott-Pillai et al., 2013; Stüber et al., 2015). In a multi-centered prospective study in which 16,000 pregnancies

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were investigated, the comparison of the pregnant women with BMI between 30 and 39.9 kg/m² and those with BMI 30 or less showed an increase in the risk of maternal obstetric problems (gestational diabetes, gestational hypertension, preeclampsia) and neonatal outcomes (fetal macrosomia) (Weiss et al., 2004). In another study with 100,000 females with a normal body mass index before pregnancy, those that gained weight less than 11.5 kg during pregnancy were found to have a lower risk of having preeclampsia, unsuccessful induction, head-pelvis inconvenience and delivering a large baby according to cesarean and gestational age (DeVader et al., 2007). In the majority of the previous studies, pre-pregnancy body measurements, gestational weight gain, pregnancy and birth complications, neonatal descriptive information and data regarding complications were obtained based on the patient's file or statements. For this reason, our study was conducted prospectively to determine whether gestational weight gain was below 8 kg (low weight gain) or greater than 16 kg (high weight gain), and the neonatal and obstetric outcomes of maternal BMI by following up pregnant women from the first follow up and to postpartum period.

2. Materials and methods

2.1. Participants and procedures

This study was carried out prospectively between 1 July 2014 and June 2015 in Kanuni Training and Research Hospital, Gynecology and Obstetrics Clinic with the pregnant women whose follow ups and deliveries were conducted in this hospital. A total of 987 pregnancies were observed, but after the exclusion criterion [births at less than 28 weeks of gestation (n = 29); morbid obese (n = 42), multiple pregnancies (n = 35); have severe systemic diseases (47), fetal and placental anomalies (31), and BMI recorded after 16 weeks of gestation (n = 105)] the number of pregnancies and births regularly observed was 698 (69.8%). The pregnancies with pregnancy follow-up from the first trimester (the first third month) were included in the study. The data such as the gestational age, the number of gestations, the number of births, gestational week, body weight before pregnancy, height, body mass index (BMI-kg/m²), placental anomalies (31), and BMI recorded after 16 weeks of gestation (BMI-kg/m²), body weight before and at delivery, monthly body weight gains, work status, previous illnesses, the gestational age at delivery and the treatment they had were obtained from the pregnant woman herself. Interventions in labor, the duration of labor, time to start breastfeeding, and newborn characteristics were recorded through researchers' follow-up. The duration of labor was evaluated in 3 time periods by measuring with a partograph. The first cervical dilatation is the time from 3 cm to full cervical dilatation (10 cm). The second one is the time from full cervical dilatation to the birth of the fetus and the third one is the time from the birth of the fetus to the birth of the placenta. Cervical dilatation was measured by midwives working in the delivery room.

Exclusion Criteria: The cases without adequate anamnesis, those who had genetic disease in their family or themselves, those who were morbidly obese (BMI > 40 kg/m²), those who had multiple pregnancies, those who had less than 28 weeks of gestation, those with severe systemic or surgical diseases before pregnancy, and fetal and placental anomalies were not included in the study.

BMI (kg/m²) was calculated using maternal weight and height data. Women were classified according to the World Health Organization criteria: underweight (BMI < 18.50 kg/m²); normal weight (BMI 18.50–24.99 kg/m²; reference group); overweight (BMI 25.00–29.99 kg/m²); obese (BMI 30.00–34.99 kg/m²) (WHO, 2013) and were divided into three gestational weight gain categories;

<8 kg (low weight gain), 8–15.9 kg and 16+ kg (high weight gain). Gestational weight gain was described as the difference between the maternal body weights recorded when the woman attended the delivery room and the one measured during the first visit to the outpatient clinic.

The findings were investigated under the following headings; instrumental vaginal delivery, the rate of cesarean delivery, infant birth weight, requirement of labor augmentation with oxytocin, small and large infants according to gestational weeks, duration of birth, episiotomy rate, average infant birth weight, the incidence of Apgar score (<7 at 5 min), necessity of infant admission to a neonatal unit, and the onset of breastfeeding.

2.2. Statistical analysis

Statistical analysis was performed using Statistics Package for Social Sciences for Windows, version 21.0. The differences in the variables were evaluated by Chi-square-test for categorical data or by One-way Anova test for continuous data. The results were assessed at a confidence interval of 95% and at a significance level of p < 0.05.

2.3. Ethical considerations

Ethical issues (Including plagiarism, informed consent, misconduct, data fabrication and/or falsification, double publication and/or submission, redundancy, etc.) have been completely observed by the authors.

3. Results

The prevalence of overweight (BMI 25.00–29.99 kg/m²) in the participants of the study was 20.6%. Obesity (BMI 30.00–34.99 kg/m²) existed in 3.9% of them. In addition, 70.8% of the pregnant women gained 8–15.9 kg during pregnancy and 19.9% gained over 16 kg. According to BMI, weight gain in overweight and obese participants was 12.2 and 11.5 kg in average respectively (Table 1).

Maternal characteristics, obstetric and neonatal outcomes of the women according to BMI classification are shown in Table 2.

Table 1
Distribution of women gestational weight gain categories according to maternal BMI class (kg) (n = 698).

BMI and gestational weightgain categories (kg)		n (%)	
BMI			
BMI < 18.5 (Underweight)		47 (6,7)	
BMI 18.5–24.9 (Normal)		480 (68,8)	
BMI 25–29.9 (Overweight)		144 (20,6)	
BMI ≥ 30 (Obese)		27 (3,9)	
Gestational weight gain categories (kg)			
<8 kg		65 (9,3)	
8–15.9 kg		494 (70,8)	
16+		139 (19,9)	
BMI	Gestational weight gain Categories (kg)	n (%)	Mean gestational weight gain (SEM)
<18.5	<8 kg	2 (4,3)	14,81 (0,67)
	8–15.9 kg	30 (63,8)	
	16+	33 (31,9)	
18.5–24.9	<8 kg	36 (7,5)	12,67 (0,17)
	8–15.9 kg	354 (73,8)	
	16+	90 (18,8)	
25–29.9	<8 kg	17 (11,8)	12,28 (0,36)
	8–15.9 kg	27 (69,4)	
	16+	27 (18,8)	
≥30	<8 kg	10 (37,0)	11,59 (1,09)
	8–15.9 kg	7 (37,0)	
	16+	9 (25,9)	

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