



ARAŞTIRMA / RESEARCH

Gestational weight gain and weight retention at postpartum 12th month

Gestasyonel kilo alımı ve postpartum 12. ayda kilo retansiyonu

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Abstract

Purpose: This study aimed to determine gestational weight gain (GWG) according to the Institute of Medicine (IOM) 2009 guidelines and postpartum 12th month weight retention, and to investigate the factors affecting it.

Materials and Methods: This is a descriptive cross-sectional study of 216 postpartum women at 12 month. Questionnaire was used to collect the research data..

Results: 64.8% of women have been determined except for the 2009 IOM guideline recommendations (44% excessive GWG), postpartum weight retention was identified in 69.5% of the women (27.8% having ≥ 5 kg; 41.7% between 0.5-5kg). Obesity ratio increased by 9.3% in postpartum women at 12 month when compared to pre-pregnancy. Excessive GWG were found in women whose pre-pregnancy body mass index was overweight and obese, had education for > 8 years, had a good income level, and a baby birth weight of ≥ 4000 grams and had a primipara. Postpartum 12 month weight retention rates were observed in women with excessive GWG, and in women whose physical activity perceptions were immobile, with breastfeeding periods of ≤ 6 months.

Conclusion: Approximately half of the participating women had excessive GWG, while two-thirds had postpartum weight retention at 12th month. There was 9.3% increase in the rate of obesity between pre-pregnancy and 12 months postpartum in the participating women. Prenatal care provider (midwife-nurse, obstetrician, family doctor etc.) should make recommendations for GWG according to IOM guidelines and weight management counseling to prevent excessive GWG and postpartum weight retention.

Keywords: Pregnancy, weight gain, weight retention, obesity, perinatal care

Öz

Amaç: Bu araştırma, Tıp Enstitüsü (IOM) 2009 yılı rehberine göre gestasyonel kilo alımı (GKA) ve postpartum 12. ay kilo retansiyonu belirleme ve bunları etkileyen faktörleri araştırmayı amaçlamıştır.

Gereç ve Yöntem: Araştırma; tanımlayıcı ve kesitsel tipte postpartum 12. ayda olan 216 kadında yapılmıştır. Verilerin toplanmasında soru formu kullanılmıştır.

Bulgular: Kadınların %64.8'nin 2009 yılı IOM rehber önerileri dışında GKA belirlenmiş (%44 aşırı GKA) ve %69.5'inde postpartum kilo retansiyonu (% 27.8'si ≥ 5 kg; %41.7'si 0.5-5kg arası) saptanmıştır. Postpartum 12. aydaki kadınların obezite oranı gebelik başlangıç obezite oranına göre 9.3% oranında artmıştır. Gebelik başlangıç beden kitle indeksi kilolu ve obez olan, > 8 yıl eğitim alan, gelir düzeyi iyi olan, bebek doğum ağırlığı ≥ 4000 gram olan ve primipar kadınlarda İOM rehberine göre aşırı GKA saptanmıştır. Aşırı GKA olan, emzirme süresi ≤ 6 ay ve postpartum fiziksel aktivite algısı hareketsiz olan kadınlarda postpartum 12. ay kilo retansiyon oranı yüksek saptanmıştır.

Sonuç: Sonuç olarak, araştırmaya katılan kadınların yaklaşık üçte ikisinde IOM rehber önerileri dışında GKA ve üçte ikisinden fazlasında postpartum 12. ayda kilo retansiyonu olduğu belirlenmiştir. Kadınların gebelik başlangıcına göre postpartum 12. ayda obezite oranında % 9.3 artış oldu. Prenatal bakım vericiler (ebe-hemşire, kadın doğum uzmanı, aile hekimi vs.) aşırı GKA ve postpartum kilo retansiyonunu önlemek için kadınlara IOM kılavuzlarına göre kilo alım önerilerinde bulunmalı ve kilo yönetimi danışmanlığı yapmalıdır.

Anahtar kelimeler: Gebelik, ağırlık artışı, kilo retansiyonu, obezite, perinatal bakım

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INTRODUCTION

The prevalence of overweight and obesity has surged worldwide. There is a significant relationship between pregnancy and postpartum period in the development of maternal obesity¹⁻⁵. According to Turkey Demographic and Health Survey (2018), 29% of women are overweight, while 30% are obese. In other words, approximately one out of three women is obese⁶. Institute of Medicine (IOM) recommended a weight gain guide for women based on pre-pregnancy body mass index (BMI). In recent studies, women were reported to have gestational weight gain (GWG) values that are 39%–73% higher than the 2019 IOM recommendations⁷⁻¹². Excessive GWG is among the risk factors of postpartum weight retention (WR)^{1,11,13-15}. Postpartum WR is observed twice as much in women with higher weight gain than recommended by IOM^{11,13,14}. Postpartum weight retention occurs at a rate of 60%–80%, while WR rate changes due to the influence of factors such as pre-pregnancy BMI, GWG, and breastfeeding^{2,8,9,12,14}. Postpartum WR in women cause a significant increase in obesity, as well as obesity-related diseases such as cardiovascular disorders, diabetes, certain cancer types, and psychological problems. There is also a high-risk of pregnancy and labor complications in obese and overweight women, as well as in women with excessive GWG^{9,10,14}.

Although the rate of maternal obesity is gradually increasing in Turkey, there are very few studies on GWG and postpartum WR, which are the most implicated factors. This present study will contribute significantly to literature, and guide studies on maternal weight management. Weight management during pregnancy and postpartum period is important not only to prevent maternal obesity, but also to improve the infant health and future generations.

Therefore, this study aimed to determine the GWG of women (according to the 2009 IOM guidelines), 12 months postpartum WR, and the factors influencing them.

MATERIALS AND METHODS

This is a descriptive cross-sectional study conducted between November, 2013 and May, 2015 on postpartum women (at 12th) registered at Izmir in Turkey, a district area with three Family Health Center (FHC). FHCs in rural areas and public funded.

Majority of the human population around the three FHCs primarily engage in farming.

The study was approved by Ege University Odemis School of Health by the Ethics Committee with approval number 2013-04- / 27/368 and complies with the 1995 Helsinki Declaration (revised in Tokyo 2004). Informed consent was obtained from all individual participants included in the study.

Sample

A questionnaire developed in line with literature^{10,11,13,14}. Pregnancy-puerperium follow-up records were used to collect data on the characteristics of participating women's pregnancy and postpartum periods. During the study, 410 pregnancy-puerperium follow-up records were screened for women at 12th month postpartum, and a total of 216 women who met the inclusion criteria (and are reachable) were included in this study.

The inclusion criteria for this study was as follows: women between the age range of 18–45; women that have single spontaneous pregnancy; women that have given birth after the 37th week; women whose baby is living; women with determined pre-pregnancy BMI and total GWG; women at 12 month postpartum period; women whose postpartum 12th month weight has been determined; women without chronic diseases; women that provided their contact information volunteer, and women that volunteered to take part in the study. However, women whose total weight gain during pregnancy could not be determined, and those who became pregnant again were excluded from the study.

Procedure

Data was collected by researchers in FHCs. Weight measurements of postpartum women were done by the researchers following standard procedures. Height measurements of the postpartum women were done in an upright position, with feet without shoes and heels touching the wall.

Identifying pre-pregnancy BMI

In order to calculate the BMI, height and weight measurements were obtained from the pregnancy-puerperium follow-up records from the start of gestation (≤ 10 weeks). BMI values were calculated by dividing the weight (in kilograms) by square of the height (in meters).

Identifying GWG

In order to calculate total GWG, initial gestation weight (≤ 10 weeks) was subtracted from the weight measurements taken at 38th week and later. Self-reported weight measurements were accepted from the women without registered weight measurements in their pregnancy-puerperium follow-up records for the period after the 38th week.

According to the IOM 2009 guide, 12.5–18 kg correspond to low BMI before pregnancy (BMI < 18.5 kg/m²), 11.5–16 kg correspond to normal BMI (BMI 18.5–24.9 kg/m²), 7–11.5 kg correspond to overweight (BMI 25–29.9 kg/m²), 5–9 kg correspond to obese (BMI > 30 kg/m²)^{7,11}. According to the BMI and the IOM guide, compliance with GWG was coded as (1) inadequate (2) adequate, and (3) excessive.

Identifying 12 month postpartum WR

Participating women's postpartum weights at 12th month were measured at FHCs where they were cared for and monitored. Postpartum WR at 12 month were calculated by subtracting the initial gestation weight measurements from the weights at 12 month postpartum.

Statistical analysis

Data was analyzed with SPSS Statistics version 25.0 (IBM Corp; Armonk, NY, USA). The compliance of the numerical variables with normal distribution was determined by Kolmogorov-Smirnov test. Numerical variables were expressed as mean (\pm standard deviation) or median (IOR: interquartile range, min-max) and categorical variables were expressed as number (percentage). Student's independent t-test was used to analyze normally distributed numerical variables (education with 12th postpartum WR), while Mann-Whitney U test (age, work status, parity, delivery mode and duration of breastfeeding with 12th postpartum WR) and Kruskal-Wallis test (BMI, GWG according to 2009 IOM guidelines, family income perception and physical activity perceptions at postpartum with 12th postpartum WR) were used to analyze variables that were not normally distributed. After the Kruskal-Wallis test, pairwise comparisons were done with Dunn's post-hoc tests with Bonferroni correction (GWG according to 2009 IOM guidelines and postpartum physical activity perception). Pearson's chi-square test was used to analyze the categorical variables (Pre-pregnancy BMI group, age group, education, work status, family

income perception, parity, delivery mode, Infant birth weight/gr with GWG according to 2009 IOM guidelines). $p < .05$ was adopted as significant.

RESULTS

The descriptive characteristics of the women participating in the study are given in Table 1. A total of 216 women at postpartum 12 months participating in the study had a median pre-pregnancy BMI of 24.8 kg/m², and a median GWG of 13.5 kg, and postpartum 12 months WR median of 2.5 kg.

Table 1. Characteristics of women, pre-pregnancy body mass index, gestational weight gain, and weight retention at 12 month postpartum.

Characteristics (N=216)	M (IOR)	Min-Max
Age (years)	29 (8)	19-41
Parity	1.0 (1)	0-4
Pre-pregnancy BMI (kg/m ²)	24.8 (6.2)	17.2-46.5
Gestational weight gain (GWG)/(kg)	13.5 (7)	-5; + 30
WR at 12 month postpartum/(kg)	2.5 (6)	-11; +18
Postpartum at 12 month BMI (kg/m ²)	26.4 (8)	18.1-49.2
Infant birth weight (gr)	3450 (560)	2000-5000
Pre-pregnancy BMI categories (kg/m ²)	n	%
Underweight (<18.5)	5	2.3
Normal (18.5–24.9)	107	49.5
Overweight (25–29.9)	66	30.6
Obese (≥ 30)	38	17.6
GWG according to 2009 IOM guidelines		
Inadequate	45	20.8
Adequate	76	35.2
Excessive	95	44.0
WR at 12 month postpartum (kg)		
No retention	66	30.5
0.5–5 kg	90	41.7
≥ 5 kg	60	27.8
BMI categories at 12 months postpartum (kg/m ²)		
Underweight	2	1.0
Normal	92	42.5
Overweight	64	29.6
Obese	58	26.9

M: Median; IOR: Interquartile range; WR: Weight retention, IOM: Institute of Medicine; BMI: Body mass index; GWG: Gestational weight gain

Based on 2009 IOM guide recommendations, 44% of the participating women had excessive GWG, while WR was observed in 69.5% of the participating

women at 12 month postpartum (41.7% had 0.5–5 kg WR; 27.8% had ≥ 5 kg WR). There was 9.3% increase in rate of obesity in the participating women at 12 month postpartum (26.9%) when compared to their initial gestation obesity rate (17.6%), (Table 1). Women who received higher education (>8 years) ($p=.018$), women who were employed ($p=.016$), and

women who earned good income ($p=.004$) were found to have excessive GWG. Also, GWG was significantly higher in primiparous women (50.5%) when compared to multiparous women (38.1%) ($p<.001$). In addition, women had higher rates of excessive GWG, with infant birth weight above 4000 grams ($p=.028$), (Table 2).

Table 2. Factors affecting gestational weight gain

Characteristics (N=216)	GWG according to 2009 IOM guidelines								
	Total		Inadequate		Adequate		Excessive		X ²
	n	%	n	%	n	%	n	%	p
Pre-pregnancy BMI (kg/m ²)									
Normal (18.5–24.9)	112 ^a	51.8	27	24.1	48	42.9	37	33.0	.021
Overweight (25–29.9)	66	30.6	12	18.2	18	27.3	36	54.5	
Obese (≥ 30)	38	17.6	6	15.8	10	26.3	22	57.9	
Age (years)									
≤ 29 years	109	50.5	19	17.4	43	39.4	47	43.1	.302
≥ 30 years	107	49.5	26	24.3	33	30.8	48	44.9	
Education									
≤ 8 years	124	57.4	34	27.4	42	33.9	48	38.7	.018
> 8 years	92	42.6	11	12.0	34	37.0	47	51.1	
Work status									
Not working	162	75.0	41	25.3	52	32.1	69	42.6	.016
Working	54	25.0	4	7.4	24	44.4	26	48.1	
Family income perception									
Low	64	29.6	23	35.9	17	26.6	24	37.5	.004
Moderate	90	41.7	17	18.9	33	36.7	40	44.4	
Good	62	28.7	5	8.1	26	41.9	31	50.0	
Parity									
Primiparous	103	47.7	9	8.8	42	41.2	52	50.5	$<.001$
Multiparous	113	52.3	36	31.6	34	29.8	43	38.1	
Delivery mode									
Vaginal	75	34.7	18	24.0	28	37.3	29	38.7	.486
Cesarean section	141	65.3	27	19.1	48	34.0	66	46.8	
Infant birth weight (gr)									
<4000 gr	192	88.9	45	23.4	65	33.9	82	42.7	.028
≥ 4000 gr	24	11.1	0	0.0	11	45.8	13	54.2	

X²: Pearson's chi-square, IOM: Institute of Medicine. In the analysis, ^a5 women with underweight were included in the normal weight group. Percentages were taken in rows.

The 12-month postpartum WR rate was higher in women with a breastfeeding duration of ≤ 6 months when compared to women with a breastfeeding duration of >6 months ($p=.033$). This study also observed high rates WR at 12 month postpartum for women with excessive GWG (4 kg) and inactive postpartum physical activity perception (4.5 kg) ($p<.001$), (Table 3). The post-hoc analysis result revealed that the difference in the WR rate at 12th month of postpartum was seen in groups with excessive GWG ($p=.002$); and low GWG ($p=.001$).

There were significant differences between the groups in terms of postpartum physical activity perception and postpartum 12th month WR ($p<.001$). The post-hoc test result was as follows: very active-active ($p=.010$), very active-inactive ($p<.001$), and active-inactive ($p=.172$). In this study, a statistically significant relationship was not observed between 12 month postpartum WR and pre-pregnancy BMI, age, level of education, employment status, parity, and mode of birth ($p>.05$), (Table 3).

Table 3. Factors associated with weight retention at 12 month postpartum

Characteristics (N=216)	WR at 12 month postpartum (kg)		
	n	M (IQR)	p
Pre-pregnancy BMI categories (kg/m ²)			
Normal weight (18.5–24.9)	112	2.0 (6)	.604 ^a
Overweight (25–29.9)	66	3.5 (7)	
Obese (≥30)	38	2.25 (7)	
GWG according to IOM 2009 guidelines			
Inadequate	45	1.0 (7)	<.001 ^a
Adequate	76	2.0 (6)	
Excessive	95	4.0 (7)	
Age (years)			
≤29 years	109	2.5 (7)	.794 ^b
≥30 years	107	3.0 (6)	
Education (Mean±SD)			
≤8 years	124	3.55±5.46	.059 ^c
>8 years	92	2.17±5.05	
Work status			
Not working	162	2.5 (6)	.578 ^b
Working	54	3.0 (7)	
Family income perception			
Low	64	3.0 (7)	.672 ^a
Moderate	90	2.0 (7)	
Good	62	3.0 (5)	
Parity			
Primiparous	103	3.0 (8)	.104 ^b
Multiparous	113	2.0 (5)	
Delivery mode			
Vaginal	75	2.0 (7)	.426 ^b
Cesarean section	141	3.0 (7)	
Duration of breastfeeding			
≤ 6 months	40	4.25 (7)	.033 ^b
> 6 months	176	2.0 (6)	
Physical activity perceptions at postpartum			
Very active	45	-1.0 (6)	<.001 ^a
Active	129	3.0 (7)	
Inactive	42	4.5 (6)	

M: Median; IQR: Interquartile range; SD: Standard deviation; ^aKruskal–Wallis test; ^bMann–Whitney U test; ^cStudent's t-test

DISCUSSION

In this study, 44% of women had an excessive GWG than the 2009 IOM recommendations. Women who gain more weight than recommended by IOM are three times more likely to go into the subsequent pregnancy as overweight⁸. In a study conducted in the center of Izmir in Turkey, excessive GWG was determined as 39.3%, and weight retention was

76.2% (with 31.8% being ≥5 kg) in postpartum women between 12–18 months¹².

In this study, it was observed that women who were obese (57.9%) and overweight (54.5%) had excessive GWG ($p = .021$). Based on IOM recommendations, pre-pregnancy BMI is a significant predictor of GWG. Studies have demonstrated that overweight or obese women gain more weight during pregnancy when compared to women with normal weight^{3,10}. In

their study, Rode et al. (2012) reported that 59.6% of overweight women gained more weight than recommended during pregnancy, as the most weight was observed in the overweight women. In the US, in 2015, about 39% of normal weight, 61% of overweight, and 55% of obese women gained more weight than the recommended during pregnancy¹⁶.

Based on IOM guide, researchers believe that the real cause of many complications arising during pregnancy in overweight and obese women is excessive weight gained^{8,11,17,18}. Excessive GWG is related to negative gestation and birth complications such as gestational diabetes, pregnancy-induced hypertension, preeclampsia, operative vaginal birth, cesarean delivery and macrosomia, and postpartum obesity^{1,8,14,17}.

In this study, there was 9.3% increase in rate of obesity in the participating women between pre-pregnancy and 12 months postpartum. In their study, Huang et al. (2010)¹³ reported that while the prevalence of overweight and obesity among women before gestation was 18.3%, it increased to 27.6% in the first 6 months after birth. BMI increases that are formed between two consecutive births can cause a severe complication in the subsequent birth^{2, 8,18}.

Based on the results of this study, women who received >8 years education had appropriate or excessive GWG than recommended by IOM when compared to women with ≤8 years education ($p=.018$). Some studies reported different relationships between level of education and GWG. A study reported that educated women had GWG levels in line with IOM recommendations when compared to less educated women.⁴ In another study, there was no relationship between education and GWG¹⁷.

This study reports an excessive GWG in working women (48.1%) ($p=.016$) and in women with good level of income (50%) ($p=.004$). In their prospective cohort study, Herring et al. (2012) observed that excessive GWG was more common among low income pregnant women, and almost half of the participants gained more weight than the current IOM recommendations. However, some studies reported no influence of socio-economic status on GWG¹⁷.

In the study, excessive GWG was determined highly in primiparous women compared to multiparous ($p<.001$). Other studies reported a higher GWG than the IOM recommendations in primiparous women

when compared to multiparous women^{2,4,8,20}. Furthermore, in this study, the birth rate of macrosomic babies (≥ 4000 gram) was high in women with higher GWG than IOM recommendations ($p=.028$). Moreover, it was reported that the birth rate of macrosomic baby are increasing in the last decade due to maternal obesity and excessive weight gain during pregnancy^{9,20,21}. It has been reported that caesarian birth rates are significantly high among obese pregnant women and women who gain excessive weight during pregnancy. The cause of high caesarian rate among these cohorts may be associated with macrosomic births, prolonged labor, and complications such as cephalo-pelvic disproportion^{8,11,18}.

Excessive GWG is also the most implicated factor in postpartum WR. Excessive GWG during pregnancy and postpartum WR are determinant factors of long-term maternal obesity^{4, 9,11,20}. Studies have reported that, at 12 month postpartum, ≥ 5 kg WR was observed in 20%–50%^{4,12,21,22}.

In this study, WR was observed in more than two-thirds of the women (69.5%) at 12 month postpartum, with ≥ 5 kg WR observed in about one in every three participating women (27.8%). Althuisen et al. (2011)²² and Rode et al. (2012)¹⁰ reported that, at 12 month postpartum, ≥ 5 kg WR was observed in 20% and 13.2% of the participating women, respectively. Similarly, another study reported ≥ 4.5 kg WR in 25% of participating women at 12 month postpartum.²³ In their study, Martin et al. (2014)²⁴ found that only 32.5% was able to return to pre-pregnancy weight or weighed less than pre-pregnancy level at 12 month postpartum. Similarly, Ketterl et al. (2018)³ found that overweight/obese women are less likely to return to pre-pregnancy BMI after birth when compared to those with normal BMI.

The most significant determinants of postpartum WR are identified as pre-pregnancy BMI, excessive GWG, and duration of breastfeeding.^{4,8,14,18,21} In this study, the average postpartum weight retention (for all groups) was 2.5 kg at one year. Although postpartum WR was most common in overweight (3.5kg) and obese (2.25 kg) women, pre-pregnancy BMI was not a determining factor for postpartum WR ($p>.05$). Contradictory results were obtained in analyses conducted with BMI in previous studies. A study conducted in America reported that while initial gestation BMI values were not associated with short term postpartum WR (first six weeks), they were

associated with long-term postpartum WR (median: 2 years). It was observed that the possibility for underweight women to preserve 0.5–4.5 kg (of the weight gained during pregnancy) at 12 month postpartum was two times higher when compared to women with normal weight.⁴ Furthermore, It was determined that the initial gestation BMI was influential in women who retained 0.5–5 kg at 12 month postpartum⁹. In a study with 1666 mothers in postpartum 12th month in Vietnam, both pre-pregnancy BMI and GWG were significantly associated with postpartum WR ($p < .001$)⁴.

In the study, women with excessive GWG had significantly higher postpartum 12th month WR ($p < .001$). In their study, Rong et al. (2015)² conducted a meta-analysis of 17 studies and reported that weight gain during pregnancy may cause short- or long-term weight instability after birth. Women who gained more or less weight than recommended by IOM during pregnancy had higher postpartum WR when compared to women who had gained weight within IOM recommendations. A meta-analysis conducted in the field reported that, compared to women who gained weight according to IOM recommendations, women who gained more or less weight than recommended by IOM during pregnancy were 3.1 kg and 4.7 kg heavier in the 3rd and 15th year after birth, respectively.¹⁸ In their study, Ha et al. (2019)⁴ reported that women with excessive GWG significantly retained more weight (5.07 kg, 95% CI) on average at 12 months when compared to mothers with adequate GWG (2.92 kg, 95% CI).

There is a possibility that women with postpartum WR will be in the overweight and obese group during their subsequent pregnancy. High BMI may cause negative conditions such as miscarriage, preeclampsia, gestational diabetes, macrosomia, premature birth, cesarean and obesity in the mother and infant in the long term²¹.

An inverse relationship was observed between postpartum WR level of education and socio-economic status. Low educational level was found to be associated with 0.5–5 kg WR at 12 month postpartum⁹. In their study, Althuzen et al. (2011)²² reported that women with high level of education had five times more probability to have WR when compared to women with lower educational level.

This study observed no relationship between postpartum WR and maternal age, level of education, employment status, and income level ($p > 0.05$).

Postpartum 5 kg and high WR was associated with mother's age, race, employment status, total energy intake, and hospitalization of infant after birth⁹. While the influence of breastfeeding is generally implicated in weight loss during the postpartum period, it may be confused with other variables such as calorie intake and level of physical activity. This study observed that 12 month postpartum WR levels were high in women with 6 months or less breastfeeding periods ($p = .033$). In their study, Østbye et al. (2012)¹⁴ reported that breastfeeding was related to light weight loss. There is a negative relationship between maternal obesity at pre-pregnancy or post-pregnancy and the onset and continuation of breastfeeding. Obesity increases the level of progesterone, which prevents the secretion of prolactin, thus causing delayed milk production. The increase in maternal obesity negatively affects the development of mammary glands, thus preventing successful lactation^{24,25}. In a study, maternal pre-pregnancy obesity or overweight and excessive GWG were independently associated with an increased risk, while breastfeeding ≥ 6 months was associated with a decreased risk of childhood overweight at 2 years of age²⁶. It was observed that WR rate decreased in women that were breastfeeding over 12 month postpartum²¹.

In this study, women who perceived themselves as very active were had lower postpartum WR when compared to women who perceived themselves to be inactive ($p < .001$). Behavioral risk factors such as diet and physical activity are associated with the change in postpartum weight^{13,14,21}. It was observed that initiatives of diet and physical activity significantly reduced GWG and postpartum WR^{14,20,22}.

Although pregnancy and postpartum are high-risk factors for the development of overweight and obesity, they also afford unique opportunities for change in lifestyle behavior as a result of women's frequent contact with health care providers, as well as the concern toward their offspring's health. Behavioral interventions can increase the chance of achieving a healthy weight in the life course of both mother and child.¹⁵ Obesity experts advises that the prevention of obesity begins during pregnancy, postpartum, and early infancy^{1,15,27}.

A recent Cochrane review reported that interventions of diet and/or exercise during pregnancy reduced the risk of excessive GWG by 20%, and may reduce the risk of cesarean delivery, macrosomia, and neonatal respiratory morbidity^{1,27}.

Behavioral interventions during pregnancy have been demonstrated to be effective in supporting women's goal of achieving GWG within IOM recommendations, thus returning to their pre-pregnancy weight postpartum¹³. However, only a few women reported to be counseled about weight gain during pregnancy despite the fact that most healthcare providers reported that they counseled women about GWG^{6,20}.

Prenatal care providers are saddled with the responsibility of evaluating maternal weight and health behaviors during antenatal and postnatal period, and to provide counseling. Many studies recommend motivational interviews, as well as patient-centered counseling style for eliciting behavioral change by having patients explore and resolve ambivalence about their behavior change, as an approach to achieve positive health outcomes especially for patients with alcohol, tobacco, or weight management issues^{28,20}.

There are many causes for weight gain during pregnancy and postpartum WR such as nutrition and physical activity, smoking, psycho-social status, and duration of hospitalization and use of contraceptives, all of which were not addressed in this study. The number of studies conducted in this field is limited in Turkey, thus more comprehensive studies with large sample size should be conducted.

In conclusion approximately half of the participating women had excessive GWG, while two-thirds had postpartum WR at 12th month. There has been an increase in obesity rate in women compared to pre-pregnancy BMI. The results of the present study may emphasize the importance of weight management during pregnancy and postpartum period in Turkey.

Nurses and midwives should provide training and counseling to women during antenatal and postpartum follow-ups in order to preserve maternal and infant health. Counseling should enlighten the women on GWG according to IOM guide, healthy lifestyle changes for weight management during prenatal and postpartum periods, nutrition, physical activity, and breastfeeding. Also, risks associated with excessive GWG and postpartum WR should be clearly explained. Preventing excessive GWG and postpartum WR is important to prevent potential obesity or obesity-related health problems in the mother and the infant, thus ensuring a better quality of life.

Yazar Katkıları: Çalışma konsepti/Tasarımı: ZD, ZES; Veri toplama: ZD, ZES; Veri analizi ve yorumlama: ZD, ZES; Yazı taslağı: ZD, ZES; İçerinin eleştirel incelenmesi: ZD; Son onay ve sorumluluk: ZD, ZES; Teknik ve malzeme desteği: -; Süpervizyon: ZD; Fon sağlama (mevcut ise): yok.

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