Effects of excessive weight gain during pregnancy on fear of birth and prenatal attachment levels

Gebelikte aşırı kilo alımının doğum korkusu ve prenatal bağlanma düzeyleri üzerine etkileri

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Abstract

Aim: This study investigated the effects of excessive weight gain on fear of childbirth and prenatal attachment levels in pregnant women.

Methods: This cross-sectional survey study included 121 women aged 18-42 who met the study criteria and had a term pregnancy. The participants were divided into two groups. Group 1: Those who started and completed the pregnancy with a normal body mass index (BMI). Group 2: Those who started pregnancy with a normal BMI but completed pregnancy with a high BMI (>24.9). Data were collected using the Personal Information Form, Wijma Delivery Expectancy/Experience Questionnaire (W-DEQ), and Prenatal Attachment Inventory (PAI). The primary outcome of the study was fear of childbirth assessed by the W-DEQ, while the secondary outcome was prenatal attachment level measured by the PAI, and its associations with gestational weight gain and term BMI were evaluated. For statistical analysis, a chi-square test, Mann-Whitney U-test, and Student's T-test were used to compare groups based on categorical or continuous features.

Results: Group 1 (n=58) and group 2 (n=63). The gestational weight, term weight, and BMI values of the patients in group 2 were higher than those in group 1 ($p<0.05$). The mean W-DEQ scores were higher in group 2 than in group 1. A positive correlation was found between the mean W-DEQ scores and weight gain during pregnancy, term weight, and BMI. Excess weight gain during pregnancy increases the fear of childbirth.

Conclusion: Excess weight gain during pregnancy can lead to negative pregnancy outcomes by increasing the fear of childbirth. Pregnant women should be informed about proper nutrition, and if necessary, individualized plans should be developed in cooperation with a dietician to maintain weight gain under control. Additionally, investments should be made during the training of healthcare professionals

Keywords: Birth; body mass index; fear; obesity; prenatal care; weight gain

Öz

Amaç: Bu çalışmada, gebe kadınlarda aşırı kilo alımının doğum korkusu ve prenatal bağlanma düzeyleri üzerindeki etkisi araştırılmıştır.

Yöntemler: Bu kesitsel anket çalışmasına, çalışma kriterlerini karşılayan ve term gebeliği olan 18-42 yaş arası 121 kadın katılmıştır. Katılımcılar iki gruba ayrılmıştır. Grup 1: Gebeliğe normal vücut kitle indeksi (VKİ) ile başlayan ve tamamlayanlar. Grup 2: Gebeliğe normal VKİ ile başlayan ancak gebeliği yüksek VKİ (>24,9) ile tamamlayanlar. Veriler Kişisel Bilgi Formu, Wijma Doğum Beklentisi/Deneyim Anketi (W-DEQ) ve Prenatal Bağlanma Envanteri (PAI) kullanılarak toplanmıştır. Bu çalışmada birincil çıktı, Wijma Doğum Beklentisi/Deneyim Anketi (W-DEQ) ile değerlendirilen doğum korkusu; ikincil çıktı ise Prenatal Bağlanma Envanteri (PAI) ile ölçülen prenatal bağlanma düzeyi olarak belirlenmiştir. İstatistiksel analiz için, kategorik veya sürekli özelliklere göre grupları karşılaştırmak amacıyla ki-kare testi, Mann-Whitney U testi ve Student t-testi kullanıldı.

Bulgular: Grup 1 (n=58) ve grup 2 (n=63). Grup 2'deki hastaların gebelik ağırlığı, term kilosu ve VKİ değerleri grup 1'dekilerden daha yüksekti ($p<0.05$). Ortalama W-DEQ skorları grup 2'de grup 1'e göre daha yüksekti. Ortalama W-DEQ skorları ile gebelikteki kilo alımı, term kilosu ve VKİ arasında pozitif korelasyon bulundu. Gebelikteki aşırı kilo alımı doğum korkusunu artırmaktadır.

Sonuç: Gebelikteki aşırı kilo alımı doğum korkusunu artırarak olumsuz gebelik sonuçlarına yol açabilir. Gebe kadınlar doğru beslenme konusunda bilgilendirilmeli ve gerekirse kilo alımını kontrol altında tutmak için bir diyetisyenle iş birliği içinde bireyselleştirilmiş planlar geliştirilmelidir. Ayrıca sağlık çalışanlarının eğitimine yatırım yapılmalıdır.

Anahtar Sözcükler: Ağırlık artışı; beden kitle indeksi; doğum; korku; obezite; prenatal bakım

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INTRODUCTION

The rate of being overweight or obese among pregnant women has increased around the world. Those with a body mass index (BMI) of 25 or above are described as overweight, and those with a BMI of 30 or above are described as obese (1). Overweight or obese pregnant women face a higher risk of complications during pregnancy and childbirth, including preeclampsia, gestational diabetes, preterm birth, increased rates of cesarean deliveries, macrosomia, stillbirth, postpartum hemorrhage, postpartum depression, infections, and difficulties with breastfeeding and mother-infant bonding (2,3).

Pregnancy is a unique process in which women adapt to biological and psychosocial changes and prepare for birth and motherhood. Today, due to advancements in healthcare services, many women experience fear of childbirth, even though obstetric complications have become less common (4,5). If a woman does not receive adequate support from healthcare personnel during childbirth, her fear of childbirth becomes more intense. Some studies in the literature indicate that various psychosocial factors are associated with the fear of childbirth (6-8).

The bond between mother and baby begins during pregnancy. During pregnancy, especially in the last trimester, the fetus can perceive and respond to the emotions of the mother. Muller defined the mother's affection and bonding with her baby during pregnancy as prenatal attachment (9). Prenatal attachment begins with a positive response to pregnancy. Previous studies indicated that the prenatal attachment process is affected by the desire for pregnancy, marital satisfaction, inter-spouse relationship, maternal anxiety and depression, mothers' perceived social support, working status, age and education status of pregnant women, number of pregnancies, births and surviving children, history of miscarriage, and risky pregnancy status (10,11).

There has been an ongoing debate regarding the pre-pregnancy BMI of women and the amount and quality of food intake during pregnancy and approaches towards these. Experimental studies evaluating the effects of food restriction or excess weight gain during pregnancy are difficult to perform. Therefore, epidemiological investigations or clinical observations are important to establish this.

The present study hypothesized that excess weight gain during pregnancy increases fear of childbirth and the level of prenatal attachment. Therefore, the relationships among weight gain, fear of childbirth, and prenatal attachment level during pregnancy were investigated in the present study.

MATERIALS AND METHODS

Data set and process

This descriptive and cross-sectional study was conducted prospectively between June 2022 and December 2022, after approval from the local ethics committee of the Erzurum Regional Training and Research Hospital Scientific Research Ethics Committee (date: 01.03.2021, decision no: 2021/05-95). The study comprised 121 pregnant women who were monitored at Erzurum Regional Training and Research Hospital (Erzurum City Hospital). Inclusion criteria for the study: All participants aged 18 to 42 years had a BMI between 18.5 and 24.9 at the start of pregnancy, showed no maternal or fetal pathologies during their pregnancy, were between 37 and 41 weeks pregnant, and were planning to have a vaginal birth. Written permission was obtained from pregnant women who volunteered to participate in the study and met the necessary criteria. In the evaluation made during the prenatal follow-ups, patients with coagulopathy, infection, long-term opioid treatment, psychiatric disorders, comorbid systemic diseases, no regular pregnancy follow-up, problematic pregnancy periods, psychiatric problems, poor obstetric history, treatment for a chronic pain disorder, pregnant women who were planned to deliver by cesarean section, and those who refused to participate in the study were excluded. The weight of the patients at the beginning of pregnancy and the term period and height were measured and recorded. BMI values at the beginning of pregnancy and at the current gestational week were calculated by dividing the body weight of the pregnant women by the square of their height (kg/square meter). Pregnant women with a BMI below 18.5 or above 24.9 at the beginning of pregnancy were excluded from the study.

Participants were divided into 2 groups: group 1, women with normal BMI at the beginning and end of pregnancy, and group 2, women who started preg-

nancy with normal BMI and completed it as overweight or obese. Routine ultrasonography was performed on all pregnant women, and the position and structure of the placenta, amniotic fluid index, and fetal biometric measurements were recorded. Pregnant women with an amniotic fluid index of < 5 or > 15 and active contractions were excluded from the study. In addition, the Wijma Delivery Expectancy/Experience Questionnaire (W-DEQ) scale was applied to all pregnant women to evaluate fear of childbirth, and the Prenatal Attachment Inventory was used to evaluate the level of prenatal attachment. The primary outcome of the study was fear of childbirth as measured by the Wijma Delivery Expectancy/Experience Questionnaire (W-DEQ). Prenatal attachment level, assessed using the Prenatal Attachment Inventory (PAI), was defined as a secondary outcome. Demographic characteristics (age, weight, height, number of pregnancies, and gestational week), scale scores, BMI values before and during pregnancy, and weight gain during pregnancy were recorded. All the measurements and evaluations were performed by an obstetrician.

In this study, an evaluation was made considering the checklist in The Strengthening the Reporting of Observational Studies in Epidemiology (STROBE 2007) guidelines for reporting observational studies (12).

Wijma delivery expectancy/experience questionnaire

The scale used to assess fear of childbirth in pregnant women was developed by Wijma et al., and Körükçü et al. conducted a Turkish validity and reliability study (13,14). In this study, the Wijma Fear of Childbirth Scale Version A used. This scale consists of 33 questions and is a 5-point Likert-type scale with 14 questions (2, 3, 6, 7, 8, 11,12, 15, 19, 20, 24, 25, 27, 31) are reverse scored. Higher scores indicate a more intense fear of childbirth, and a score of 85 or higher indicates a clinical fear of childbirth.

Prenatal attachment inventory

The Prenatal Attachment Inventory (PAI) was developed by Mary Muller in 1993 (9). The scale was developed to explain the thoughts, feelings, and situations experienced by women during pregnancy and to determine the level of attachment to the baby in the prenatal period. It consists of 21 items. Each item is rated on a four-point Likert-type type, which can be scored between 1 and 4. A minimum of 21 points and a maximum of 84 points were obtained from the scale. A higher score indicated a higher level of attachment to pregnant women. The validity and reliability of the Turkish version of the scale were developed by Yılmaz and Beji (15). In the internal consistency analysis of the scale, the Cronbach's alpha was 0.84. In the present study, Cronbach's alpha for the scale was 0.85.

Statistical analyses

The conformity of the data to the normal distribution was evaluated using the Kolmogorov-Smirnov test. Descriptive statistics of continuous variables are expressed as mean±standard deviation. An Independent t-test (Mann-Whitney U test in nonparametric situations) was used to compare the means of the variables, and Fisher's exact and Pearson chi-square tests were used to compare the prevalence frequencies. The p-values derived from the statistical analysis were assessed at a significance level of $\alpha = 0.05$, corresponding to a 95% confidence interval. Comparisons were deemed statistically significant if the p-values were below 0.05. The data were evaluated using the SPSS Statistics for Windows (Statistical Package for the Social Sciences package program version 23.0, IBM Corp., Armonk, N.Y., USA). All figures in the study were visualized using RStudio software (Version:4.1.2 R Foundation for Statistical Computing, Vienna, Austria). The "ggcorrplot" and "GGally" packages were used for correlogram figures. An experimental (post hoc, retrospective, posterior) power analysis was performed to justify the sample size (n=121). With an alpha level of 0.05 (the probability of a Type I error) and an effect size of d=0.5, the power of the study ($1-\beta$) was calculated as 0.85. The power of the sample was calculated using G*Power 3.0.10 software (Version: 3.0.10, Universität Düsseldorf, Germany).

RESULTS

Dataset findings

A total of 121 term pregnant women aged between 18 and 42 years were included in the study (group 1, n=58; group 2, n=63). Demographic and clinical characteristics of the study groups are summarized in table (Table 1). There were no differences between

Table 1. Comparison of demographic and clinical characteristics and measurement results between Group 1 and Group 2.

		Group 1 (n: 58)	Group 2 (n: 63)	p
Age (years)		30.40±3.72	30.90±4.51	0.64*
Height (cm)		174.90±6.39	173.68±6.28	0.27*
Gravida	0-1	24(42.1)	33(57.9)	0.29**
	2	21(48.8)	22(51.2)	
	3+	13(61.9)	8(38.1)	
Live birth	0	25(41.7)	35(58.3)	0.31**
	1	21(51.2)	20(48.8)	
	2+	12(60)	8(40)	
Parity	0	26(44.8)	32(55.2)	0.39*
	1	25(55.6)	20(44.4)	
	2+	7(38.9)	11(61.1)	
Abortion	0	53(47.7)	58(52.3)	0.89**
	1+	5(50.0)	5(50.0)	
Gestational week		38.0±1.01	37.89±0.92	0.51*
Weight at the beginning of pregnancy (kg)		72.77±4.75	71.11±6.05	0.09***
BMI at the beginning of pregnancy (kg/m^2)		23.79±1.09	23.54±0.99	0.35*
Weight at the term of pregnancy (kg)		77.38±4.75	83.20±7.31	***0.001****
BMI at the term of pregnancy (kg/m^2)		25.35±1.88	27.58±1.97	***0.001****
Weight gain		4.68±3.91	12.10±6.54	***0.001****
PAI score		59.53±10.98	63.49±10.40	0.06*
W-DEQ scores		53.38±13.93	66.44±18.58	***0.001*****

BMI: Body Mass Index, PAI: Prenatal attachment inventory, W-DEQ: Wijma Delivery Expectancy Questionnaire, All data are presented as mean ± standard deviation, *: Mann Whitney U Test, **: Chi-Square Test, ***: Student t Test

the groups in terms of age, gravidity, gestational week, height, weight at the onset of pregnancy, and BMI at the onset of pregnancy. The gestational weight, weight at term, and BMI values of the patients in Group 2 were higher than those in Group 1 (Table I). The mean W-DEQ and Prenatal Attachment Inventory scores were higher in group 2 than in group 1 (Table I).

The balloon correlation graph shows the Spearman correlation analysis between demographic, obstetric, and anthropometric variables included in the study and WDEQ and PAI scores in Fig. 1. The size of the circles represents the absolute value of the correlation coefficient (r), and the color scale represents the direction and strength of the relationship (purple: negative correlation, red: positive correlation). The strength of the correlation increases as the color intensity and circle diameter increase in Fig. 1. A positive correlation was found between the mean W-DEQ scores of the groups and weight gained during pregnancy, weight, and BMI during the term period (Figures I-II). The multivariate distribution matrix showing the relationships between maternal anthropometric measurements, pregnancy-related weight variables, PAI scores, and WDEQ scores included in the study are visualized in Fig. 2. Density plots for each variable are presented on the diagonal axis. Scatter plots and Spearman correlation coefficients for pairs of variables are shown in the cells outside the diagonal. Figure 2 shows both the overall correlation ("Corr.") and the correlation coefficients calculated between two subgroups (Normal–Normal and Normal–Obese) separately for each pair of variables. The color scale represents the groups and allows for a comparative view of the distributions. This visualization allows for a holistic evaluation of linear/non-linear relationships between variables, group differences, and distribution patterns.

All relevant data are within the paper and its supporting information files.

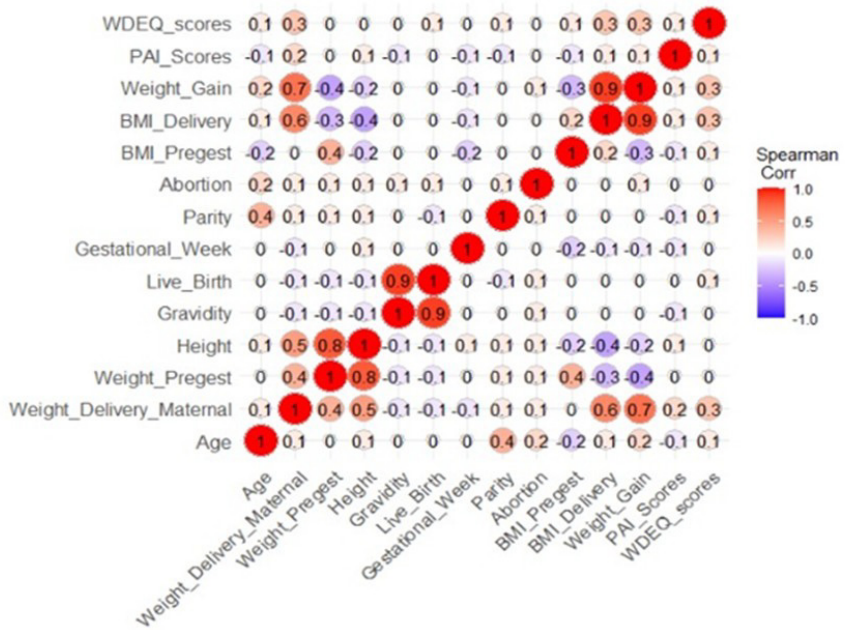


Figure 1. Heat map graph for all variables

Spearman correlation matrix between the variables in the study. Color intensity and tones indicate the direction and strength of the correlation between the variables. Red colors represent positive correlations; blue colors represent negative correlations. As the values approach 1 (full red), they indicate a strong positive correlation; as they approach -1 (full blue), they indicate a strong negative correlation. For example, a positive correlation is observed between weight gain and WDEQ scores.

Statistical findings

The mean age of patients participating in the study was 30.66±4.18 years. In terms of gravida, 57 (47.1%) patients were pregnant for the first time. The mean weight gain by the patients during pregnancy was 8.54±6.57 kg. The mean PAI score of all patients was 61.60±10.81, while the mean W-DEQ score was 60.18±17.71. It was observed that the classes of the groups examined as dependent variables were evenly distributed ($n_{Group\ 1}$=58, $n_{Group\ 2}$=63). The distribution of all variables by group in the study was examined, and the comparisons of the demographic and clinical characteristics of patients are listed in table (Table I).

In this study, it was observed that the mean weight at the term of pregnancy, BMI at the term of pregnancy, and weight gain variable were higher in group 2 patients (p=0.001).

In terms of the Prenatal Attachment Inventory scores, the mean score of the patients in Group 2 was higher, but the difference was not significant (p=0.069). In contrast, Group 2 patients had significantly higher W-DEQ scores (p=0.001).

The analysis of the relationships between all variables in the study was evaluated using Spearman's Rank Correlation analysis, and the results are shown in Figure I.

As a result of testing the hypotheses, the detailed relationships of the variables found to be statistically significant between Group 1 and Group 2 are shown in Figure I. In the figure, the upper panel illustrates the correlation between the continuous variables, while the lower panel displays scatter plots. The diagonal section features density plots of the continuous variables categorized by the outcome variable (Normal-Normal or Normal-Obese Groups).

A positive but non-significant relationship was found between weight gain and PAI scores (r=0.128, p=0.160). In contrast, the correlation between weight gain and the W-DEQ scores was positive and significant (r=0.315, p=0.001). Thus, W-DEQ scores increased with increasing weight gain. The correlation between the PAI and W-DEQ scores was positive, but not significant (r=0.146, p=0.109). There were positive correlations between the W-DEQ scores and maternal weight at delivery (p=0.001, r=0.319).

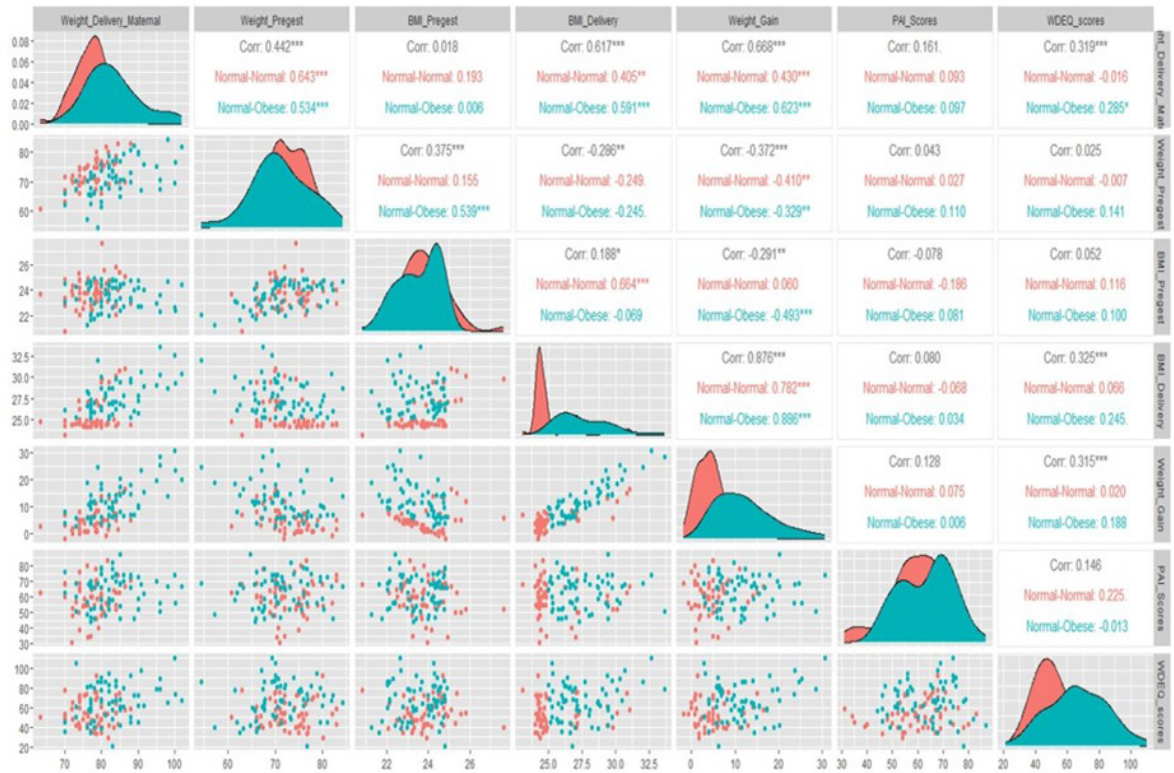


Figure 2. The correlogram graphs of major variables of the study groups

(In the figure, "**" denotes significance at p<0.05 while "***" indicates significance at p<0.001. For example, there was a significant positive correlation between the BMI delivery variable and W-DEQ scores (r=0.325, p=0.001). Thus, higher BMI was associated with higher W-DEQ scores.)

Pairwise scatter plot matrix showing the relationships between key variables in the study, such as **Weight at Delivery**, **Pre-gestational Weight**, **BMI (Pre-gestational and Delivery) **, **Weight Gain**, **PAI Scores**, and **WDEQ Scores**. Each plot displays density distributions for **Normal** and **Obese** groups, with correlation coefficients for different pairings provided. Blue density represents the normal BMI group, while red density represents the obese BMI group. Statistically significant correlations between variables are marked with asterisks, with the level of significance indicated (e.g., *p* < 0.05, **p** < 0.01, ***p*** < 0.001). This matrix allows for easy visualization of linear relationships and comparisons across normal and obese groups.

DISCUSSION AND CONCLUSION

Obesity has been associated with various health issues, including diabetes, cardiovascular disease, and certain cancers. In recent years, there has been an increase in the number of pregnant women with high BMIs in Western countries, with reported rates ranging from 2% to 25%. Obesity during pregnancy is associated with complications such as hypertensive disorders, and gestational diabetes. A high BMI also affects the fetus in terms of further malformations and stillbirths, as well as increases the risk of shoulder dystocia and cesarean delivery. This study aimed to investigate the relationship between weight gain during pregnancy, prenatal attachment, and fear of childbirth. In our study, a positive correlation was found between BMI during term pregnancy and fear of childbirth. Additionally, the fear of childbirth and prenatal attachment levels of pregnant women who gained excess weight during pregnancy were higher than those who did not gain excess weight.

Fear of childbirth can manifest itself as a fear of birth before, during, or after birth. Although a certain level of fear during the prenatal period can motivate pregnant women to prepare for childbirth, an excessive level of fear is referred to as tokophobia (16). Fear of childbirth is a common condition in society, and most women experience mild-to-moderate fear of childbirth, especially before birth. Severe fear of childbirth is less common, but it is important for maternal

health in terms of its consequences (17). In a study covering 6 European countries, the incidence of severe fear of childbirth was found to be 11% (18). In another study, 20% of nulliparous women had mild or moderate fear of childbirth, and 6% reported severe fear of childbirth (tokophobia) (19).

Maternal obesity, which has a high prevalence, is associated with serious short- and long-term complications in the mother and fetus. Obese pregnant women face a high risk of pregnancy complications, such as gestational diabetes, preeclampsia, thromboembolism, and risky birth outcomes, such as cesarean section and prolonged labor. Studies have indicated that this situation increases the fear of childbirth in obese pregnant women (20,21). In the present study, we observed that excess weight gain during pregnancy increased the fear of childbirth.

Mother-infant attachment begins immediately before birth and continues to develop over time. The loving attachment of the mother to her baby is a condition that ensures healthy growth and development of the baby and positively affects their whole life. Communication between the mother and baby has important effects on the personality development of the baby in the coming years. Therefore, the mother-infant relationship is important because the first person with whom a person feels close from the moment he/she is born is the mother, and it is this process in which his/her emotional, behavioral, and cognitive abilities develop that will affect his/her whole life. It is well known that the foundation of mother-infant attachment is laid in the prenatal period. The mother's affection for and attachment to her baby during pregnancy has been defined as prenatal attachment by Muller (9-11). Prenatal attachment begins with a positive response to pregnancy. An attached pregnant woman believes that her baby has established a relationship with her, dreams of her baby, and considers the baby as a separate individual. These thoughts cause the mother to show love, affection, and attention to her baby, and to protect and interact with the baby sensitively. In the prenatal period, especially in the last trimester, the fetus can perceive and respond to the emotions of the mother. Previous studies have shown that the prenatal attachment process is affected by the desire for pregnancy, marital satisfaction, interspouse relationship, maternal anxiety, depression, mothers' perceived social support, employment status, age and education status of pregnant women, pregnancy, birth and number of living children, history of miscarriage, and risky pregnancy status (9-11). Although there are many studies on the factors affecting prenatal attachment, studies on maternal obesity and prenatal attachment, which are increasingly important public health problems for women of reproductive age, are rare. In a study conducted by Arali et al., prenatal attachment levels were found to be lower in pregnant women who were obese before pregnancy than in pregnant women with a normal BMI (22). In terms of the study subgroups, prenatal attachment levels were similar in pregnant women with normal BMI and those who were obese due to excessive weight gain during pregnancy. Dikmen et al. reported similar results to those of the study conducted by Arali et al. (22,23). In a study by Dikmen, PBI levels of patients who were obese before pregnancy were lower than those of patients with normal BMI. In their study, Dikmen et al. did not provide information about obese patients because of excessive weight gain during pregnancy. Our study is similar to that of Arali et al. in terms of the study design. In the present study, we observed that pregnant women with normal BMI at the beginning and end of pregnancy had lower fear of childbirth and PAI scores than pregnant women who were normal at the beginning of pregnancy but became overweight or obese at term. The different criteria for patient selection may have led to different results.

Our study makes a good contribution to literature because it is one of the few studies investigating the fear of childbirth and prenatal attachment level in patients with normal BMI at the beginning of pregnancy and in overweight patients in the term period. Limitations of our study: The small sample size (n=121) and the single-center nature of the study are limitations of our research, and these limitations may restrict the generalizability of the results. PAI scores were higher in group 2, the difference was not statistically significant, which may be due to the low number of samples. The advantage of the present study is that there are few studies on this subject in the literature, and that we aimed to determine the association between prenatal attachment and fear of birth with weight gain during pregnancy. Since the study consisted of questionnaires

(such as W-DEQ and PAI), the data was subjective. In addition, short-term post-pregnancy outcomes were evaluated, but long-term effects could not be evaluated because they were not included in the scope of the study.

As the global prevalence of overweight and obesity continues to rise, the burden of adverse pregnancy outcomes and the associated threats to maternal and neonatal health are becoming increasingly significant. This study makes a valuable contribution to the literature by jointly evaluating fear of childbirth and prenatal attachment in women who entered pregnancy with a normal BMI but developed excessive weight gain during gestation. While most existing studies primarily focus on pre-pregnancy obesity, evidence addressing the psychosocial consequences of gestational weight gain itself remains limited. In this context, our findings demonstrate that not only pregestational BMI but also weight gain during pregnancy play a significant role in shaping fear of childbirth. Furthermore, the observation that prenatal attachment levels were not adversely affected by excessive gestational weight gain adds novel insight to the limited and inconsistent literature on this topic.

Overall, this study underscores the importance of incorporating gestational weight management into prenatal care, not only to prevent obstetric complications but also to support maternal psychological well-being and childbirth-related perceptions. Pregnant women should be informed about proper nutrition from the beginning of pregnancy and, when necessary, encouraged to cooperate with a dietitian. Future studies with larger sample sizes are needed to further investigate the effects of gestational weight gain on prenatal attachment. To mitigate the negative consequences of obesity during pregnancy, the development of individualized and flexible care plans, increased investment in the training of healthcare professionals, and the integration of these strategies into routine prenatal care are essential.

Conflict-of-interest and financial disclosure

The authors declare that they have no conflict of interest to disclose. The authors also declare that they did not receive any financial support for the study.

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