

RESEARCH / ARAŞTIRMA

The Effect of Maternal Pre-Pregnancy Obesity on Breastfeeding: A Pilot Prospective Cohort Study

Gebelik Öncesi Maternal Obezitenin Anne Sütü ile Beslenme Üzerine Etkisi: Prospektif Kohort Pilot Çalışması

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Abstract

Objective: This prospective cohort study was conducted to investigate the effect of mothers who have obesity according to body mass index (BMI) in the pre-pregnancy period on their infant's exclusive breastfeeding status six months after delivery.

Material and Methods: The study sample consisted of 44 obese and 44 non-obese mother-infant pairs registered to a Family Health Center in İzmir, Türkiye. The data were collected during the 1st week, 1st, 3rd, and 6th months after delivery using the Individual Identification Form, LaTCH Tool, and Breastfeeding Status Follow-up Form. Independent t-test, Chi-square and Cochran's Q tests, and Cox's regression analysis were used.

Results: A significant difference was found between the exclusive breastfeeding status of the infants of obese and non-obese participants in all follow-up weeks. In the Cox regression model, the only significant explanatory variable on exclusive breastfeeding in all follow-ups was prepregnancy BMI of the participants. The infants of obese participants were exclusively breastfed by 2.25 times less in the 1st week, 4.50 times less in the 1st month, 2.20 times less in the 3rd month, and 1.69 times less in the 6th month than the infants of non-obese participants.

Conclusion: It was determined that maternal obesity statistically decreased the exclusive breastfeeding status. It can be recommended to monitor women of the reproductive age for obesity during pre-pregnancy follow-ups and to implement nursing interventions such as health education and counselling to reduce obesity.

Keywords: Maternal obesity, breastfeeding, cohort study.

Öz

Amaç: Bu prospektif kohort araştırması, gebelik öncesi dönemde beden kütle indeksi (BKI)'ne göre obezitesi olan kadınların doğum sonrası altı aylık dönemde bebeklerini sadece anne sütü ile beslenme üzerine olan etkisinin incelenmesi amacıyla yürütülmüştür.

Gereç ve Yöntem: Araştırma örneklemi, Türkiye İzmir'de bir Aile Sağlığı Merkezine kayıtlı 44 obezitesi olan ve 44 obezitesi olmayan anne ve bebeğinden oluşmuştur. Veriler, doğum sonrası 1. hafta, 1. ay, 3. ay ve 6. ay izleminde Birey Tanılama Formu, LATCH Emzirme Değerlendirme Aracı ve Emzirme Durumunu İzlem Formu ile toplanmıştır. Veri analizinde independent t test, ki kare, Cochran's Q testi ve Cox's regresyon analizi kullanılmıştır.

Bulgular: Tüm izlem haftalarında obez ve obez olmayan annelerin bebeklerinin sadece anne sütü ile beslenme durumları arasında istatistiksel olarak anlamlı farklılık saptandı. Cox regresyon modelinde, yalnızca anne sütü ile beslenmeye ilişkin istatistiksel olarak tek anlamlı açıklayıcı değişken annelerin gebelik öncesi BKİ değeri idi. Obez annelerin bebekleri, obez olmayan annelerin bebeklerine göre; doğum sonrası 1. haftada 2.25 kat, 1. ayda 4.50 kat, 3. ayda 2.20 kat ve 6. ayda 1.69 kat daha az sadece anne sütü ile beslenmiştir.

Sonuç: Gebelik öncesi obezitenin, sadece anne sütü ile beslenme durumunu istatistiksel olarak azalttığı belirlendi. Gebelik öncesi takiplerde üreme çağındaki kadınların obezite açısından izlenmesi ve obeziteyi azaltmaya yönelik sağlık eğitimi, danışmanlık gibi hemşirelik girişimlerinin uygulanması önerilebilir.

Anahtar Kelimeler: Gebelik öncesi obezite, emzirme, kohort çalışması.

1. Introduction

According to the data (2018) from the Centers for Disease Control and Prevention (CDC), the frequency of obesity was 30.7% among women in the 20-34 age group and 43.1% among women aged 35-44 years in the United States (1). In the data of the World Health Organization (WHO), 35.6% of women in the 15-49 age group are obese in Türkiye (2). Maternal obesity increases the risk of many complications related to pregnancy, birth, maternal and infant health. One of the most important consequences of maternal obesity is its adverse effect on breastfeeding (3,4). Breastfeeding is one of the most effective ways to ensure child health and survival (5).

The WHO recommends that infants are exclusively breastfed for the first six months and breastfed up to the age of two or beyond with complementary foods (5). However, breastfeeding rates are not at the desired level in the world and in our country (5-7). Nearly two out of three infants are not exclusively breastfed for the recommended six months-a rate which has not improved in two decades (5). While the rate of exclusive breastfeeding for full six months is 40% in the world, it varies between 1-89% (4,6). It is stated that breastfeeding rates are low in low-income countries due to factors e.g. advertising of infant formula, beliefs, and the lack of education and in high-income countries due to reasons e.g. mothers' returning back to work, insufficient family support, and obesity (4). Although breastfeeding is a behaviour that is preferred by mothers and supported by the social environment in Türkiye, the rate of exclusive breastfeeding of infants for six months is low (41%) (7). The low breastfeeding rates in Türkiye may be related to the fact that approximately one-third of women are obese (2,7).

It is stated that imbalances in the pancreatic and thyroid hormones in obese women and physical properties of breast (large breast, non-protruding, short nipple, large areola, etc.) are potential risk factors for the low rate of initiation and maintenance of breastfeeding of those women (8,9). Ruager-Martin et al. (10) determined that the impaired levels of prolactin, insulin, lipid, and leptin in the breast milk of obese mothers can alter the synthesis of orexigenic peptides, developing hyperphagia and higher fat deposition. In their study on obese women including experimental and control groups, Carlsen et al. (11) determined that infants in the experimental group provided with intensive breastfeeding counselling were breastfed for a statistically significantly longer time compared to infants in the control group provided with standard counselling. However, despite intensive counselling, 15% of the experimental group could not maintain exclusive breastfeeding (11). Therefore, it is important to determine and prevent maternal obesity.

The frequency of obesity in women of reproductive age is increasing, and this may be an obstacle to achieving breastfeeding goals. It is important to examine the relationship between maternal obesity before pregnancy and breastfeeding success, which is thought to be an important factor in achieving the desired goals in breastfeeding. Few studies examine the association of maternal obesity on breastfeeding in the world (3,9,12). Although the prevalence of obesity among women aged 15-49 years is high in Türkiye (2), no studies are showing the effect of maternal obesity on breastfeeding.

1.1. The aim of study

This study aimed to investigate the effect of women who have obesity according to the BMI in the pre-pregnancy period on their infant's breastfeeding status six months after delivery.

The study focused on the following question;

Does the mother's obesity status affect the duration of exclusive breastfeeding of infant?

2. Material and Methods

2.1. Study Design

This pilot study used a prospective cohort design. Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) checklist was used in the study design and drafting of the manuscript (13).

2.2. Participants

This study was carried out in a family healthcare center (FHC) in Izmir of Türkiye province between May 2017 and October 2018. 450 pregnant participants in the last trimester of pregnancy in the FHC constituted the population of the study. The sample size was determined by power analysis (G*power software, version 3.1). The effect size was calculated based on the data in the study by Baker et al. (14). When the Type I error rate was considered as 0.05 and the testing power as 80.0%, the sample of the study was determined as at least 40 obese and 40 non-obese participants.

In the present study, those with a BMI value of 30 kg/m² and above were considered as having obesity, and those with a BMI value of 29.9 kg/m² and below were considered as not having obesity according to the WHO classification (15). The women in the last trimester of pregnancy in the FHC where the study was carried out were identified from the FHC's records. The pregnant participants who met the inclusion criteria for the study were interviewed, and their voluntary participation in the study was ensured. The pre-pregnancy heights and weights of these pregnant participants were measured by the person who is working in the FHC and also who was the researcher in the study. They were divided into two groups according to the pre-pregnancy BMI as those with a BMI of 30 kg/m² and above (obese, exposed group) and those with a BMI of 29.9 kg/m² and below (non-obese, non-exposed group). In this study, the mean BMI values of pre-pregnancy group having obesity was 34.69±4.49 kg/m² (Min=30.18 kg/m²- Max=42.26 kg/m²), and it was 22.59±2.26 kg/m² (Min=18.98 kg/m² - Max=27.80 kg/m²) for non-obese group (t=13.327, p = 0.001). The purposive sampling method was implemented in this study.

2.3. Inclusion and exclusion criteria

Women who volunteered to participate in the study were over 18 years of age and able to read and write, had no multiple pregnancies, willing to breastfeed, had no obstacle to breastfeeding (flat nipple, drug use) were included in the study. Those with a flat nipple were excluded from the study without sampling. The infants who had no health problems requiring incubator care, who were not hospitalized for more than seven days

and who had no obstacle to sucking e.g. cleft lip were included in the study. There was no statistically significant difference between the groups in terms of the mothers' education level, chronic disease during pregnancy, the gender of the infant, and birth order of infant ($p>0.05$).

2.4. Measurement and Data Collection Tools

In the study, the data were collected using the "Individual Identification Form", "Breastfeeding Status Follow-up Form", and "LaTCH Breastfeeding Assessment Tool (LaTCH Tool)".

2.4.1. Individual Identification Form

This form was prepared as a result of the literature review, contains a total of 23 questions, and 18 of these questions are aimed at identifying the socio-demographic and obstetric characteristics of the mother including age, education level, employment status, smoking, pre-pregnancy height and weight, weight gain during pregnancy, existing chronic disease, and day of discharge. The last four questions in the individual identification form are related to the infant's sex, birth order, birth week, and delivery method (16-18).

2.4.2. Breastfeeding status follow-up form

It was prepared by the researchers as a result of the relevant literature review. The form includes the infant's breastfeeding status (exclusive breastfeeding, partially or mixed breastfeeding (formula and breastfeeding) in the 1st week, 1st, 3rd, and 6th months (17).

2.4.3. LaTCH Breastfeeding Assessment Tool (The LaTCH tool)

The LaTCH tool was used to prevent the failure of breastfeeding due to breast structure between groups. The LaTCH tool was developed to objectively identify breastfeeding, to determine breastfeeding problems, to make an education plan, to create a common language among healthcare professionals, and to determine the success of breastfeeding in longitudinal studies (19).

The LaTCH tool consists of five evaluation criteria (LaTCH on breast, audible swallowing, type of nipple, comfort breast/nipple, hold), and each item is evaluated between 0 and 2 points. The total score to be obtained from the tool is 10 points (19). The validity and reliability study of the LaTCH tool in Türkiye was performed by Yenil and Okumuş, and Cronbach's alpha value was calculated to be 0.95 (20). In this study, the Cronbach alpha coefficient of the LaTCH tool was 0.91.

2.5. Procedure

Mothers come to the FHC on postpartum days three and five, as required by the Neonatal Screening Program. In this interview, breastfeeding status was evaluated according to the LaTCH tool. The LaTCH tool was filled out by the researcher by observing breastfeeding without any intervention in a breastfeeding room in FHC in this interview. For participants who have obesity the mean

LaTCH tool score was 7.34 ± 1.65 (Min=4.00 - Max=10.00), and the mean LaTCH tool score of non-obese participants was 8.36 ± 1.36 (Min=5.00 - Max=10.00). It was not a statistical difference in terms of the mean LaTCH tool score between groups ($t=1.746$, $p = .084$). All participants were questioned whether they received breastfeeding education. Effective

breastfeeding education was provided by the researchers if the mother did not receive breastfeeding education ($n=25$). The institution where the study was carried out is a baby-friendly institution. In Türkiye, the Baby-Friendly Hospitals program has been implemented since 1991. In 2015, 62% of FHCs and 95% of hospitals were baby-friendly institutions (21). There were 11 midwives or nurses working in the FHC where the study was carried out. Each midwife/nurse was monitoring approximately 20 pregnant women. In this institution, in addition to pregnancy monitoring, infant and child monitoring, early diagnosis services and outpatient clinic services were offered.

The individual identification form and the breastfeeding status follow-up form were also filled out by the researchers during the interview in postpartum week one (3rd-5th day). The mothers were interviewed by the researchers in the interviews during the 1st month, 3rd month, and 6th month follow-ups after delivery in FHC, and the breastfeeding status follow-up form was used in these interviews (Figure 1).

2.6. Outcomes

To evaluate breastfeeding status as the outcomes criteria, the exclusive breastfeeding or partially breastfeeding definitions made by WHO were taken as reference. The WHO defines exclusive breastfeeding as the non-consumption of any food or liquids (including water) other than breast milk in the first six months of life. However, oral rehydration solution, drops, and syrups can be taken. Partially breastfeeding, on the other hand, is defined as the infant's intake of formula, other food, or liquids in addition to breast milk in the first six months of life (5). According to this, the outcomes of the study were exclusive breastfeeding or partially breastfeeding of the infant in the 1st week, 1st, 3rd, and 6th months, and the main exposure factor of the study was the maternal pre-pregnancy BMI value (obese or non-obese). The control variable of the study was the LaTCH tool mean score.

2.7. Data Analysis

IBM SPSS 25.0 program was used in the data analysis. In the study, the data were evaluated by number, percentage distribution, independent t-test, chi-square, and Cochran's Q test. Cox's regression analysis (CRA) was used to identify factors associated with the period on exclusive breastfeeding. At first, factors associated with exclusive breastfeeding were determined by bivariate analyses. Afterward, the CRA was applied to the factors (pre-pregnancy maternal obesity, weight gain during pregnancy, mother's age, delivery method, birth week and day of discharge) that were found to be statistically significant ($p<0.05$).

2.8. Ethical Aspect of the Research

The study was conducted in accordance with the ethical principles of the 1964 Helsinki Declaration and complied with these standards. Ege University Faculty of Nursing Ethics Committee Approval was obtained to carry out the study (Date: 12.12.2016, Number: 296). Written permission was received from Izmir Public Health Directorate (Date: 19.04.2017, Number: 604.2). The aim of the study was explained to the participants who were included in the study, the written consent of the participants who agreed to participate in the study was obtained, and they were included in the study.

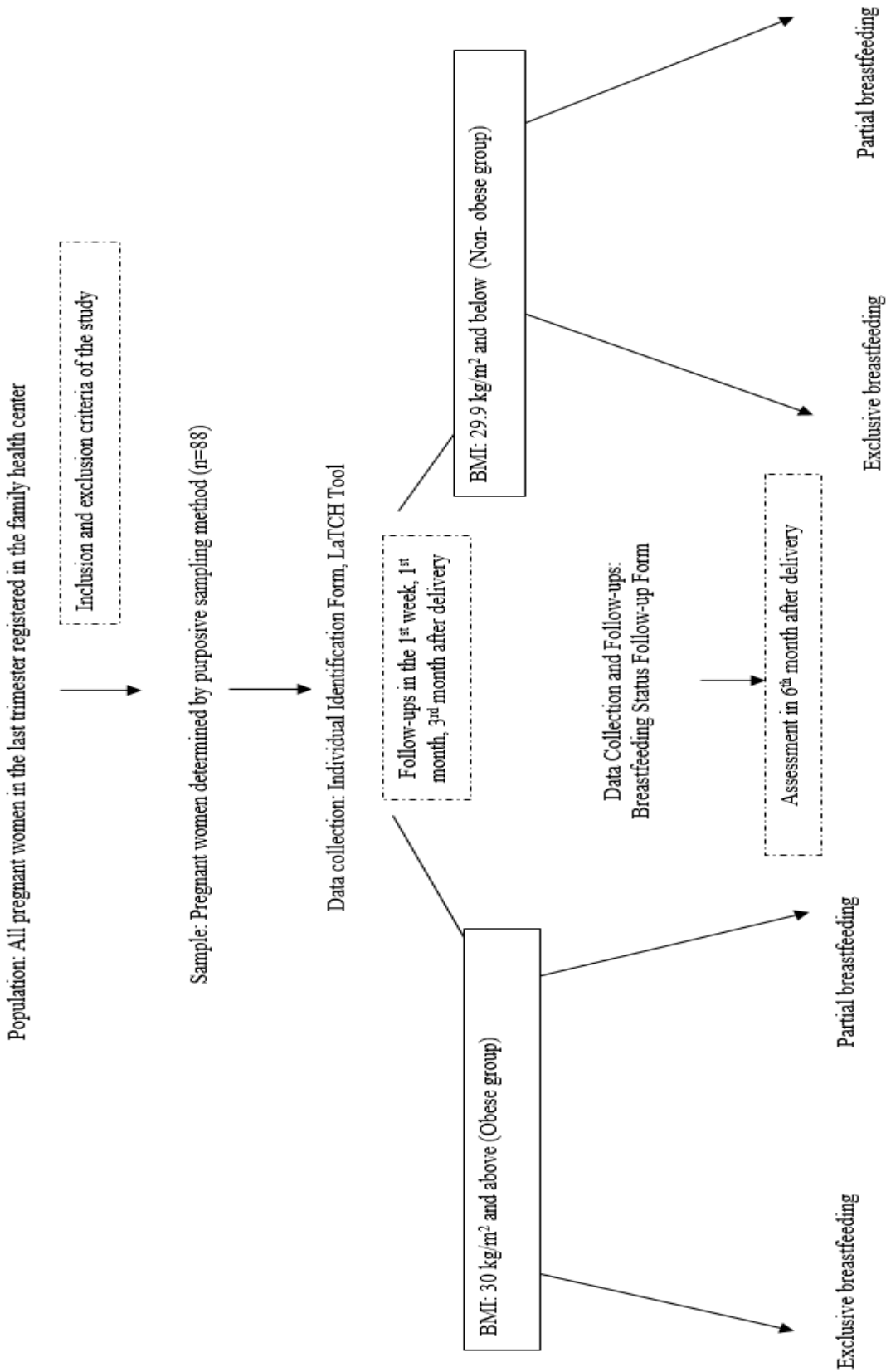


Figure 1. Study Design and Data Collection Scheme

3. Results

The mean age of the participants who have obesity was 29.25 ± 5.09 year (Min=21.00-Max=38.00), and 65.9% of them had high school or higher education. The mean weight gain was 8.34 ± 3.99 kg (Min=3.00-Max=20.00) during pregnancy, a chronic disease occurred in 22.7% of them, and gestational diabetes and hypertension occurred in 9.1% and 4.5% of them, respectively. 50.0% were girls, 68.2% of the infants of obese participants were first infants, and 86.4% were born by caesarean section. The infants of these participants were born at the gestational week 37.84 ± 1.46 on mean (Min=34.00-Max=40.00). The infants of participants who have obesity were discharged from the hospital on day 2.38 ± 1.84 on mean (Min=1.00-Max=6.00) (Table 1).

The mean age of the non-obese participants was 28.45 ± 4.65 year (Min=18.00 - Max=25.00), and 77.3% of them had high school and above education. The mean weight gain was 12.45 ± 3.66 kg (Min=4.00 - Max=22.00) during pregnancy, a chronic disease occurred in 11.4% of them, and gestational diabetes and HT occurred in 4.5% and 2.3% of them, respectively. 72.7% of the infants of non-obese participants were first infants, 47.7% were girls, and 65.9% were born by caesarean section. The infants of these participants were born at the gestational week 38.47 ± 1.21 on average (Min=35.00-Max=40.00). The infants of non-obese participants were discharged from the hospital on day 1.72 ± 0.62 on average (Min=1.00- Max=3.00) (Table 1).

Concerning the descriptive characteristics of the obese and non-obese participants, a statistically significant difference was found in terms of weight gained during pregnancy ($p = 0.001$), method of delivery ($p = 0.024$), week of birth ($p = 0.029$), and day of discharge from hospital ($p = 0.031$) (Table 1).

Table 1. Descriptive Results Related to Sociodemographic Characteristics

Characteristics	Obese group (n=44)		Non-obese group (n=44)		p*
	n	%	n	%	
Mothers' educational level					
Below high school	15	34.1	10	22.7	0.237
High school and above	29	65.9	34	77.3	
Chronic disease during pregnancy (anemia, hypothyroidism, etc.)					
Yes	10	22.7	5	11.4	0.156
No	34	77.3	39	88.6	
Gestational diabetes during pregnancy					
Yes	4	9.1	2	4.5	0.411
No	40	90.9	42	95.5	
Hypertension during pregnancy					
Yes	2	4.5	1	2.3	0.557
No	42	95.5	43	97.7	
Birth order of infant					
First	30	68.2	32	72.7	0.080
Second or more	14	31.8	12	27.3	
Gender of infant					
Girl	22	50.0	21	47.7	0.831
Boy	22	50.0	23	52.3	
Method of delivery					
Vaginal	6	13.6	15	34.1	0.024
Caesarean	38	86.4	29	65.9	

Chi-square test *

3.1. The Breastfeeding Characteristics of the Infants

The breastfeeding characteristics of the infants according to follow-ups are given in Table 2. In the 1st week and 1st month of the infants of obese participants, 59.1% of them were exclusively breastfed and 40.9% of them were partially breastfed. In the 3rd and 6th months of the infants in this group, 50.0% of them were exclusively breastfed, 50.0% of them were partially breastfed. The within-group difference between the observations was statistically significant ($p = 0.033$) (Table 2).

In the 1st week of the infants of non-obese participants, 81.1% of them were exclusively breastfed and 18.2% of them were partially breastfed. In the 1st month of the infants in this group, 90.9% of them were exclusively breastfed and 9.1% of them were partially breastfed. In the 3rd month, 77.3% of them were exclusively breastfed, 22.7% of them were partially breastfed. In the 6th month, 70.5% of these infants were exclusively breastfed, 29.5% of them were partially breastfed. The intra-group difference between the observations was statistically significant ($p=0.026$) (Table 2).

A statistically significant difference was found between the breastfeeding status of the infants of obese and non-obese participants in the 1st week, 1st month and 3rd month, and 6th month ($p=0.019$, 0.028, 0.001, 0.049 respectively) (Table 2).

The results of the Cox regression analysis are presented in Table 3,. Accordingly, maternal obesity during the 1st week after discharge, 1st month, 3rd month, and 6th-month follow-ups after delivery and the effects of the variables of maternal obesity, weight gain during pregnancy, birth method, week of birth, and day of discharge from hospital on exclusive breastfeeding of infants were examined. It was found statistically significant that maternal obesity was an explanatory variable on the infant's exclusive breastfeeding. The infants of obese participants were exclusively breastfed by 2.25 times less in the first week, 4.50 times less in the 1st month, 2.20 times less in the 3rd month, and 1.69 times less in 6th-month than non-obese participants did ($p=0.031$; 0.005; 0.009; 0.014 respectively). The variables of weight gain during pregnancy, delivery method, week of birth, and day of discharge from the hospital did not have any statistically explanatory effects on exclusive breastfeeding in all follow-ups ($p > 0.05$) (Table 3).

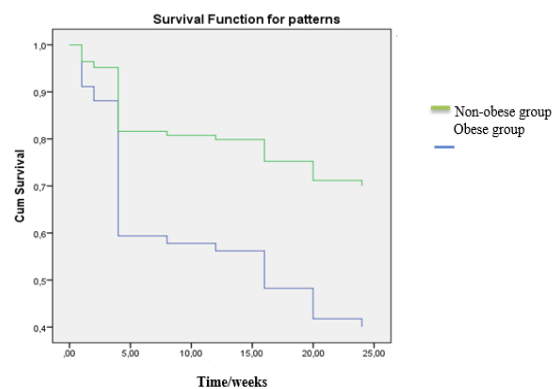


Figure 2. Proportion Exclusive Breastfeeding (Cox Regression Analysis) Stratified by Pre-pregnancy Body Mass Index

Table 2. Breastfeeding Status of the Participants in the Obese and Non-obese Groups according to Follow-ups

Groups		1 st week after discharge		1 st month		3 rd month		6 th month		Intra-group difference ^a
n		%	n	%	n	%	n	%	n	
Obese (n=44)	Exclusive breastfeeding	26	59.1	26	59.1	22	50.0	22	50.0	$\chi^2=8.742$
	Partial breastfeeding	18	40.9	18	40.9	22	50.0	22	50.0	p=0.033
Non-Obese (n=44)	Exclusive breastfeeding	36	81.8	40	90.9	34	77.3	31	70.5	$\chi^2=9.250$
	Partial breastfeeding	8	18.2	4	9.1	10	22.7	13	29.5	p=0.026
Intergroup difference^b		$\chi^2=5.459$		$\chi^2=7.143$		$\chi^2=11.879$		$\chi^2=4.920$		
		p= 0.019		p= 0.028		p= 0.001		p= 0.049		

It was used for intra-group differences Cochran's Q test^a, and intergroup differences Chi-square test^b

Table 3. Cox Regression Analysis: Variables related to Exclusive Breastfeeding Status (n=88).

Variables	1 st week after discharge			1 st month			3 rd month			6 th month		
	Exp. (B)	%95 CI	p	Exp. (B)	%95 CI	p	Exp. (B)	%95 CI	p	Exp. (B)	%95 CI	p
Pre-pregnancy maternal obesity	2.25	1.75-2.88	0.031	4.50	3.19-6.39	0.005	2.20	1.77-2.72	0.009	1.69	1.40-2.04	0.014
Weight gain during pregnancy	1.028	0.98-1.07	0.203	1.06	0.99-1.12	0.063	1.02	0.94-1.12	0.529	0.99	0.95-1.04	0.943
Delivery method	3.21	0.75-13.63	0.156	1.42	0.74-1.74	0.800	1.42	0.49-4.06	0.510	1.41	0.57-3.44	0.450
Week of birth	0.82	0.61-1.12	0.223	0.84	0.58-1.20	0.353	0.78	0.57-1.06	0.123	0.84	0.64-1.10	0.208
Day of discharge	1.04	0.96-1.14	0.275	1.04	0.95-1.14	0.332	1.06	0.98-1.16	0.125	1.08	0.99-1.17	0.061

Exp(B) is the ratio of hazard rates that are one unit apart on the predictor; CI, confidence interval

4. Discussion

The benefits of breastfeeding are well established in the literature. There are studies on breastfeeding attitudes of mothers and initiation and maintenance of breastfeeding in the world and Türkiye. Worldwide obesity rates in women of reproductive age are rising at an alarming pace. Barriers related to breastfeeding, such as maternal obesity, are also cited in the literature. However, there is a limited number of studies revealing breastfeeding success with maternal obesity (3,9,22-25). Since this study is a prospective cohort design study, it provides strong evidence to show the association of mothers who are obese according to BMI and the breastfeeding status of their infants.

While obese mothers exclusively breastfed their infants at a rate of 59.1% in the 1st week and 1st month, they exclusively breastfed their infants at a rate of 50.0% in the 3rd month, and 6th month after delivery. Non-obese mothers exclusively breastfed their infants at a rate of respectively 81.1% in the 1st week, 90.9% in the 1st month, 77.3% in the 3rd month, and 70.5% in the 6th month after delivery. The rate of exclusive breastfeeding of infants of obese mothers decreased by 9.1% from the 1st week to the 6th month. This rate for infants of non-obese mothers was 11.3%. The decrease in the rate of exclusive breastfeeding for infants of both obese and non-obese mothers is approximately one in 10 infants. However, when the groups (obese and non-

obese) are at each follow-up, this difference varies up to 2-3 times according to the follow-ups. Results from this study revealed that initiation of exclusive breastfeeding is very important for the continuation of exclusive breastfeeding. The obese mothers less frequently exclusively breastfed their infants in the 1st week, 1st month, 3rd month, and 6th month after delivery by 22.7%, 31.8%, 27.3%, and 20.5%, respectively, compared to the non-obese mothers. The difference in all follow-ups was statistically significant (Table 2). Similarly, Marshall et al. (9) determined in the 6th week and 6th month that overweight ($\geq 25\text{kg/m}^2$) women breastfed their infants statistically less by approximately 12-30% than women with normal weight. Fan and Molinaro (22) found a significant negatively correlated with elevated mothers' BMI and breastfeeding continuation in the early postnatal period. By eight weeks, 32.2% of them had ceased breastfeeding (22). The fact that mothers are not obese before pregnancy has a significant effect on the exclusive breastfeeding of their infants. The infants of obese mothers were exclusively breastfed by 2.25 times less in the 1st week, 4.50 times less in the 1st month, 2.20 times less in the 3rd month, and 1.69 times less in the 6th month after delivery (Table 3). Similarly, to the results obtained from this study, Ballesta-Castillejos et al (23) in their study, a linear relationship was observed between the highest BMI figures and the reduction of the probability of starting skin-to-skin contact. Huang et al (24) also found in their meta-analysis study that if women were obese before

pregnancy, they were less likely to initiate and continue breastfeeding according to recommendation time. In another meta-analysis study carried out by Achike and Akpinar-Elci (25) showed that of the 23 studies that assessed the relationship between maternal BMI and breastfeeding intention and other outcomes, only 4 found no differences in breastfeeding outcomes across BMI categories. Overweight and obese women were less likely to intend to breastfeed and initiate breastfeeding. They also had shorter breastfeeding durations and were less likely to exclusively breastfeed for any period compared with normal weight women (25). According to the results obtained from this and other studies, it can be considered that maternal obesity has negative effects on exclusive breastfeeding during the first six months.

It was determined that other variables (weight gain during pregnancy, delivery method, week of birth, day of discharge from hospital) in the CRA in our study were not significant predictors in exclusive breastfeeding in any follow-up period ($p>0.05$). There are studies showing the mother's low education level and caesarean delivery were negative effective factors in exclusive breastfeeding (22,26,27). In the relevant studies, it was determined that the mother's educational level, birth method, weight gain during pregnancy, and week of birth were not effective factors in exclusive breastfeeding, as in this study (16,18).

4.1. Limitations

This pilot study has some limitations. The study has a small sample size (88 mother-infant dyads) and was conducted in a single institution. Research results can be generalized to the sample group. For all that, the participants of the study were followed-up for six months. Findings from the study provide preliminary evidence for cohort studies involving large numbers of subjects.

5. Conclusion

Despite the limitations mentioned above, this research has significant implications for health and care practitioners. First, this study found that obese mothers exclusively breastfed their infants significantly less, especially in the 1st week and in the 1st month, compared to non-obese mothers. This period is critical for the continuation of breastfeeding. The negative effect of maternal obesity on exclusive breastfeeding was statistically significant six months after delivery.

6. Contribution to the Field

Health care practitioners as nurses and midwives need to focus on the mother's weight in the success of breastfeeding. Although not the main purpose of the study, the symptoms and outcomes (weight gain, discharge from hospital, delivery style) experienced by obese and non-obese mothers during pregnancy were also different. This is important for planning care and preventing complications during pregnancy, and also maintaining breastfeeding. For initiation and maintenance of breastfeeding, it is important to monitor women of the reproductive age for obesity during pre-pregnancy follow-ups and to implement health education and counselling interventions to reduce obesity.

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Conflict of Interest

There is no conflict of interest regarding any person and/or institution.

Authorship Contribution

Concept: RÖD; **Design:** RÖD, AUT; **Supervision:** RÖD, AUT; **Funding:** RÖD; **Materials:** RÖD; **Data Collection/Processing:** RÖD, GÇ; **Analysis/Interpretation:** RÖD, AUT; **Literature Review:** RÖD, AUT, GÇ; **Manuscript Writing:** RÖD, AUT; **Critical Review:** RÖD, AUT.

References

- Centers for Disease Control and Prevention. Obesity, 2018. Available from : <https://www.cdc.gov/nchs/data/abus/2018/026.pdf>.
- World Health Organization. Obesity, 2016. Available from: <https://www.who.int/news-room/fact-sheets/detail/obesity-and-overweight>.
- Ballesta-Castillejos A, Gomez-Salgado J, Rodriguez-Almagro J, Ortiz-Esquinas I, Hernandez-Martinez A. Relationship between maternal body mass index with the onset of breastfeeding and its associated problems: an online survey. *Int Breastfeed J*. 2020; 15(1): 1-13.
- Skouteris H, Nagle C, Fowler M, Kent B, Sahota P, Morris H. Interventions designed to promote exclusive breastfeeding in high-income countries: a systematic review. *Breastfeed Med*. 2014; 9(3):113-127.
- World Health Organization. (2020). Breastfeeding. Available from: https://www.who.int/health-topics/breastfeeding#tab=tab_2.
- Global Breastfeeding Scorecard (2017). Available from : <https://www.who.int/nutrition/publications/infantfeeding/global-bf-scorecard2017>.
- Turkey Demographic and Health Survey (TDHS) (2018). The Results of Study. Available from: http://www.hips.hacettepe.edu.tr/tnsa2013/rapor/TNSA_2013_ana_rapor.pdf.
- Aung ZK, Grattan DR, Ladyman SR. Pregnancy-induced adaptation of central sensitivity to leptin and insulin. *Mol Cell Endocrinol*. 2020;110933. <https://doi.org/10.1016/j.mce.2020.110933>.
- Marshall NE, Lau B, Purnell JQ, Thornburg KL. Impact of maternal obesity and breastfeeding intention on lactation intensity and duration. *Matern Child Nutr*. 2019;15(2):e12732. <https://doi.org/10.1111/mcn.12732>.
- Ruager-Martin R, Hyde MJ, Modi N. Maternal obesity and infant outcomes. *Early Hum Dev* 2010; 86(11):715-722 DOI: 10.3109/00016489.2013.841991.
- Carlsen EM, Kyhnaeb A, Renault KM, Cortes D, Michaelsen KF, Pryds O. Telephone-based support prolongs breastfeeding duration in obese women: a randomized trial. *Am J Clin Nutr*. 2013; 98(5):1226-1232.
- Martin H, Thevenet-Morrison K, Dozier A. Maternal pre-pregnancy body mass index, gestational weight gain and breastfeeding outcomes: a cross-sectional analysis. *BMC Pregnancy and Childbirth*. 2020; 20(1): 1-10.
- von Elm E, Altman DG, Egger M, Pocock SJ, Götzsche PC, Vandenbroucke JP. For the STROBE Initiative. The strengthening the reporting of observational studies in epidemiology (STROBE) statement: Guidelines for reporting observational studies. *The Lancet*. 2007; 37: 1453–1457.
- Baker JL, Michaelsen KF, Sørensen TI, Rasmussen K.M. High prepregnant body mass index is associated with early termination of full and any breastfeeding in Danish women. *Am J Clin Nutr*. 2007;86(2):404-411.

15. World Health Organization. Obesity: preventing and managing the global epidemic. report of a WHO consultation. World Health Organ Tech Rep Ser. 2000;894:i-xii, 1-253
16. Guelinckx I, Devlieger R, Bogaerts A, Pauwels S, Vansant G. The effect of pre-pregnancy BMI on intention, initiation and duration of breast-feeding. *Public Health Nutr.* 2012; 15(5):840-848.
17. Lucas R, Judge M, Sajdłowska J, Cong X, McGrath JM, Brandon D. Effect of maternal body mass index on infant breastfeeding behaviors and exclusive direct breastfeeding. *J Obstet Gynecol Neonatal Nurs.* 2015; 44(6):772-783.
18. Wojcicki JM. Maternal prepregnancy body mass index and initiation and duration of breastfeeding: a review of the literature. *J Womens Health.* 2011;20(3):341-347.
19. Jensen D, Wallace S, Kelsay, P. LATCH: a breastfeeding charting system and documentation tool. *J Obstet Gynecol Neonatal Nurs.* 1994; 23(1):27-32.
20. Yenil K, Okumuş H. The relation between breastfeeding self-efficacy and breastfeeding success in mothers. *JAREN.* 2003;5(1):38-44.
21. Ministry of Health. 2013-2017 Strategic Action Plan. Available from: https://dosyamerkez.saglik.gov.tr/Eklenti/9843,saglik-bakaligi-stratejik-plan--2013-2017pdf.pdf?0&_g1=732DB6BBC0692DEE6FC458B05035CFADB14F1F97.
22. Fan W Q, Molinaro A. Maternal obesity adversely affects early breastfeeding in a multicultural, multi-socioeconomic Melbourne community. *Aust N Z J Obstet Gynaecol.* 2021;61(1):78-85.
23. Ballesta-Castillejos A, Gomez-Salgado J, Rodriguez-Almagro J, Ortiz-Esquinas I, Hernandez-Martinez A (2020). Relationship between maternal body mass index with the onset of breastfeeding and its associated problems: an online survey. *Int. Breastfeed. J.* 2020; 15: 1-13.
24. Huang Y, Ouyang YQ, Redding SR. Maternal prepregnancy body mass index, gestational weight gain, and cessation of breastfeeding: a systematic review and meta-analysis. *Breastfeed Med.* 2019; 14(6): 366-374.
25. Achike M, Akpınar-Elci M. The role of maternal prepregnancy body mass index in breastfeeding outcomes: a systematic review. *Breastfeed Med* 2021; 16(9): 678-686.
26. Kandeel WA, Rabah TM, Zeid DA, El-Din EMS, Metwally AM, Shaalan A, Shaaban SY. Determinants of exclusive breastfeeding in a sample of Egyptian infants. *Open Access Maced J Med Sci.* 2018; 6(10):1818.
27. Tanda R, Chertok IR, Haile ZT, Chavan BB. Factors that modify the association of maternal postpartum smoking and exclusive breastfeeding rates. *Breastfeed Med.* 2018;13(9): 614-621.