Medical Science

pISSN 2321–7359; eISSN 2321–7367

The influence of maternal overweight and obesity on breastfeeding among women in Al-Madinah, Al-Munawwarah

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To Cite:
Youssef MH, Alsharif HS, Qartali AA, Bahar MM, Abbas AM, Alshehri FS, Malki SZ. The influence of maternal overweight and obesity on breastfeeding among women in Al-madinah, Al-Munawwarah. Medical Science 2022; 26: ms485e2573.
doi: https://doi.org/10.54905/disssi/v26i129/ms485e2573

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Peer-Review History
Received: 3 November 2022
Reviewed & Revised: 05/November/2022 to 19/November/2022
Accepted: 21 November 2022
Published: 23 November 2022

Peer-review Method
External peer-review was done through double-blind method.

URL: https://www.discoveryjournals.org/medicalscience

ABSTRACT

Background: Breastfeeding has advantages for both infant health in the short and long term, and the mother. The study aimed to identify the prevalence of prenatal overweight and obesity among breastfeeding women and to determine the effect of breastfeeding duration on obesity in postpartum females in Al-Madinah, Al-Monawarrah. *Methodology:* A cross section research was conducted from March 2022 to October 2022. An inconvenient sample was carried out among the postpartum females in the Maternity and Children's Hospital in Al-Madinah Al-Monawarrah, KSA. A self administered semi structured questionnaire was used. *Results:* A total of 163 postpartum women were included. Of the total participants, 44.7% of women were in the obese or overweight category. The findings of the study showed a relation between breastfeeding duration and body mass index (BMI) levels ($p = 0.044$). Moreover, a significant negative correlation between BMI level and duration of breastfeeding ($p = 0.002$; $r = -0.25$) was found. This means that the lactation period was affected by increasing BMI levels. Additionally, Weight before and after conception and the length of breastfeeding had a strong negative correlation ($r = -0.162$, $p = 0.039$, $r = -0.184$, $p = 0.019$, respectively). *Conclusion:* The duration of lactation is reduced in pregnant women who are overweight or obese. These findings show that weight control before, during and after pregnancy should be a priority of prenatal control. Further more, these factors consist of increasing breastfeeding among obese pregnant women.

Keywords: Breastfeeding, overweight, obese, exclusive breastfeeding

1. INTRODUCTION

In the breastfeeding week 2020 message, there was a theme of "support breastfeeding for a healthier planet." Breastfeeding has benefits for both early and long-term Infant wellbeing, in addition benefits for the mother (Moubareck et al., 2021). Breastfeeding has a minor but substantial influence in preventing future obesity in both the mother and the child. Many bioactive

substances found in human milk include immunoglobulins, growth factors, microRNAs and human milk oligosaccharides (HMOs). These form a complex system that connectsthe mother's lifestyle factors, such as diet and gut microbiota, to outcomes on infant growth, gut microbiota, immunity and other developmental features (Gay et al., 2018). Breast and ovarian malignancies, hypertension, hyperlipidemia, diabetes mellitus, myocardial infarction and obesity are all serious risks for mothers who prematurely wean their children, with the risk of these conditions being highest in mothers who never breastfeed (Schwarz and Nothnagle, 2015). Breastfeeding has an effect on psychological health. Lactating mothers experience less anxiety, depressive symptoms and stress, as well as more sleep duration and fewer sleep disturbances than formula feeding mothers (Doanet al., 2007; Groer et al., 2005).

During the last couple of decades, maternal obesity has become more common (Guelinckx et al., 2008). Obese women are more suspectable to suffer from pregnancy complications, cesarean delivery and adverse infant outcomes (Avcı et al., 2015) such as neonatal asphyxia (Cedergren et al., 2004; Minsart et al., 2013) macrosomia (Cedergren et al., 2004; Sebire et al., 2001) and preterm birth (McDonald et al., 2010). These conditions have been associated with lower rates for initiation of breastfeeding and reduced breastfeeding duration (Chen et al., 1998). There is a negative outcome due to maternal overweight in relation to breastfeeding (Knight et al., 2020). Reproductive age women with BMIs over the normal range are more susceptible to report reduced occurrence and interval of lactation and breastfeeding (Schwarz and Nothnagle, 2015). The harm will affect both mothers and children (Pinheiro and Goldani, 2018). Exclusive breastfeeding for 6 months has many benefits for women and their infants. Overweight and obese women showed lower rates of breastfeeding intention, initiation and duration as compared to normal weight women (Bever Babendure et al., 2015). Previously, some researchers determined no correlation between BMI and breastfeeding (Garcia et al., 2016). Another study revealed that longer duration of lactation was related with a higher maternal weight (Liet al., 2003). As a result, the current research aims to discover the occurrence of the influence of pregnancy overweight and obesity on breastfeeding.

2. METHODS

Patients and Settings

This is a cross sectional study carried out at Maternity and Children Hospital in Al-Madinah Al-Monawarrah in Saudi Arabia. The data were collected during March to October 2022. An inconvenient sample was carried out among the postpartum females in the study center.

Study tool and data collection

Self administered questionnaires with two parts were utilized to gather the required data after the patient selection. The participant's age, education, occupation, place of residence and income ratio were among the sociodemographic questions in the first section. The second section asks questions about the characteristics of the maternal and the infant, including the mother's BMI before and after pregnancy, gestational weight gain, the birth weight of the infant, the gestational age (based on the onset of the woman's last menstrual period) parity, smoking during the last three months of pregnancy and the start of prenatal care (Amir and Donath, 2007).

The participants were asked to answer the questionnaire. The questionnaire took about 5 to 10 minutes to be answered. Informed consent was obtained from all individual participants included in the study. All participants signed the consent form before answering the questionnaires. The researchers explained the questionnaire to the participants in the hospital. The study's inclusion criteria were breastfeeding mothers. Women having hypertension or diabetes during pregnancy who lived outside of Al-Madinah will not be included in study. Our population consisted of a total of 163 breastfeeding females met the inclusion criteria from 176 responses who completed the questionnaire. This study was approved by the study number (HAPO-02-K-012-2022-03-1002) was approved by the Scientific Committee of Research Ethics at Umm Al-Qura University's faculty of medicine.

Statistical Analysis

The data was entered into Microsoft Excel, which cleaned it all up for analysis. Variables were then imported into SPSS (Statistical Package for Social Sciences, version 23) for statistical analysis. Means and standard deviations were used to represent the qualitative data, while numbers and percentages were used to represent the quantitative data. For continuous variables, a t test was used to evaluate differences in means between the groups. The correlation between obesity and breastfeeding period was analyzed using the Chi Square/Fisher's Exact Test. A Spearman rank correlation coefficient was used to obtain the direction and strength of the association. A One Way ANOVA with a post hoc test was used to compare the means of BMI between the three durations of breastfeeding. A p value that is< 0.05 indicates a significant association.

Validity and reliability of the questionnaire

Before the beginning of the study, the semi structured questionnaires were pretested on 10 postpartum women to explore if any ambiguity or items were leading to misunderstanding in the questionnaire to reach its final form. The validity of the questionnaire was ensured by reviewing it by 3 experts. The questionnaire was re-administered after a week to the same sample of the pilot study to check test-retest reliability.

3. RESULTS

A total of 163 responses met the inclusion criteria from 176 females who completed the questionnaire. The study population was distributed as follows: The normal BMI (BMI < 25) of the participants totaled 89 (55.3%) and the overweight and obese women (BMI ≥ 25) were 72 (44.7%). Two women were underweight. The average height of the participants was 160.1±5.99 cm. The mean weight before pregnancy was 58.6± 14.22 kg. The mean weight after the pregnancy was 68.5 ± 16.27 kg. The mean BMI was 26.7±5.12 kg/m2, and the mean gestational weight gained was 13.0±11.37 kg (Table 1).

Table 1 Descriptive analysis for numerical data of the study

Variables	Mean ± SD
Height (cm)	160.1± 5.99
Weight before pregnancy (kg)	58.6 ± 14.22
Weight after pregnancy (kg)	68.5 ± 16.72
BMI (kg/m2)	26.7 ± 5.12
Gestational weight gain (kg)	13.0 ± 11.37

It is obvious from table 2 that most of the participants were aged over 30 years (63.8%) and the majority had a university level of education (74.2%). Housewives made up the majority (55.2%). Only 3 participants lived in villages and 160 (98.2%) of them lived in cities. Only 7 (4.3%) of the participants' newborns were underweight, leaving 156 (95.7%) with normal weights. All the participants had infants at full term of gestational age of the total participants, 117 (71.8%) had multiparous parity, only 5 (3.1%) of the participants were smokers. Most of the participants had the initiation of prenatal care in all trimesters (57.7%). Moreover, the period of lactation was the highest for 6 months, with 68 responses (41.7%). The majority of participantsBMI (54.7%) was normal. The normality assumption was fulfilled as there were more than 30 participants in each group.

Table 2 Descriptive analysis of 163 participants

Variables	Categories	N (%)
Age	20-24 Years	15 (9.2)
	25-29 Years	44 (27)
	≥30 Years	104 (63.8)
Education	< Highschool	13 (8)
	Highschool	29 (17.8)
	University	121 (74.2)
Occupation	Teacher	28 (17.2)
	University Lecturer	2 (1.2)
	Housewife	90 (55.2)
	Student	11 (6.7)
	Doctor/Healthcare	13 (8)
	Others	19 (11.7)
Residency	City	160 (98.2)
	Village	3 (1.8)
Infant's birth	Normal (≥2500 g)	156 (95.7)

weight	Low (< 2500 g)	7 (4.3)
Gestational age of infant	Preterm (< 37 wk.)	-
	Full term (≥37wk.)	163 (100)
Parity	Multiparous	117 (71.8)
	Primiparous	46 (28.2)
Smoking in the third trimester	Yes	5 (3.1)
	No	158 (96.9)
Initiation of prenatal care	1st Trimester	34 (20.9)
	2nd Trimester	3 (1.8)
	3rd Trimester	9 (5.5)
	1st and 3rd Trimester	4 (2.5)
	2nd and 3rd Trimesters	15 (9.2)
	All Trimesters	94 (57.7)
	Never	4 (2.5)
Period of Lactation	6 Months	68 (41.7)
	1 Year	49 (30.1)
	2 Years	46 (28.2)
BMI Level	Underweight	2 (0.6)
	Normal	88 (54.7)
	Overweight	37 (23)
	Obese	35 (21.7)

The Chi Square test result shows (Table 3**)** the association between the level of BMI and the interval of breastfeeding. The results show that $p = 0.044$, thus, there was an association between the level of BMI and the interval of breastfeeding.

Table 3 Association between the level of BMI and interval of breastfeeding

Variable	Interval of breastfeeding			P Value
	n (%)			
BMI categorization	6 months	One Year	Two Years	
Underweight	0 (0.0)	0 (0.0)	2 (0.6)	
Normal	28 (31.8)	31 (35.2)	29 (33)	0. 044*
Overweight	17 (45.9)	11 (29.7)	9 (24.3)	
Obese	22(62.9)	6 (17.1)	7 (20.0)	

*P < 0.05**

Moreover, the correlation between BMI level and Period of lactation (Table 4) was significant at $p = 0.002$ and observed a negative correlation ($r = -0.25$). That means the period of lactation was affected by increasing BMI levels.

Table 4 Results of Spearman Correlation

	Period of breastfeeding	
	r	p
Level of MBI	-0.25	0.002*

**Correlation test*Significant level <0.01*

Table 5 reveals the findings of one-way ANOVA to compare the means of BMI between the three durations of breastfeeding. There was a marked change in the BMI mean readings between the three durations of breastfeeding observed (p = 0.005). The pairwise comparison revealed that mothers who lactate their infants for 6 months had a significantly higher BMI than mothers who lactate their infants for 12 (p = 0.017) months and mothers who lactate their children for two years (p = 0.002). Mothers who lactate their infants for six months had a mean BMI of 28.30 ± 5.84, those who did so for a year had a mean BMI of 26.0 ± 4.37 and mothers who lactate their children for two years had a mean BMI of 25.3 ± 4.16. Therefore, there was noclear differentiation in the BMI between 12 months and 24 months of breastfeeding mothers.

Table 5 BMI means the difference between durations of breastfeeding

Variable	BMI	Mean difference	P Value
Breastfeeding	Mean ± SD	(95% CI)	
6 months	28.3 ±5.84	(26.84 - 26.69)	
12 months	26. 0 ± 4.37	(24.71- 27.25)	0.005*
24 months	25.3 ± 4.16	(24.09 - 26.56)	

*P < 0.05**

Using an LSD post hoc test, it has been found that between 6 months and 12 months (p = 0.017) and 6 months and 24 months (p = 0.002), breastfeeding significantly differed. The Chi Square test result shows that there was an association between the groups of BMI and the period of lactation (p = 0.015) (Table 6).

Table 6 Association between groups of BMI and interval of breastfeeding

Variable	Interval of breastfeeding			P Value
	n (%)			
BMI	6 months	One Year	Two Years	
BMI < 25	28 (31.5)	31 (34.8)	30 (33.7)	0.015*
BMI ≥ 25	39 (54.2)	17 (23.6)	16 (22.2)	

There was a significant negative correlation between weight before and after pregnancy and the periods of lactation (r = -0.162, p = 0.39, r = -0.184, p = 0.019, respectively).

4. DISCUSSION

In this study, we have investigated the prevalence of the effect of perinatal overweight and obesity on breastfeeding. Specifically, we detected a relationship between the level of BMI and the interval of breastfeeding. Moreover, we found a negative association between BMI level and the interval of breastfeeding. That means the interval of breastfeeding was decreased with an increase in BMI levels or elevated maternal pre pregnancy BMI is related to significantly higher rates of short duration or discontinuation of breastfeeding.

Our study results are supported with those of many other researchers who have found that women with higher BMI are might be less susceptible to induce good breastfeeding than women of normal weight and there are a variety of factors that can contribute to a delay in lactogenesis (Amir and Donath, 2007; Ballesta-Castillejos et al., 2020). Obese women may have more dependable hormone levels because progesterone is retained in adipose tissue, which may be the cause of lactogenesis inhibition. It is known that reduced progesterone levels after delivery are recognized to be one of the variables responsible for mammary gland preparation. Second, the anatomical characteristics of the obese woman's breast may negatively affect the reported lactogenesis delay, as adipose tissue between the ducts may interfere with adequate milk flow. Overweight or obese women have reduced prolactin responses to suckling (Lepeet al., 2011). Excess adiposity in obese women contributes to dysregulation of the hypothalamic pituitary gonadal axis. They have a lower prolactin response to the baby's suckling with a delayed onset of milk production even if their new borns have stronger suction (Rasmussen and Kjolhede, 2004).

In gynecological and reproductive medicine clinics, obese or overweight women predominate (Norman and Clark, 1998). They are more prone than women of normal weight to have illnesses such as polycystic ovary syndrome (PCOS) and diabetes, as well as obstetric problems and cesarean births (Pasquali et al., 2006; Yu et al., 2006). Delayed lactogenesis or decreased milk production may be more significant in diabetic women and those who bear via Caesarean section (Arthur et al., 1989; Rowe-Murray and Fisher,

2002). Due to the endocrinological alterations brought on by PCOS (high levels of androgens, insulin resistance and commonly low progesterone levels), some PCOS patients have inadequate milk production (Marasco et al., 2000). These causes could be responsible to the decrease in breastfeeding duration among obese pregnant women, such as the risk of prolonged labor, excessive labor stress and cesarean birth, all of which delay lactogenesis II (Preusting et al., 2017). Obese women tend to have lower self esteem (Matz et al., 2002) and poorer mental health than normal weight women (Stunkard et al., 2003). Postpartum depression is more common among obese women (Lacoursiere et al., 2006); Breastfeeding becomes less common continued by depressed mothers than by non-depressed mothers (Astburyet al., 1994). Over a 24-hour evaluation period, obese formula feeding women spent less time associating with their infants than non obese mothers, based on a small study (Rising and Lifshitz, 2005).

Moreover, this might be related to problems with self image and with being uncomfortable with breastfeeding in public. Additionally, post partum depression is more common among obese mothers, which is also associated with reduced lactation. This study reported a significant pattern of decreased lactation in mother who is overweight or obese (Lepe et al., 2011; Swanson et al., 2017). Adiposity affects placental nutrition transport and changes the composition of breast milk (Alvarez et al., 2020).

We found a negative impact on breastfeeding period in our current study of obese women. This corresponds to (Marshall et al., 2019) who reported a significant negative correlation between weight before and after pregnancy and interval of breastfeeding ($r = -0.162$, $p = 0.39$, $r = -.184$, $p = 0.019$, respectively). This might be due to the fact that elevated pre pregnancy BMI and higher body fat percentage in early pregnancy was significantly associated with lower rates of exclusive breastfeeding and higher rates of lactation cessation as of 6 months postpartum. They suggested that body fat percentage may have a threshold effect rather than a dose response effect or may be one component of multiple physiologic factors responsible for breast milk production. One possibility would be an impairment of normal breast glandular development in early pregnancy. Although breast glandular maturation begins at puberty, terminal differentiation is not complete until after full term pregnancy and lactation (Martinson et al., 2013). In animal studies, abnormalities in fat mass are associated with abnormal mammary gland development and low milk supply. In contrast to our finding that the period of breastfeeding was correlated with the weight after pregnancy (Martinson et al., 2013) reported that by late pregnancy, maternal percentage body fat was no longer significantly related to reduced incidence of exclusive breastfeeding.

The results of this study showed that being overweight orobese was associated with a decreased duration of breastfeeding. Further research is needed to learn more about the causes so that effective intervention options can be developed. Several limitations need to be considered before interpreting the results and findings of this study. The number of samples is small. The instrument used in this study was a questionnaire and was based on self reporting by the subjects. Some questions might be sensitive to some people, for example, questions on total household income. Therefore, there might be biases or discrepancies from the actual overall scenario.

5. CONCLUSION

Overweight and obese reduce the period of breastfeeding. This finding provides evidence that weight control should be an aim of maternity care before, during and after pregnancy. Additionally, these results also indicate the importance of emphasizing the encouragement of breastfeeding among obese pregnant mothers. More strategies need to be carried out focusing on this population. They could be exposed earlier during their antenatal follow-up to the benefits of lactation to the infants as well as to the mothers in terms of weight management.

Acknowledgements

We would like to sincerely thank Dr. Magda H Youssef for carefully evaluating and monitoring our work before completing this research.

Author Contributions

Magda Youssef: Helped in writing the case presentation and discussion as well as supervising the writing and reviewing the final manuscript before submission.

Hanouf Alsharif: Helped in collecting the data, writing the abstract, case presentation, discussion and conclusion.

Aminah Qartali: Helped in collecting the data, writing the abstract, case presentation, discussion and conclusion.

Muruj Bahar: Helped in collecting the data, writing the abstract and discussion.

Arwa Abbas: Helped in collecting the data, writing the abstract and conclusion.

Fahad Alshehri: Helped incase presentation, discussion and conclusion.

Sulaiman Malki: Helped in case presentation, discussion and manuscript submission.

Ethical considerations

This study was approved by The Biomedical Committee of Research Ethics at the faculty of medicine at Umm Al-Qura University approved the study number (HAPO-02-K-012-2022-03-1002). All participants are complete confidentiality; before answering the questionnaire, all agreed with written consent.

Funding

This research was funded totally by the authors

Conflict of interest

The authors declare that there is no conflict of interests.

Data and materials availability

Data that support the findings of this study are embedded within the manuscript.

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