

## Association of Maternal Obesity and Diabetes Mellitus with Exclusive Breastfeeding Among Saudi Mothers in Jubail, Saudi Arabia

### Abstract

**Background:** Obesity and diabetes are common public health issues in Saudi Arabia. The aim of this study is to evaluate the association of maternal obesity and diabetes with exclusive breastfeeding among Saudi Mothers at the Royal Commission Service Primary Health Care Centers in Jubail City, Saudi Arabia. **Methods:** It is a cross-sectional study and 360 mothers were selected from primary health center through a simple random sampling. A validated and structured questionnaire was used. Body mass index was used for calculation of obesity and fasting blood sugar to find out the diabetic status. Chi-square test was used to assessing the difference between obese and nonobese and diabetic and nondiabetic group with respect to exclusive breastfeeding. Logistic regression was used to determine the association of obesity and diabetes with exclusive breastfeeding. **Results:** Obesity and diabetic prevalence among study participants were 81.9% and 65.5%, respectively. Exclusive breastfeeding prevalence among total study participants was 36.9%. Among obese, it was 28.8% and diabetes, it was 29.1% and this difference is statistically significant when compared to nonobese and nondiabetic group ( $P$ -value 0.04). The obese [OR1.30 (1.12–4.85) with  $P$  value 0.02] and diabetic [OR 1.56 (1.35–3.9) with  $P$  value 0.00] mothers were more than one time more likely associated with nonexclusive breastfeeding. **Conclusions:** The study concludes that the rate of exclusive breastfeeding decreased among obese and diabetic mothers and the positive association of obese and diabetes with nonexclusive breastfeeding. Intervention is required to reduce the prevalence of obesity and diabetic among breastfeeding mothers.

**Keywords:** Breastfeeding, central obesity, diabetes mellitus, exclusive breastfeeding

### Introduction

The World Health Organization (WHO) has defined exclusive breastfeeding (EBF) as during first 6 months of an infant receiving only breast milk.<sup>[1]</sup> According to WHO, it had been shown that in the Middle East and North Africa Region (MENA) region, more than 60% of mothers initiated early breastfeeding and it continued up to 12 months of breastfeeding.<sup>[2,3]</sup> A study on the cost burden of breastfeeding practices in USA reported that a saving of 13 billion dollars in healthcare can be optimized if around 90% of mothers practiced EBF for at least 6-month postpartum.<sup>[4]</sup>

Different studies had found that mothers with central obesity were associated with decreased in intention, initiation, and duration of breastfeeding.<sup>[5-7]</sup> Mothers with high body mass index (BMI) were at increased risk for numerous complications

in the perinatal period, which might be contributed to lowering breastfeeding initiation, as well as the duration of breastfeeding.<sup>[8-10]</sup>

Diabetic mothers were associated with lower rates of breastfeeding.<sup>[11]</sup> Study results found that diabetic mothers had a lower intention to breastfeed.<sup>[12]</sup> Recent research had pointed out that diabetic mothers were implausible to partly or exclusively breastfeed up to 6-month postpartum compared to nondiabetic mothers.<sup>[13-18]</sup>

Given the Saudi women have a high burden of obesity and diabetes and less likely to initiate breastfeeding after birth, there is a need to investigate the association of obesity and diabetes with exclusive breastfeeding. Recommendations and results of this study will help to apply potential risk assessment and preventive measures to minimize the factors that are associated with minimizing EBF duration.

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Ohud Mohammed Al-Anazi,  
Mohammad Shafee Mohammad Haneef,  
Mubashir Zafar,  
Mohammad Ahsan<sup>1</sup>

Department of Public Health,  
College of Public Health,  
Imamm Abdul Rahman Bin Faisal university, Dammam,  
Saudi Arabia, <sup>1</sup>Department of Physical Therapy, College of Applied Medical Sciences, Imam Abdul Rahman Bin Faisal University, Dammam, Saudi Arabia

### Address for correspondence:

Dr. Mubashir Zafar,  
Department of Public Health,  
College of Public Health,  
Imamm Abdul Rehman Bin Faisal University, Dammam,  
Kingdom of Saudi Arabia.  
Email: mzzahmed@iau.edu.sa

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## Methods

### Study setting and study group

The study was conducted at the Royal Commission Health Services Program (RCHSP) Primary Health Care Centers (PHCCs) in Jubail Industrial City Saudi Arabia, during the spring of 2019 calendar year. Jubail is the smallest city in the eastern province. Average daily OPD attendance in RCHSP had an average of 500 patients per day. Mothers with infants up to 18 months of age who live in Jubail Industrial City, Saudi Arabia were included in the study.

### Study design, target population, and inclusion and exclusion criteria

It is a cross-sectional study. The inclusion criteria for the participants were mothers aged between 18 and 45 years old, Saudi citizens, live in Jubail Industrial City, Saudi Arabia, had a healthy baby in the past 18 months. The exclusion criteria for the participants were mothers suffer from major illnesses other than obesity and diabetes mellitus and not willing to participate in the study.

### Sample size and sampling technique

Study participants were selected from the primary health center through a simple random sampling technique. A list of patients taken from the outpatient department and generate the random number and selected the study participant. A sample size of 360 was calculated through Epi info software with 95% Significant level, margin of error 5%, and prevalence of 38% exclusive breastfeeding from previous study.<sup>[4]</sup>

### Assessment of biomedical characteristics

The study participant's height and weight were measured and BMI was calculated. Diabetic status was measured with fasting blood glucose form hospital record of each patient. BMI, which was defined according to the guidelines from the National Heart, Lung, and Blood Institute: BMI classified as underweight (<18.5), normal weight (18.5-24.9), overweight (25.0-29.9) and obese (>30.0).<sup>[19]</sup> Fasting blood glucose classification as 5.3 mmol/L; 1-h 10.0 mmol/L; 2-h ,8.6 mmol/L; and 3-h 7.8 mmol/L.

### Data collection tools

Participant mothers were interviewed by the researcher. The questionnaire consists of section included: sociodemographic characteristics, biomedical characteristics, and assessment of exclusive breastfeeding duration in obese and diabetic mother. Study variables included age of mothers, gender, education level, marital status, occupation, income, family size, weight of baby, housing type, type of delivery, weight of mother, height of mother, diabetes status, BMI, and dependent variables exclusive breastfeeding.

## Statistical analysis and ethical considerations

Data were cleaned and coded. A codebook for all variables collected was created. Analysis of data was performed using IBM SPSS statistical software version 22.0. Descriptive Statistics were calculated for demographic and biomedical variables, breastfeeding indicators, and the prevalence of infant feeding practices. A Chi-square test was used to determine the difference between obese and diabetic mother with nonobese and nondiabetic mothers. Logistic regression was performed to determine the association of obese and diabetes with exclusive breastfeeding. An Institutional review board approval had been obtained from Imam Abdurrahman Bin Faisal University and King Fahd Specialist Hospital. An informed written consent from selected mothers was taken. Participation of study is voluntary; any participants can quit the study before the signing of consent form.

## Results

The mean age of mothers was 29.19 years with a standard deviation of 5.22. The majority of mothers were married 91.9%. The leading income group less than 10000 Saudi Rial (SAR) was 60% [Table 1].

There were more female babies than males (53.1% versus 46.9%). The dominant type of delivery in the study

**Table 1: Sociodemographic characteristics of mothers (n=360)**

Characteristics	Frequency n (%)
Mother Age (Mean±SD)	29.2±5.20
Marital Status	
Married	331 (91.9%)
Divorced	29 (8.1%)
Mother Education	
Secondary School	134 (37.3%)
Graduate	226 (62.7%)
Father Education	
Illiterate	5 (1.4%)
Secondary School	122 (33.9%)
Undergraduate	133 (64.7%)
Mother Occupation	
Working	132 (36.7%)
Housewife	228 (63.3%)
Father Occupation	
Working	332 (92.2%)
Unemployed	28 (07.8%)
Type of housing	
Villa	119 (33.1%)
Apartment	241 (66.9%)
Family Income (Saudi Rial)	
1-10000	216 (60%)
>10000	144 (40.0%)
Family Size (People)	
1-3	136 (37.7%)
>3	224 (23.9%)

subjects and in the obese and diabetic mothers' sample was the natural birth delivery (68.6%) [Table 2].

The mean BMI of a mother before pregnancy was 28.3 with a standard deviation of 4.56, whereas the mean BMI of mother at 6-month postpartum was 29.5 with a standard deviation 3.95. The highest prevalence of diabetes was observed during pregnancy as almost half of the mothers in the sample were diabetic (50.6%), whereas only 27.2% of mothers were diabetic prior pregnancy and 38.3% were diabetic at 6-month postpartum. Of the obese mothers, 28.8% were diabetic prepregnancy and an increasing number of diabetic mothers during pregnancy were observed 52.5%; then, the percentage of diabetic obese mothers decreased to 40.6% at 6-month postpartum [Table 3].

The prevalence of exclusive breastfeeding among obese mothers is 28.8% and this is statistically significant (*P*-value 0.004) difference from nonobese mothers. The prevalence of exclusive breastfeeding among diabetic mothers is 29.1% and this is statistically significant (*P*-value 0.002) with nondiabetic mothers [Table 4].

The family size with Odd Ratio [OR 1.40 (1.17–2.97)], obese mothers [OR 1.30 (1.12–4.85)], and diabetic mothers [OR 1.56 (1.35–3.9)] were more than one time more likely associated with nonexclusive breastfeeding [Table 5].

**Table 2: Biomedical characteristics of study participants (n=360)**

Variables	n (%)
Type of Birth Delivery	
Normal Vaginal	247 (68.6%)
Caesarean	113 (31.4%)
Infant Gender	
Male	169 (46.9%)
Female	191 (53.1%)
Infant's Weight (kg)(mean and SD)	
At birth	3.107±0.646
6-month postpartum	8.31±1.096

**Table 3: The prevalence of obesity and diabetes status among study participants**

Maternal body mass index (kg/m <sup>2</sup> ) and diabetic status	n (%)	
	Prepregnancy	6-month postpartum
Obese (BMI ≥30)	135 (37.5%)	160 (44.4%)
Nonobese (BMI <30)	225 (62.5%)	200 (55.6%)
Diabetic	98 (27.2%)	138 (38.3%)
Nondiabetic	262 (72.8%)	222 (61.7%)

**Table 4: Prevalence of exclusive breastfeeding among mothers classified based on their obesity and diabetes status**

Status of Breastfeeding	Obese	Nonobese	* <i>P</i>	Diabetic	Nondiabetic	* <i>P</i>
Exclusive Breastfeeding	46 (28.8%)	87 (43.5%)	0.004	53 (29.1%)	80 (44.9%)	0.02
Nonexclusive Breastfeeding	114 (71.3%)	113 (56.5%)		129 (70.9%)	98 (55.1%)	

Figure 1 shows the type 1 and type 2 diabetes prevalence among pre-pregnancy, pregnancy, and 6-month postpartum.

Figure 2 shows the prevalence of feeding practice among mothers.

## Discussion

The present study finds out the positive association of two prevalent chronic diseases (maternal obesity and diabetes mellitus) with nonexclusive breastfeeding (NEBF), which means those mothers who have obesity and diabetic are associated with low rate of exclusive breastfeeding.

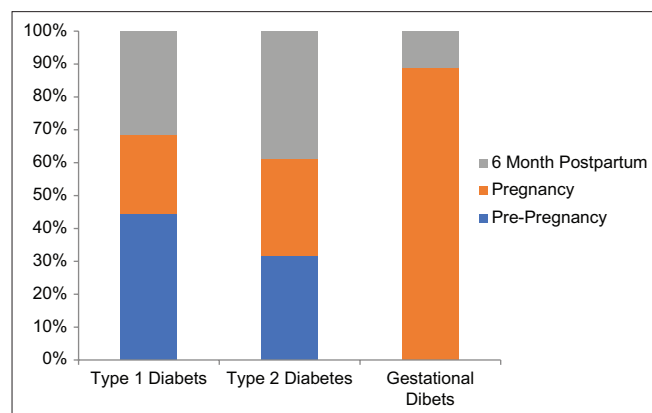
Our findings showed that EBF rate found to be 36.9%, which decreased over the first 6 months of the newborn age. The World Health Organization (WHO) reported that in the period of 2007 to 2014, only 36% of infants worldwide were exclusively breastfed.<sup>[2]</sup> The percentage of infant's breastfed exclusively through 6 months was 24.9% in the United States.<sup>[20]</sup> In a recent study on breastfeeding patterns in Abu Dhabi, United Arab Emirates, the EBF rate was 44.3%,<sup>[19]</sup> superior to the global rate stated by WHO and the rate in our study. Another prospective study testing the predictors of breastfeeding duration among women in Kuwait conveyed that the rate of EBF at 6-month postpartum was very low only 2%.<sup>[21]</sup> According to nationwide surveys in the Saudi Arabia, a high rate of EBF up to 6-month postpartum was demonstrated; one survey demonstrated a 33% EBF rate up to 6-month postpartum.<sup>[22]</sup>

The obesity rate of mothers in our sample was 37.5% before pregnancy and the rate of obesity among the mothers increased up to 44.4% at 6-month postpartum. A similar study in Western Saudi Arabia showed an increase of 11.5% in obesity among mothers in the sample.<sup>[13]</sup> In line with previous studies, our findings demonstrate an association of maternal obesity with decreased prevalence of EBF at 6-month postpartum. The rate of EBF at 6-month postpartum in obese mothers was 28.8%. International studies had described similar results; a study had shown that mothers with central obesity were associated with negative intention to breastfeed and declined rates of breastfeeding initiation and duration.<sup>[5,6]</sup> The author of a systematic review on the association between psychological factors and breastfeeding behavior in women with a BMI above 30 stated that obese mothers were unlikely to initiate breastfeeding and if breastfeeding initiated, early cessation is predicted, leading to shorter duration of breastfeeding.<sup>[23]</sup> The results showed that some underlying reasons: low self-esteem and body image as well as the low nutritional value of their breast milk, which explained

the discrepancy among the intentions and length of breastfeeding in obese mothers.<sup>[23]</sup> Other studies in Saudi Arabia have evaluated the relationship of maternal obesity and BF duration and found that maternal obesity postpartum is associated with shorter duration of breastfeeding,<sup>[13]</sup> and the results lead to a similar conclusion with the EBF rate in obese mothers explored in this study. Another study conducted in Arar, Northern Saudi Arabia, looked at the relation of higher BMI in children with breastfeeding. The results showed that more than half of the study participants (54.8%) were females, out of which 39.9%

**Table 5: Association of sociodemographic characteristics with the nonexclusive breastfeeding**

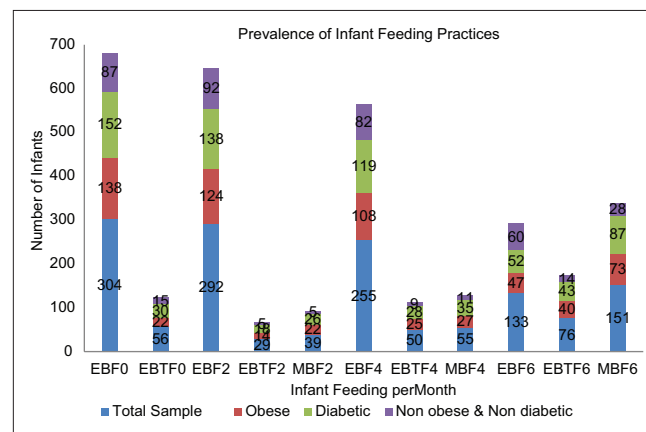
Characteristics	Adjusted odd ratio (AOR) (95%CI)	*P
Infant Gender		
Female	1.20 (0.76-5.91)	0.421
Male	1	
Type of Birth		
Cesarean	1.87 (0.54-5.41)	0.584
Normal Vaginal	1	
Marital Status		
Divorced	1.67 (0.30-4.50)	0.337
Married	1	
Mother Education		
Secondary School	1.91 (0.55-1.55)	0.733
Graduate	1	
Family Income (Saudi Rial)		
1-10000	1.18 (0.81-1.71)	0.361
>10000	1	
Family Size (People)		
>3	1.40 (1.17-2.97)	0.040
1-3	1	
BMI Status		
Obese (BMI >30)	1.30 (1.12-4.85)	0.020
Nonobese (BMI <30)	1	
Diabetic Status		
Diabetes	1.56 (1.35-3.9)	0.00
Nondiabetes	1	



**Figure 1: Percentages of diabetic mothers by their diabetes mellitus types at each time point**

were obese; the author asserted that there was a significant relation of the type and duration of breastfeeding and being obese. Infants who were fed less than 4-month postpartum were 43% obese, whereas the infants who were breastfed more than 4-month postpartum but not more than 6-month postpartum were 31.2% obese.<sup>[24]</sup>

In our study, the rate of diabetes mellitus is 50.6% of the study population; this rate increased after birth from 27.2% prepregnancy diabetic mothers to 38.3% postpregnancy diabetic mothers. The increased rate of diabetes among mothers could be explained with the rate of GDM among mothers in the sample. From the data collected in the Saudi Health Information in 2013, the rate of breastfeeding among diabetes Saudi females was 11.7%.<sup>[25]</sup> In comparison to the national rate, a study on the status of the diabetes epidemic in the Kingdom of Saudi Arabia reported results of a national survey conducted by the Saudi Ministry of Health (MOH), reporting a prevalence of 14.7% type 2 diabetic Saudi women.<sup>[26]</sup> Our study revealed that there was a statistically significant association between diabetes mellitus and EBF duration at 6-month postpartum. The rate of EBF in diabetic mothers at 6-month postpartum in our study was 29.1%. International studies had described similar results in the relationship between diabetes mellitus and duration of exclusive breastfeeding with variation between counties; Sweden had strong association between diabetes mellitus and short duration of breastfeeding, while Finland showed no association.<sup>[24,27]</sup> According to breastfeeding in women with type 1 diabetes, exploration of predictive factors, mothers with diabetes were unlikely to partly or exclusively breastfeed at 2-month and 6-month postpartum than nondiabetic mothers.<sup>[17]</sup> In a cross-sectional study about the relation between breastfeeding and incidence of diabetes mellitus type I in Saudi Arabia, the author looked at the relationship between breastfeeding and incidence of diabetes mellitus type 1. The results of the study showed out of the 407 samples, more than half



**Figure 2: The prevalence of infant feeding methods in all mothers, in obese mothers, in diabetic mothers, and in nonobese and nondiabetic mothers at each time point. EBF = Exclusive Breastfeeding; EBTf = Exclusive Bottle Feeding; EMBF = Exclusive Mixed Breastfeeding.**

of the participants 52.3% became diabetic and 47.4% were nondiabetic. The results showed that 45% of the participants were exclusively breastfed and 45.9% were fed through mixed feeding method, and only 9.1% were formula fed.<sup>[28]</sup> Out of 52.3% that were diagnosed with type 1 diabetes, 26.3% were exclusively breastfed while 59.6% were mixed fed and only 14.1% were formula fed. The results showed that breastfeeding exclusively children have lower risk of diabetes.<sup>[28]</sup> EBF can be increased by the awareness among mothers through social media, establishment of baby friendly hospitals, regulation to establish the baby breastfeed room at all workplaces for women, and incentives to mothers for breastfeed baby. There is a need for more studies for determining the factors affecting breastfeeding.

The limitations of the study are, first, a cross-sectional nature of study which cannot determine the temporal relationship between outcome and independent factors and, second, self-reported information which leads to information bias in the study because results depend upon self-reported information.

## Conclusions

The rate of EBF decreased over the first six months of an infant's life. Maternal obesity and diabetes had negative effects on breastfeeding outcomes. Nonobese and nondiabetic mothers had higher rates of EBF than obese and diabetic mothers did. In future, a prospective follow-up study should be undertaken.

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## Conflicts of interest

There are no conflicts of interest.

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