

## ORIGINAL ARTICLE

# Association Of Sociodemographic And Breast Feeding Variables In Normal Weight And Over Weight Lactating Mothers

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## Abstract:

**Background:** The prevalence of obesity is increasing worldwide. Along with other ill health effects, high body mass index (BMI) may interfere with breast feeding practices in lactating mothers

**Objectives:** This study was designed to find an association between maternal BMI and milk hormone prolactin along with other risk factors for breastfeeding outcome

**Methods:** This cross-sectional analytic study included 88 lactating mothers in different BMI categories using non-probability purposive sampling technique. Data included various sociodemographic and breastfeeding variables along with fasting blood for serum prolactin levels. Analysis was done by SPSSv.20.,  $p<0.05$  was considered as significant.

**Results:** An increase in operative deliveries, decreased Prolactin levels, decreased duration of lactation was observed in high BMI group. A significant negative correlation was found between serum Prolactin and high BMI group. Socioeconomic status, time duration of one breast feed and number of breast feeds/day were not different among the two groups.

**Conclusion:** High maternal BMI is a risk factor for high cesarean births, decreased duration of breastfeeding, low rates of exclusive breastfeeding and decreased serum Prolactin levels.

**Keywords:** BMI, lactation, lactogenesis, obesity, overweight, Prolactin.

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## Introduction

Worldwide the prevalence of obesity is increasing in high-income countries as a significant public health problem (1). With obesity not only the risk for several non-communicable diseases is raised (2) but it also contributes as a major risk factor for women in reproductive age (3). WHO recommends exclusive breastfeeding (EBF) for six months and

continued BF for two years for appropriate development of children (4). Amongst the barriers in achieving WHO BF practices, maternal obesity increases the risk of shortened BF duration and earlier BF discontinuation as compared to non-obese or normal weight women (5). Obese mothers tend to have reduced initiation of lactation, with a considerable drop in the rate of EBF in the initial postnatal days (6). Several studies documented independent relationship for delayed onset of lactation with prolong labor, maternal exertion and fetal distress during labor, primiparity and delivery by cesarean section along with obesity (7-9). Research on animal models revealed delayed lactogenesis, high fat content in milk but reduced milk volume, decreased prolactin levels associated with poor pup growth and high pup mortality rates in comparison to the rats fed with low fat diet (10). The underlying mechanism behind high BMI and failed lactation in humans is not yet clear and probably multifactorial.

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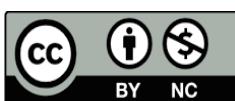
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Delayed perception of onset of lactation (>72 hours after delivery) in mothers with high BMI (11), difficulty in latching on, improper positioning of infant for feeding along with decreased response of Prolactin secretion to suckling in obese mothers are the proposed hypothesis in literature (12).

The anterior pituitary lactotrophic hormone Prolactin is essential for breast development and differentiation during pregnancy. Initiation of lactation depends principally on Prolactin secretion (13, 14) and drop in levels of progesterone after delivery of the placenta (15). Fat cells store and concentrates progesterone, leading to high serum levels of progesterone in women with high BMI but this adipose stored progesterone was not associated with delayed onset of lactation in these subjects (12). Prolactin levels in contrast were considerably lowered in response to suckling in overweight and obese women (12).

This study is designed to find an association between maternal BMI and serum Prolactin levels and their effect on breast feeding outcome.

#### **Methodology:**

Lactating women (n= 88) with duration of lactation 2-8 months, included in this cross sectional study were recruited at the local community health clinic with the help of their health workers by non-probability purposive sampling. Written informed consent was obtained from each mother after explaining the aim of the study and the requirements of the participants. This study was conducted at Institute of basic medical sciences, Khyber medical university (IBMS, KMU) Peshawar after approval by AS&RB (No# DIR/KMU-AS&RB/PS/000807) and Ethical Review Committee KMU, Peshawar (No# DIR/KMU-EBP/PS/000629).

All the lactating women were breast feeding on demand to a singleton full term infant at the time of study, parity 1-5, with no active breast infection or chronic illness, not using any kind of addiction or medications to enhance or depress lactation.

A detailed questionnaire was administered to answer various socio demographic (age, residence, monthly income, mode of current delivery, parity) and breast feeding variables (duration of BF, EBF, weaning, time duration of one breast feed, number of feeds per day). Maternal Body mass index (BMI) was expressed as weight in Kg/ height in meter square (m<sup>2</sup>). BMI was categorized into different groups according to the WHO classification as normal weight (NW) (18.5-24.9kg/m<sup>2</sup>) and overweight /obese (OW/obese) (25.0-30.0 kg/m<sup>2</sup>) (16, 17).

**Blood sampling for Prolactin levels:** Mothers were instructed not to breast feed or express milk one hour before the blood sample collection to avoid changes in basal prolactin levels. Morningfasting venous blood of 3ml was collected under aseptic measures. Serum was obtained by centrifugation at 3000rpm and stored at -80° C until the hormonal analysis. For estimation of serum prolactin levels the commercially available ELISA kit by Chemux Bioscience, INC USA cat no: 10006 was used according to manufacturer's instructions.

#### **Results:**

**Data of this study was extracted from another research study designed to evaluate the stress responsiveness in working and non working lactating women.** All the data was analyzed by using SPSS version 20 and  $P < .05$  was the criterion for statistical significance. Means and standard deviation of variables was calculated for both the groups. Independent sample t test was used to compare the means of different variables. **chi square test was used for** comparison of categorical variables. The two groups of subjects on the basis of WHO BMI classification was compared for mean prolactin levels for each group. The different socio demographic variables were also compared among the groups. Pearson's correlation was performed to find association between different BMI groups and serum Prolactin levels.

**Table1.** Sociodemographic characteristics of study participants (independent sample t test, p value by chi square test)

Characteristics		BMI Category		P value
		Normal weight (NW)(n=45)	Overweight/ obese (OW/obese) (n=43)	
Age (years)		22±5.24	24±5.01	0.20
No of children		1.9±0.8	2±1.5	0.12
Monthly income	Low	8 (17.8%)	10 (23%)	0.42
	Middle	27 (60%)	19 (44%)	
	High	10 (22.2%)	14 (32%)	
Mode of current delivery	NVD	34 (75%)	24 (55%)	0.07
	C/S	10(22%)	20 (46%)	
Residence	Rural	25 (55%)	23 (53%)	0.12
	Urban	20 (44%)	20 (46%)	

**Table 2.** Breast feeding variables and serum Prolactin levels

Duration of breast feeding ( months)		6±2.2	4±1.3	0.41
No of breast feeds/ day	3-5	8 (17.8%)	12 (27.9%)	1.0
	6-8	28 (62%)	21 (48.8%)	
	9-12	9 (20%)	10 (23.3%)	
Duration of one feed (minutes)	5	7 (15%)	15 (35%)	0.06
	10	30 (66%)	20 (46%)	
	15	8 (17%)	8 (18%)	
Mode of feeding	EBF	17 (37.8%)	10 (23.3%)	0.41
	Bottle+ BF	10 (22%)	15 (34%)	
	Weaning + BF	18 (40%)	36 (40%)	
Serum prolactin levels (ng/ml)		79.53± 59.40	65.23±53.4	0.28

### Socio-demographic characteristics

The socio-demographic characteristics of different BMI categories are shown in table 1. The NW n=45 and OW/obese group no= 43. There was no significant difference between the ages of both the groups  $22 \pm 5.24$  years and  $23 \pm 5.01$  for NW and OW/obese group respectively  $p>0.20$ . The monthly income of the groups was divided into three groups, low, middle and high income. Based on these income groups, we found no statistically significant difference between the monthly incomes of both the groups. Also there was no statistically significant difference between the residence of both the groups  $p>0.05$  as shown in table 1. Mean parity for NW group was recorded as  $1.9 \pm 0.8$  and for OW/obese group as  $2 \pm 1.5$   $p=0.12$ .

There was a difference between the mode of delivery in current pregnancy  $p<0.07$ . Amongst the NW group 34 (75%) delivered by NVD as compared to 24 (55%) of the OW/obese group. While in OW/obese group 20 (46%) delivered by C/S as compared to 10 (22%) amongst the NW subjects.

### Breast feeding variables and serum Prolactin levels (table 2)

The mean duration of breast feeding in NW group was  $6 \pm 2.2$  months while in OW/obese group it was recorded as  $4 \pm 1.3$  months  $p=0.41$

Regarding mode of feeding, EBF was prevalent in 17 (37.8%) of NW subjects in contrast to 10 (23.3%) of OW/obese subjects. 10 (22%) of NW subjects used bottle +BF in comparison to 15 (34%) of OW/obese group. Weaning +BF was adopted by 18 (40%) of NW and 36 (40%) in OW/obese group. Although there was a difference in mode of feeding between the two groups, but it was not a statistically significant difference  $p=0.06$ .

The number of Breast feeds /day was divided into three categories i.e 3-5 times /day, 6-8 times /day and 9-12 times /day. 8(17.8%) of NW and 12 (27.9%) of OW/obese subjects had 3-5 times feeds/day. 28 (62%) of NW and 21 (48.8%) of OW/obese were feeding for 6-8 times/day. While, 9-12 times feeds/day was seen amongst 9 (20%) of NW as compared to 10 (23%) of OW/obese group. The difference in number of breast feeds/day was not statistically significant.

The duration of one breast feed was also categorized

into three groups these were; duration of 5 minutes, 10 minutes and 15 minutes. Amongst the NW group 7 (15%) and OW/obese group 15(35%) took 5 minutes for one breast feed. 20 (46%) of NW and 30 (66%) of OW/obese group had 10 minutes for one feed. The NW group 15 (35%) and OW/obese group 8 (18%) gave 15 minutes to one feed. The difference in duration of one breast feed was not statistically significant  $p>0.05$ . Although we found considerably decreased levels of serum Prolactin levels amongst the OW/obese group  $65.23 \pm 53.4$  in comparison to  $79.53 \pm 59.4$  in NW group, but this difference was not statistically significant  $p=0.28$ . The Pearson correlation revealed a negative correlation  $r= -.080$  between BMI and Prolactin levels.

		BMI	Prolactin ng/ml
BMI	Pearson Correlation	1	-.080
	Sig. (2-tailed)		.461
	N	88	88
Prolactin ng/ml	Pearson Correlation	-.080	1
	Sig. (2-tailed)	.461	
	N	88	88

### Discussion:

In this study we tried to find an association between maternal BMI, different socio-demographic, various breast feeding variables and serum prolactin levels. It is evident from our results that there is a decrease in duration of BF in high BMI group as compared to normal BMI. Our results are in agreement with many studies conducted in past. Studies by Castillo *et al.*; 2016 revealed that probability for early weaning in infants of mothers with high BMI was three months earlier than those from normal BMI mothers (18). High maternal BMI and decreased lactation with low prolactin response were also reported previously (12, 19).

High Pre pregnant and pregnant BMI is a known risk factor for earlier termination of EBF (20-22). Similar findings were shared in another study where the investigators found a significant association between high maternal BMI and delayed onset of lactation (23).

Our study did not find a statistically significant reduction in duration of breast feeding this finding is consistent with those of *Martin et al.*; they showed difference in duration of breastfeeding in high BMI and low BMI groups (24). A recent cohort study from China also showed decreased duration of any breast feeding in high BMI mothers (25), and decreased duration of breast feeding before 6 months (26).

We compared the mode of feeding of both the groups. As shown in our results EBF was reduced in high BMI group leading to earlier introduction of bottle feeding and weaning. Our results are consistent with those of *Dewey et al.*, 2004 who investigated various risk factors for delayed and poor lactation performance in newborns. They found high maternal BMI as a significant factor in delayed lactogenesis (27). Amongst the various factors leading to poor lactation the latch on phenomenon to maternal breast is important. In mothers with high BMI, this mechanical difficulty has been found as a cause of delayed lactogenesis (19, 27). *Marshal et al.*; also reported decreased rates of EBF and earlier termination of lactation in obese mothers (28) Although our results are not statistically significant but research in the past showed that high maternal weight is a significant risk factor for breast feeding initiation, continuation and termination (28).

In our study we noted high rates of caesarean births in high BMI group as compared to normal weight women. This finding is similar to most of the studies done in the past. They have reported high emergency and elective operative delivery rates in women with high BMI both before and during pregnancy (29-31). This high rate of c/s in obese women may be a contributing factor for decreased EBF and early bottle feeding in our study.

Regarding the socioeconomic status, we found no significant difference between the monthly incomes of women in any BMI group. Studies from high income countries related to maternal weight showed significant findings of high BMI and decreased BF duration (32). In contrast, low socioeconomic status was reported as a risk factor for early introduction of formula milk and weaning in a study by *Ludvigson et al.*, 2005 (33).

Serum Prolactin levels were also decreased in OW/obese group in comparison to NW subjects. Although we recorded depressed levels of Prolactin in high BMI group but it was not a statistically significant finding. The relationship of Prolactin levels and BMI status was also observed in previous studies demonstrating high BMI and depressed Prolactin response to suckling (34). Study by *Rios et al.*; demonstrated normal levels of serum prolactin but decreased levels in milk prolactin in fat fed rats (35). Prolactin deficiency alone has been documented as the cause of lactation failure in obese woman (36).

#### **Limitations of our study:**

The limitations of our study include the comparatively small sample size and the lack of follow-up data of same participants at different durations of lactation for more comprehensive association of BMI, breast feeding variables and serum prolactin levels in both the groups.

#### **Conclusion:**

Keeping in mind the immense importance of breast feeding for the new born and also the benefits for lactating mother, it is necessary to reduce the risk factors leading to disrupted breastfeeding practices. Taking into consideration the worldwide increasing population with high BMI, our study highlights the different factors involved in depressed lactation. From our study high BMI was a risk factor for decreased Prolactin levels, early termination of breast feeding and early initiation of bottle feeding along with high c/s rate. Proper nutritional advice, life style modification to reduce the risk of obesity is the need of time. Guidance for optimal breast feeding behavior can help reduce this risk to some extent and WHO guidelines for continued breast feeding can be attained. Further, long term studies should be designed to investigate the molecular mechanisms involved in decreased duration of lactation in obese mothers.

#### **Declaration:**

**Conflict of Interest:** I declare that I have no conflict of interest.

**Funding:** I declare that I have no source of funding

**Data:** I declare that Data will be available on request.

**Ethical approval:** Was obtained from all participants.

Our paper had limited geographical representativeness, further research is needed to confirm our data at the regional and national levels. Moreover, prospective studies at a larger scale may be required in order to better understand a possible effect (association/correlation) of BMI on the WHtR value, so as to assess whether it is suitable to use either as an effective means to assess obesity and cardiometabolic risks in a population.

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