

# Maternal Depression and Infant's Growth during Breast-feeding: Is There Any Relationship?

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## Abstract

**Background:** Depression is a worldwide disease affecting more than 300 million people and is associated with disability, burden of disease, and significant health care costs. Children's nutritional status can definitely affect their growth. The burden of malnutrition remains high in developing countries and reduces the potential for individual, social, and economic development. The aim of this study was to investigate the relationship between breastfeeding depression and infant's growth.

**Methods:** This is a cross-sectional study on 90 breastfeeding mothers and their 2-4 month old infants in Yasuj. Data collection in mothers was done by measuring anthropometric variables and by interviews through questionnaires. For assessing maternal depression, Beck Depression Inventory questionnaire was applied, and neonatal physical growth was evaluated by head circumference, weight, and length Z-scores of 2-4 months old infants.

**Results:** The result showed that the relationship between maternal depression score and Z scores of infants' weight, height, and head circumference was not significant ( $P > 0.05$  for all). There were no differences between depression scores of mothers and infants' growth in different groups of education or occupation among mothers ( $P > 0.05$  for all). There was a significant relationship between maternal waist circumference with hip circumference, weight, and number of children ( $P < 0.001$  for all).

**Conclusion:** This study showed that depressed mothers, despite having depression, were concerned with the optimal growth of their infants. However, tracking children's developmental status and maternal depression over the time (especially in depressed mothers or underweight infants) in several stages can be helpful in increasing information in this regard.

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## Introduction

Depression is a worldwide disease affecting more than 300 million people and is associated with disability and burden of disease. By 2030, depression is predicted to be the leading cause of disability and the second main cause of disease burden in the world.<sup>1</sup> Postpartum depression is a type of depression that a mother experiences in a few

weeks, a few months, or even a year after the birth of her baby. The person may feel low self-esteem, inefficiency, low self-confidence, constant feeling of sadness, negative thoughts, stress, tendency to think about well-being of the baby, and fatigue. The depressed mother also experiences changes in sleep patterns and appetite. Mood disorders are among the symptoms negatively affecting family well-being and child development.<sup>2</sup> From 2005 to

2015, the global prevalence of depression increased by more than 18%.<sup>3</sup> Until 2007, mental disorders increased significantly.<sup>4</sup> Globally, an estimated 165 million children younger than 5 years old were stunted and underweight existed in 101 million of them (16%). Also, wasting was reported in 8% of children (52 million) in 2011. More than 90% of the world's stunted children live in Africa and Asia. Seventy percent of the world's wasted children live in Asia, most of them being in South-Central Asia.<sup>5</sup>

Nutritional status of children can definitely affect their growth and health. The burden of malnutrition remains high in many developing countries and reduces the potential for individual, social, and economic development.<sup>6</sup> Childhood growth in the first year of life is affected by various factors, among which the mental condition of the mother is one of the most important and vital issues. Children of depressed mothers are more likely to be exposed to underweight and stunting during the first year of their life.<sup>7</sup>

Women are so susceptible to depression, and their responsibility for taking care of their children makes their role so important. On the other hand, maternal depression is so prevalent in developing countries and this is a significant alarm that mothers' mental health can have negative effects on their children's development during childhood in these countries.<sup>8</sup> When left untreated, a mother's depression can affect her abilities and moods such as increased hostility, negative interactions, lower responsiveness, and less communication, which reduces a mother's ability in taking care of her child.<sup>9, 10</sup>

Maternal depression also affects the childcare activities such as the duration of breastfeeding, sleeping, health care, early introduction of complementary foods, and stimulation of physical activity that all can affect the child's growth.<sup>11-13</sup> Moreover, in developing countries, children of depressed mothers are at higher risk for short stature and underweight.<sup>14</sup>

Due to the high prevalence of depression in mothers and malnutrition in infants and children, the effect of maternal depression on the growth of their infants, and the lack of studies in this field, the present study was designed to investigate the effects of depression of breastfeeding mothers on the infants' growth, including their weight, height, and head circumference in Yasuj, a city of Iran. This study could also help the policymakers in evaluating the condition and planning in this regard as sufficient evidence and knowledge about mental health problems, especially in breastfeeding women are not available and prevalence of under-nutrition among infants is high.

## Methods

### *Study Design and Sample Selection*

This is a cross-sectional study that was performed on 90 breastfeeding mothers and their 2-4 month old

infants in Yasuj (a city in Iran) to investigate the relationship between maternal depression and neonatal growth. The ethics committee of Shiraz University of Medical Sciences reviewed and approved the study design (IR.SUMS.REC.1399.213). Study population included all breastfeeding women over 18 years and their 2-4 months old infants that were exclusively breast-fed and referred to the health centers for growth evaluations in Yasuj in February-June, 2021.

Finally, 90 mothers who met the inclusion criteria were recruited. Mothers with metabolic diseases, infection or recent hospitalization, women with the history of heart disease, liver or kidney failure, mental retardation, alcohol and addictive substance abuse, neuroleptic tardive dyskinesia, severe obesity, HIV, tuberculosis or hepatitis, cancer, or those undergoing chemotherapy and radiation were excluded from the study. Also, those using anti-depressant or anxiety medications or those with the diagnosis of mood disorders affecting the study results were excluded from the study. The infants that were taking formula or those starting complementary foods were not included and this was defined by interviews with the mothers. All the available mothers and their infants referring to the health care centers were assessed for eligibility.

In order to conduct this study, the purpose and stages of the research were fully explained to the eligible mothers and if they accepted to participate in the study, a written consent form was completed for each mother. In the next step, the questionnaires used in the study (demographic information questionnaire, anthropometric variables, and the Beck Depression questionnaire) were completed by the main researcher for each mother.

Respondent s' addresses and contact information were obtained from the integrated healthcare system. The information was reviewed and verified by the health-care providers of each center. Always, the healthcare provider gives enough maternal and child health care services in different stages of life including pregnancy, growth (i.e. childhood and infancy and new-born), and the postpartum period at health centers through interviews, observations, and advice routinely. Breastfeeding mothers are given general advice including the foods they could eat during the course, awareness of vaccines, information about complementary nutrition, and instructions about the techniques needed for breastfeeding. Data collection method, justification of inclusion and exclusion criteria, assessment of maternal depression using Beck Depression Inventory and anthropometric measurement techniques for mother and infant were taught to the questioner.

### *Demographic and Anthropometric Data Gathering*

Demographic questionnaire was applied to gather information about socio-economic characteristics.

Anthropometric measurements were done carefully with calibrated standard instruments such as scales, height gauges, and tape measure for mothers. A weighing scale was used for measuring the women's weight to the nearest 0.1 kg. They were asked to remove their shoes and with minimum clothing. They were asked to distribute their weight equally on both legs. After collection, data were checked thoroughly for consistency and completeness. Height, waist circumference, and hip circumference were also measured with standard methods for each mother. Waist circumference was measured in the midway between the iliac crest and the lower rib with a tape measure to the nearest 0.1 cm. The largest circumference around the hip was measured with a tape measure for hip circumference. For calculating body mass index (BMI) in mothers, weight in kilograms was divided by squared height in meters ( $\text{kg}/\text{m}^2$ ).

For assessing the children's growth, Z-score of height, weight, and head circumference for age were used. Anthropometric measurements for infants were done following standard procedures by healthcare providers in the Yasuj Health Centers. Infants' weight was measured to the nearest 0.10 kg using a children scale with minimal clothes after the scale had been properly calibrated. Supine height of infants was measured with a portable gauge with an accuracy of 1 mm. Infants were placed upwards with the head on the fixed side of the caliper and the body parallel to the long axis of the board. Head circumference was measured with a non-stretchable flexible tape to the nearest 1 mm. The tape was fitted around the infant's head, going from the supraorbital ridge to the occipital protuberance.<sup>2</sup> For assessing nutritional status in infants, Z-scores for weight, height, and head circumference were reported.

#### Maternal Depression Assessment

A multiple-choice self-assessment questionnaire with 21 questions named Beck questionnaire,<sup>15</sup> which is one of the most common psychometric tests to measure the severity of depression, was used for assessing depression in breastfeeding mothers. In its current version, BDI-II is designed for people aged 16 years and older and includes items related to depressive symptoms. Data were collected through face-to-face interviews. The Beck questionnaire contains 21 questions and each question can take a response from four statements showing the severity of depressive symptoms during the last 2 weeks (0-3). At the end, by adding all scores related to the 21 questions, a score between 0-63 was defined as the sum score of depression for each person.

#### Statistical Analysis

All the study analyses were performed using SPSS software version 21. Z-score was calculated

using the Anthro software. As to the quantitative variables, the means and standard deviations were reported. The Shapiro-wilk test was used to assess the normality of the data. To determine the relationship between neonatal growth and depression score, we used Pearson correlation for the data with normal distribution and Spearman correlation for the skewed data. The significance level of the tests was considered less than 0.05.

## Results

Ninety breastfeeding women over 18 years old participated in the current study. Mothers' mean age was  $30.01 \pm 5.94$  years and 84% of them were housewives. Considering maternal educational status, more than half of them had a diploma or higher (68.9%), and a smaller number had lower education. Most of the mothers included in the study had 1 and 2 children (80%) and a smaller percentage of them had more children (Table 1).

**Table 1:** Baseline demographic and anthropometric characteristics of the study participants

Age of mothers (year)*	30.01 (5.94)
Age of infants (day)*	81.2 (20.9)
Weight at birth (gr)*	3220.78 (447.92)
Maternal weight (kg)*	71.09 (10.74)
Maternal height (cm) <sup>8</sup>	160.15 (7.28)
Maternal Waist circumference (cm)*	90.98 (14.60)
Maternal Hip circumference (cm)*	105.35 (10.90)
Maternal BMI ( $\text{kg}/\text{m}^2$ )*	27.78 (4.36)
Sum Q*	12.01 (8.71)
Z score of Weight*	0.09 (0.82)
Z score of Height*	0.12 (0.87)
Z score of head circumference*	0.15 (0.74)
Education of mother**	
Illiterate	1 (1.1)
Primary school	8 (8.8)
High school	19 (21.1)
Diploma	24 (26.6)
Associate Degree	10 (11.1)
Bachelor	16 (17.7)
Master Degree	9 (10)
PhD	3 (3.3)
Mother's job**	
Housewife	84 (93.3)
Manual worker& Employee	5 (5.5)
Unemployed	1 (1.1)
Number of children**	
1	36 (40)
2	36 (40)
3	14 (15.5)
4	4 (4.4)
Birth Weight	
<2.5 kg	3 (3.3)
$\geq 2.5$ kg	87 (96.7)

\*Data are expressed as mean (SD); \*\* Data are expressed as frequency (percent); n=90 for all parameters

The infants included in the study were 2 to 4 months old and their mean weight at birth was  $3220.78 \pm 447.92$  grams. 96.7% of the infants had a birth

weight higher than 2.5 kilograms (others were low birth weight). The growth parameters of the infants were as follows: Mean Z score of the infants' weight was  $0.09 \pm 0.82$ , that of height was  $0.12 \pm 0.87$ , and that of head circumference was  $0.15 \pm 0.74$ . The socio-demographic and anthropometric characteristics of the study population including mothers and their infants are shown in Table 1.

The mean score of depression in mothers (according to the beck questionnaire) was  $12.01 \pm 8.71$  (Table 1).

The relationship between the study variables was also assessed. Due to the skewed data, Spearman correlation test was used for assessing the relationship between the mothers' depression score and infants' growth parameters. The results showed that the relationships between the mothers' depression score and Z score of infants' weight, height, and head circumference were not significant ( $P > 0.05$  for all of them) (Table 1).

Also, there was no significant correlation between the maternal depression score and maternal age, height, weight, waist circumference, and hip circumference. According to the relationship between other variables, maternal hip circumference was significantly associated with waist circumference and maternal weight ( $P < 0.001$ ,  $P < 0.001$ , respectively). Also, there was a significant relationship between the mother's weight and height with waist circumference ( $P < 0.001$ ,  $P = 0.004$ , respectively). Moreover, maternal

hip circumference was significantly associated with maternal weight ( $P < 0.001$ ). In addition, there was a significant relationship between the number of children with mother's age ( $P = < 0.001$ ), waist circumference ( $P = 0.001$ ), and mother's hip circumference ( $P = 0.007$ ) (Table 2).

Considering the mothers' educational status and occupation, mothers were classified into two groups for each of them (two groups for educational status: those with and without university education, and two groups for occupation: employed and housewives). There were no significant differences between different categories of education and occupation of the mothers considering the maternal depression scores and infants' growth (Table 3).

### Discussion

In developing countries, maternal depression is very common and can have negative effects on their children's growth.<sup>9</sup> The aim of this study was to investigate the relationship between breastfeeding mothers' depression and infants' growth.

In the present study, there were no statistically significant relationships between breastfeeding mothers' depression score and Z scores of the weight, height, and head circumference of the infants. Considering maternal educational status, a higher proportion of mothers (57.6%) had diploma and less than half of them had a university education. On

**Table 2:** Correlation between the study variables

Variable	Test	Z score of weight	Z score of height	Z score of head circumference	Sum Q
Z score of weight	Correlation coefficient	1.000	0.500	0.376	-0.109
	P value*	-	<0.001	<0.001	0.306
	N	90	90	90	90
Z score of height	Correlation coefficient	0.500	1.000	0.345	-0.049
	P value*	<0.001	-	0.001	0.644
	N	90	90	90	90
Z score of head circumference	Correlation coefficient	0.376	0.345	1.000	-0.110
	P value*	<0.001	0.001	-	0.301
	N	90	90	90	90
Sum Q	Correlation coefficient	-0.109	-0.049	-0.110	1.000
	P value*	0.306	0.644	0.301	-
	N	90	90	90	90

\*Spearman correlation was used for assessing the correlations;  $P < 0.05$  was considered significant

**Table 3:** Comparison of maternal depression scores and infants' growth between different groups of mothers considering their education and occupation

Classifications of mothers Education/ occupation	SumQ*	Head circumference Z Score	Height Z Score	Weight Z Score
With university education (n=38)	$10.8 \pm 8.6$	$0.25 \pm 0.74$	$0.19 \pm 0.94$	$0.18 \pm 0.77$
Without university education (n=52)	$12.9 \pm 8.7$	$0.11 \pm 0.75$	$0.07 \pm 0.82$	$0.06 \pm 0.86$
P values**	0.18	0.36	0.84	0.48
Employed (n=6)	$7.1 \pm 6.1$	$-0.11 \pm 0.8$	$-0.08 \pm 0.85$	$0.54 \pm 0.74$
Housewives (n=84)	$12.36 \pm 8.8$	$0.19 \pm 0.75$	$0.14 \pm 0.87$	$0.08 \pm 0.82$
P values**	0.14	0.32	0.58	0.16

\*Data are expressed as mean±SD; SumQ is related to the depression score; \*\* Due to the non-parametric data, Mann-Whitney U test was used for comparing the variables between different groups of mothers regarding their education or occupation

the other hand, there were no significant differences between the two groups of mothers based on their education or occupation in terms of depression scores and infants' growth. Mothers' hip circumference was significantly associated with waist circumference and maternal weight.

Findings of the current study are in line with those of some studies; however, there are some different results reported by others. The main reason for these differences can be possibly related to the population studied, study design, tools used for assessing depression status, and cut-offs considered in various studies.

One of the results of our study was that there was no significant relationship between maternal depression score and Z-score of the height, weight, and head circumference of the infants. In a prospective cohort study, 297 mothers without depression and 103 mothers with depression (18–36 years old) were assessed to find the relationship between postnatal depression and infants' physical growth. Z-scores of infants were evaluated three times at birth, after 6 weeks, or after 8 months in mothers with and without depression. They concluded that the Z scores of infants of depressed mothers were lower than those of non-depressed mothers, but it was not statistically significant<sup>2</sup> and their results were similar to those of our study. In the study by Sharmin et al., in addition to the weight for age Z scores, length for age Z scores, and MUAC were also measured. It was shown that infants of mothers with depression were more susceptible to malnutrition than the infants of healthy mothers ( $P < 0.001$ ), that was not in line with our study results. Probably because in the study by Sharmin, a large number of mothers who had depression used bottle milk for feeding their infants, and the mother's depression could affect the processes of care, feeding, and ultimately the growth of the infants, while in our study all infants were exclusively breastfed, and the infants' growth was not affected by maternal depression. Moreover, the sample size of their study was larger, and the study design was different from our study.

In another study, they assessed the relationship between maternal depression and child stunting in Ghana. In northern Ghana, they found that the prevalence of mothers' depression and stunting in children was estimated to be 27.8 and 16.1%, respectively. They evaluated children aged 0 to 59 months, and it was shown that children of depressed mothers were three times more likely to be stunted than healthy mothers<sup>8</sup> which was not in line with our study, probably because children aged 0 to 59 months were studied. It is obvious that older children had problems with complementary feeding and frequent exposure to infections that could negatively affect the child's growth and depressed mothers lost interest in childcare and nutrition activities.<sup>8</sup> However, in the

present study, children aged 2 to 4 months were assessed over a limited period of time, and there was not enough time for the growth to be affected by maternal depression. On the other hand, the included infants in the present study were exclusively breastfed and they hadn't started the complementary foods yet. Moreover, in the current study, the number of breastfeeding mothers was 90, of which 22 had a score of depression above 17 (based on Beck Depression Inventory) which shows a need for psychologist or psychiatrist advice. The frequency of depression in lactating mothers was 24.4%, and 16 mothers were a little depressed (17.7%). Hence, the number of depressed mothers was small, and this could also affect the relationships between maternal depression and infants' growth as well.

Further, in a European cohort study, no association was found between maternal depression and infants' growth. Depression of mothers was assessed with Edinburgh Postnatal Depression Scale (EPDS) at 2, 3, and 6 months postpartum. EPDS scores of 13 and above were considered as maternal depression. Also, weight, length, triceps, and subscapular skinfold thicknesses and body mass index (BMI) at two years old were measured. They concluded that a high maternal postnatal depression score did not have any major effect on the offspring growth in high-income countries;<sup>2</sup> the findings were consistent with those of the present study.

Moreover, in a study, the relationship between postpartum depression and short stature in 5 to 10-month-old infants in northern Ethiopia (among 232 mother–infant pairs) was assessed, and symptoms of mothers' depression were checked by EPDS ( $EPDS \geq 13$ ). They found that common predictors of neonatal short stature were lack of knowledge and practice in mothers regarding complementary foods, low socioeconomic levels or status, and lower educations in mothers, but maternal depressive symptoms were also significantly associated with neonatal short stature and poor complementary nutrition.<sup>16</sup> This was not in accordance with the findings of the present study. The reason for the difference in the results may be the fact that in their study, they examined the children aged 5 to 10 months that had started complementary feeding; they found that childcare activities such as complementary feeding were affected by depression of the mother,<sup>16</sup> while in our study the infants were 2 to 4 months old and were exclusively breastfed.

In our study, there was no significant relationship between the depression score and demographic characteristics such as maternal age, occupation, and education, birth weight of infants, and number of children. However, in another study,<sup>3</sup> there was a significant difference between demographic characteristics such as maternal age, maternal

occupation, and number of children in both groups of depressed and non-depressed mothers, which was not consistent with our study. Also, in a study, there were significant differences in the socioeconomic characteristics between the mothers with and without depression, as the depressed mothers were younger, currently unmarried, poorer, and had low birth weight babies;<sup>8</sup> this was not in accordance with the current study findings. The main reason of such difference could be possibly the low frequency of depressed mothers in the present study which could affect the results and also the fact that in our study all infants lived with both parents and most of them weighed more than 2.5 kilograms at birth.

According to the other findings of the present study, maternal hip circumference was significantly associated with waist circumference and maternal weight which seems logical as higher weight is accompanied with higher hip and waist circumferences in mothers.

As another finding, there was a significant relationship between the number of children with mother's age, waist circumference, and mother's hip circumference. It is obvious that the mother with more children has an older age. On the other hand, mothers with more children have higher waist and hip circumferences due to the weight gains during pregnancies and also because of the time they have to spend on children care. Putting more time on children's care could possibly cause self-neglect and weight gain in mothers which can affect their body size as they have limited time for physical activity and their own daily chores.

This study had some limitations that could affect the interpretation of results. One of the limitations of this study was that the depression score of breastfeeding mothers was only assessed once during the study and certainly the repetition of monitoring and assessing the mother's mental status could show better results of their depressive status. Also, it would be better to monitor and evaluate children's growth over a longer period, so that we could assess the child's growth more accurately. A larger sample size with higher numbers of depressed mothers or undernourished infants would help us achieve better results. Also, the study was performed on a limited sample in Yasuj who were exclusively breastfed, so the findings of this study cannot be generalized to the entire city of Yasuj.

Of course, studying the depression of breastfeeding mothers and the growth of their infants and helping to increase information in this particular area are the strengths of this study that can help the policymakers to decide better about the effects of maternal status on infants' growth and plan on mother-child care strategies based on this issue.

## Conclusion

In conclusion, the present study indicated that possibly

maternal depression could not affect the infant's growth in the exclusively breast-fed infants. It can be concluded that despite the depression of some mothers in the study, the children of these mothers grew well; in other words, it can be asserted that these mothers might have ignored the situation. Spiritually, they have made the same effort for the growth of their infants as others. However, more studies are warranted on depressed mothers and infants with poor growth over the time to compare the results with those of the normal infants and mothers to better elucidate the relationship between mothers' mental status and infants' growth. These studies can surely help the policymakers to better plan nutritional and health-promoting strategies for mother and child care.

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**Conflicts of Interest:** None declared.

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