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Original Article

The Relationship between Postpartum Depression in Parents and Infant Growth, Development, and Exclusive Breastfeeding: A Cohort Study in Tehran, Iran

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ABSTRACT

Background: Recent research suggests that mood disorders during pregnancy affect both parents, with maternal depression negatively impacting fetal and infant growth. However, few studies have simultaneously explored the influence of maternal and paternal depression on infant development and breastfeeding. This study aimed to concurrently examine the impact of postpartum depression in parents on the process of infant growth and exclusive breastfeeding.

Methods: This cohort study involved 150 couples and their infants at Vali-e-Asr Hospital in Tehran, utilizing convenience sampling. Data were collected via demographic questionnaires, the Beck Depression Inventory (BDI), and the Edinburgh Postnatal Depression Scale (EPDS) at three time points: the last trimester of pregnancy, immediately after childbirth, and 4 weeks postpartum. Infant growth indicators (weight, length, head circumference) were assessed at birth, with weight and exclusive breastfeeding evaluated at 4 weeks and 6 months postpartum.

Results: Maternal depression showed a significant correlation with infant growth indicators and exclusive breastfeeding ($P < 0.0001$). Paternal depression was significantly associated with infant head circumference at birth ($P < 0.001$). Logistic regression analyzed the relationship between maternal and paternal depression.

Conclusion: These findings highlight the role of parental postpartum depression in influencing infant growth, development, and breastfeeding. Pre-conception screening and psychological interventions are recommended to prevent these effects.

Keywords: Breastfeeding, Infant, Growth and development, Newborn, Postpartum depression

Introduction

Pregnancy and childbirth are two significant life events for women. The arrival of a child brings about sudden and substantial changes in a woman's roles and responsibilities. Consequently, the postpartum period represents a vulnerable time for the onset of maternal postpartum depression (PPD). PPD is a serious mental health concern and an episode of major depression that has profound negative effects on both the mother and her infant.

The prevalence of PPD varies considerably depending on the disorder's definition, the country of residence, the diagnostic tools employed, the chosen screening threshold, and the

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timeframe within which the prevalence is determined (1). The estimated prevalence of PPD ranges from 5% to 40% across different societies. Nonetheless, approximately 15% of women experience postpartum depression following childbirth (2). One study found that up to 16% of fathers experienced mild to severe depression during the two years following the birth of their child, while another study reported that 5% to 13% of husbands experienced depression immediately after their spouse's childbirth (3, 4).

Postpartum depression (PPD) typically begins between the second and sixth week after childbirth (5). In women experiencing postpartum blues, symptoms are not very pronounced and usually dissipate within two weeks. However, in women with PPD, symptoms are much more pronounced and have a significantly longer duration (6). The symptoms of PPD include feelings of inadequacy, loneliness, loss of affection for the infant, diminished self-esteem, and loss of interest in daily activities (7-8).

PPD has significant negative effects on both mothers and infants. For infants, problems arising from PPD include growth and developmental disorders, speech and cognitive issues, social difficulties, and a potential increased likelihood of future behavioral disturbances (9-10). PPD is associated with an increased risk of conditions such as asthma, diabetes, and diarrhea in children. It can also disrupt infants' sleep cycles and may be linked to structural brain abnormalities. Longer periods of PPD might be associated with psychiatric disorders in children, such as attention-deficit hyperactivity disorder (ADHD) and anxiety disorders (11). Infants born to depressed and anxious mothers prior to childbirth are at a higher risk of preterm birth and low birth weight, both of which are significant health concerns for newborns (12).

Another factor related to infant growth and development is exclusive breastfeeding. Breastfeeding offers numerous benefits for both the mother and her child's health. Breast milk contains all the necessary nutrients for healthy infant growth and development. Breastfeeding provides a special psychological stimulus for both the mother and the infant. During breastfeeding, the mother provides the child with feelings of warmth, security, and protection. By fostering a sense of security, emotional attachments formed during infancy are considered preventive factors against various undesirable behaviors in the future, such as criminal behavior, different addictions, and violence (11).

The results of a study demonstrated a lower prevalence of postpartum depression in women who exclusively breastfed their infants (13). Furthermore, in a systematic review conducted by Slomian et al. (2019), the findings indicated that PPD could lead to the occurrence of disorders in infant growth and development, including physical health, sleep, and motor, cognitive, language, emotional, social, and behavioral development. Additionally, PPD can play a significant role in the interactions and attachment between the mother and the infant (1).

Maternal depression negatively impacts fetal and infant growth. However, a limited number of studies have simultaneously investigated the effects of both maternal and paternal depression on fetal and infant growth and breastfeeding. This study aimed to concurrently examine the impact of postpartum depression in parents on the process of infant growth and exclusive breastfeeding.

Methods

A longitudinal (cohort) study was conducted to simultaneously investigate the impact of parental postpartum depression on infant growth and exclusive breastfeeding. To examine parental PPD, the sample size included 300 couples (150 wives and 150 husbands). Additionally, to assess the effect of parental PPD on infant growth and breastfeeding, 150 infants were included in this study. The study was conducted over the course of one year, from 2021 to 2022.

The present study was carried out at Vali-e-Asr Hospital. Questionnaires were distributed at three distinct time intervals: the last trimester of pregnancy, immediately after childbirth, and 4 weeks postpartum. The questionnaires were enclosed in designated postal envelopes. Before providing the questionnaires to the parents, detailed explanations about the study were given. After obtaining informed consent, individuals who met the inclusion criteria were enrolled in the study. These criteria included a gestational age of at least 35 weeks and the absence of known chronic conditions (such as chronic hypertension, cardiovascular diseases, kidney diseases, hematological disorders, thyroid disorders, and autoimmune diseases), as well as not having a high-risk pregnancy. Exclusion criteria for infants included diseases and congenital defects. After obtaining informed consent, participants were asked to return the completed questionnaires to the hospital via mail. It should be noted that participants were granted permission to withdraw

from the study at any time if they wished to discontinue their involvement.

The records of the study participants' infants were examined after childbirth to extract infant growth indicators, including birth weight, length, and head circumference. Subsequently, regarding breastfeeding, mothers were inquired about their method of feeding their infants immediately after birth (breastfeeding or formula). Following this, a telephone survey was conducted by the interviewer to follow up on the infant's weight at 4 weeks and the breastfeeding pattern at 6 months. Finally, 30 sets of questionnaires were not returned to the hospital; consequently, another group of eligible pregnant attendees was substituted.

The measurement tools utilized in this study included a demographic questionnaire, the Beck Depression Inventory (BDI), and the Edinburgh Postnatal Depression Scale (EPDS).

The Beck Depression Inventory (BDI) is a self-report questionnaire consisting of 21 questions. The content of this questionnaire predominantly focuses on cognitive aspects in depressed patients. Scoring in this test is based on a four-point scale ranging from 0 to 3. The items cover domains such as sadness, pessimism, feelings of inadequacy and failure, guilt, disturbed sleep, loss of appetite, self-dislike, etc. Specifically, 2 items pertain to affect, 11 items to cognition, 2 items to observable behavior, 5 items to physical symptoms, and 1 item to interpersonal symptomatology. This scale classifies varying degrees of depression from mild to very severe, with scores ranging from a minimum of zero to a maximum of 63. The validity of the Beck Depression Inventory in Iran has been reported as 0.80, and its reliability is reported as 0.81 (14, 15).

The Edinburgh Postnatal Depression Scale (EPDS) is a measure used to assess postpartum depression. The EPDS score ranges from zero to 30, and a score of 12 or higher is considered indicative of postpartum depression. Questions 1, 2, and 4 are scored from 0 to 3, while questions 3, 5, and 6 are scored from 0 to 10. In the present study, the Cronbach's alpha coefficient for the Edinburgh Postnatal Depression Scale was 0.70. The content validity and reliability of the EPDS test were determined to be 92% using the equivalence method (16).

A previous study found a correlation coefficient of r=0.165 between parental depression scores. Using this estimate, and considering a 5% error rate and a statistical power of 80%, 300 subjects participated in this study according to the sample size determination formula based on the correlation coefficient (17). The data were entered into SPSS 20 software. The results are presented as descriptive statistics, including frequency, mean, and standard deviation. The relationship between maternal and paternal depression was analyzed using logistic nonlinear regression analysis.

Ethical approval

This research protocol was approved by the ethics committee of Tehran University of Medical Sciences with design number 24057 and tracking code No. 13278, and ethics approval letter No. 1402/11/53/2228 dated 07/08/1402 (the letter of ethics approval is attached to the article).

Results

The results of the logistic nonlinear regression analysis indicated that maternal postpartum depression was significantly associated with infant growth measures at birth, such as weight, length, and head circumference, as well as with infant weight at 4 weeks. In other words, maternal postpartum depression can have a negative effect on infant and child growth and development. Conversely, children whose mothers *did not* experience postpartum depression showed better growth and development.

According to the binary logistic regression analysis, maternal history of depression (BDI) and maternal postpartum depression score (EPDS1) had a statistically significant relationship with the type of infant feeding at birth. Specifically, the results showed that, on average, with an increase of one unit in the maternal depression history score (BDI), the likelihood of using formula milk alongside breastfeeding in newborns increased by 9%. The same conclusion held true for the maternal postnatal depression score (EPDS1) (Table 3).

Furthermore, the results of the binary logistic regression analysis showed that paternal history of depression (BDI father) and maternal postpartum depression score (EPDS1) were significantly associated with the type of infant feeding at 6 months postpartum. However, other variables, namely maternal history of depression (BDI mother), paternal postpartum depression (EPDS1 father), and maternal and paternal depression at 4 weeks after birth (EPDS2 mother and father), were not significantly associated with the type of infant feeding at 6 months postpartum.

Moreover, the logistic regression analysis indicated that, on average, with an increase of one

Table 1. Demographic and psychological characteristics of participants

Variables	F (%)	Variables	F (%)
Education (Father)		Job (Mother)	
-Unfinished high school education	16(10.7)	-housewife	120(80)
-High school diploma and higher	134(89.3)	-employed	30(20)
Education (Mother)		Job (Father)	
-Unfinished high school education	31(20.7)	-unemployed	50(33.3)
-High school diploma and higher	119(79.4)	-employed	100(66/7)
Income		Type of Delivery	
-Not Good	5(3.3)	-NVD	15(13.6)
-Good	145(96.7)	-Cs	95(86.4)
Variables		M±SD	
Age(Father)		30.75±4.90	
Age(Mother)		34.44±5.14	
Gestational Age		37.6±2.84	
Psychological Variables			
Beck(Father)		17.37±9.28	
Beck(Mother)		12.76±6.79	
Edinburg1(Father)		11.61±5.71	
Edinburg1(Mother)		8.09±5.67	
Edinburg2(Father)		7.92±4.60	
Edinburg2(Mother)		6.57±4.83	

M±SD: Mean± Standard deviation
F (%): Frequency(Percent)

Table 2. Statistical characteristics of growth indicators and exclusive breastfeeding in the infant group

Variables	M±SD at birth	M±SD 4 weeks postpartum
Height	50±1.67	-
Head	35.31±1.59	-
Weight	3243.7±465.22	3986.77± 615.09
Variables	F (%) at birth	F (%) 6 months postpartum
Breastfeeding	110(73.3)	85(56.7)
Breastfeeding and formula	40(26.7)	65(43.3)

unit in the paternal history of depression score (BDI father), the odds of using both formula and breastfeeding in infants increased by 11%. Similarly, with an increase in the paternal depression score at 6 months after birth (BDI father), the odds of using both formula and breastfeeding, compared to exclusive breastfeeding, increased in infants at 6 months after birth. A similar trend was observed for the maternal postpartum depression score (EPDS1). The binary logistic regression analysis showed that, on average, with an increase of one unit in the maternal postpartum depression score (EPDS1), the odds of using both formula and breastfeeding in infants at 6 months after birth increased by 32%. In other words, the odds of using both formula and breastfeeding, compared to exclusive breastfeeding, increased by 32% at 6 months after birth with an increase of one unit in the maternal postpartum depression score (EPDS1).

Figure 1 demonstrates an inverse linear relationship between the maternal postpartum depression score and infant weight at birth. In other words, the infant's weight at birth tended to decrease with an increase in the maternal postpartum depression score (based on the EPDS). Although the magnitude of this correlation was not substantial, it was statistically significant.

Table 3. Analytical analysis of relationship between psychological variables and growth indicators and exclusive breastfeeding

Psychological Variables	Height at birth		Head circumference at birth		Weight at birth		Weight 4 weeks postpartum		Breastfeeding at birth		Breastfeeding 6 months postpartum	
	β	P-value	β	P-value	β	P-value	β	P-value	Adj. OR(CI)	P-value	Adj. OR(CI)	P-value
Beck (Father)	-0.051	0.5	-0.021	0.8	0.04	0.60	0.127	0.1	0.976(0.927-1.028)	0.3	1.119(1.040-1.203)	0.003
Beck (Mother)	0.190	0.06	-0.061	0.5	0.159	0.09	-0.006	0.9	1.092(1.011-1.180)	0.02	0.971(0.872-1.080)	0.5
Edinburg 1 (Father)	0.130	0.169	0.248	0.007	-0.030	0.7	-0.112	0.3	1.024(0.944-1.111)	0.5	1.132(0.972-1.318)	0.1
Edinburg1 (Mother)	-0.429	0.000	0.411-	0.000	-0.552	0.000	-0.826	0.000	1.091(1.000-1.191)	0.04	1.321(1.121-1.557)	0.001
Edinburg 2 (Father)	-	-	-	-	-	-	0.011	0.9	-	-	0.987(0.800-1.217)	0.9
Edinburg 2 (Mother)	-	-	-	-	-	-	0.191	0.19	-	-	1.084(0.874-1.344)	0.4

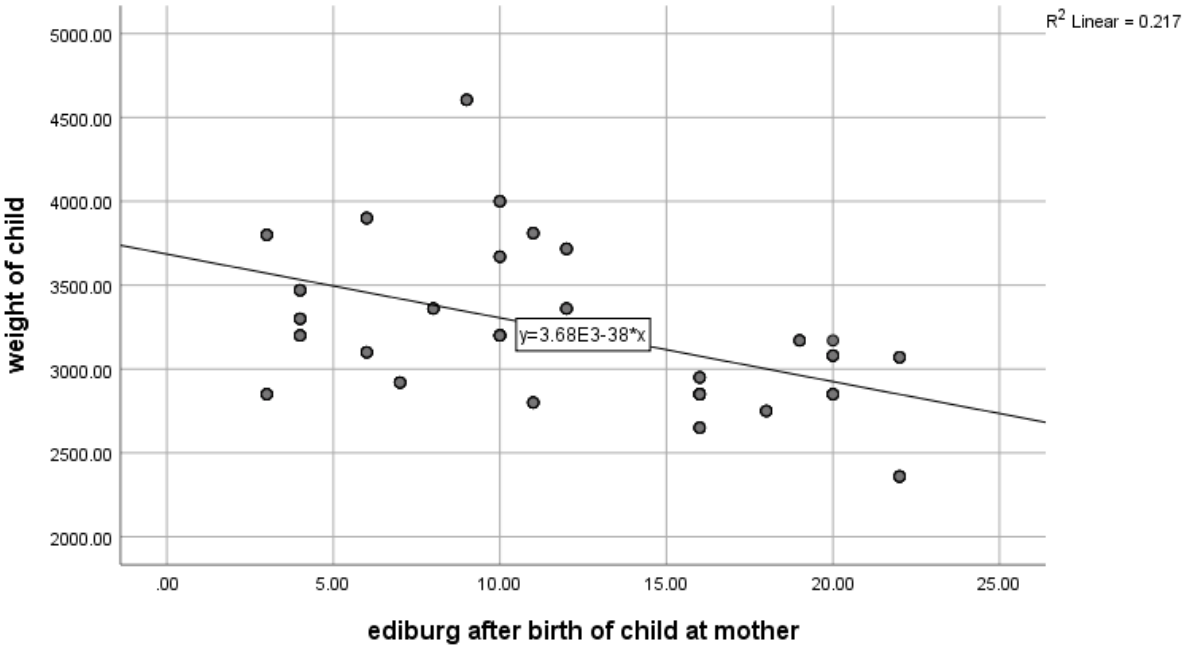

Figure 1. Linear relationship between maternal postpartum depression score and infant weight at birth

Figure 2 shows an inverse linear relationship between the maternal postpartum depression score and infant weight at 4 weeks after birth. This indicates that the infant's weight at 4 weeks postpartum tended to decrease with an increase in the maternal postpartum depression score (Edinburgh 1).

The results also show an inverse linear relationship between the maternal postpartum depression score (EPDS 1) and infant length at birth. In other words, the mean infant length at birth decreased with an increase in the maternal postpartum depression score after childbirth.

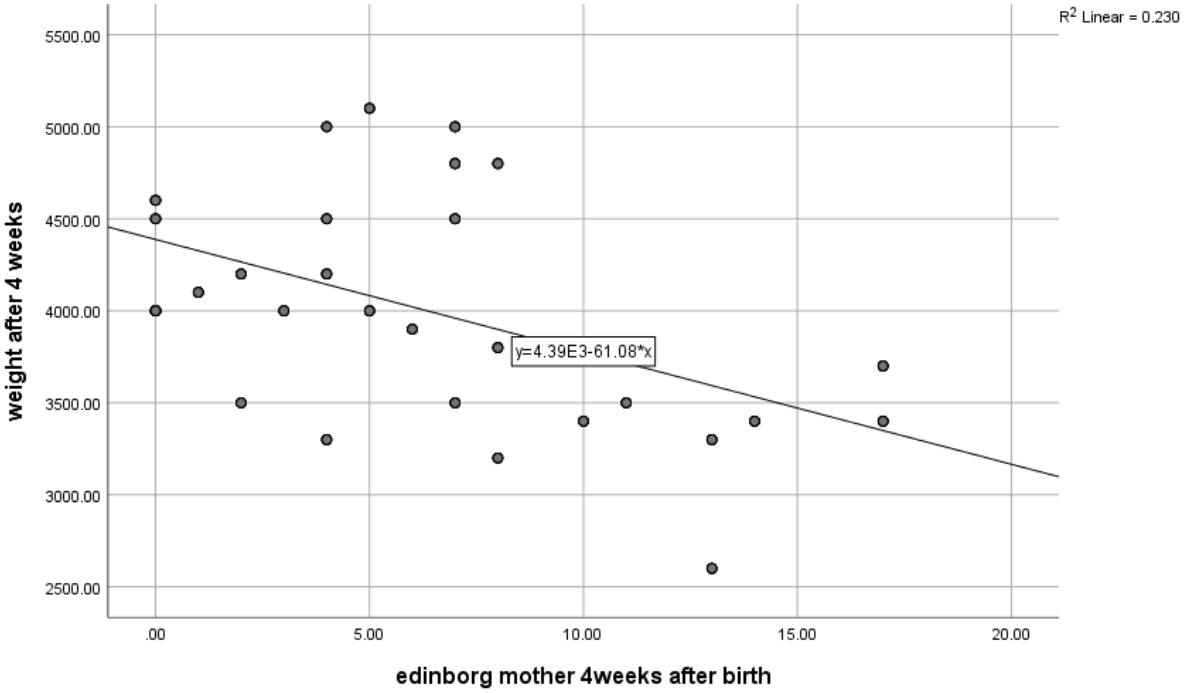

Figure 2. Linear relationship between maternal postpartum depression score and infant

Discussion

The main objective of this study was to explore the relationship between postpartum depression in parents and the continuity of breastfeeding and infant growth indicators. The findings obtained from this research demonstrated a significant correlation between the variables of interest. Specifically, infant growth indicators, including weight, length, and head circumference, as well as the intensity of breastfeeding, decreased with an increase in parental depression. In a study entitled "Maternal depression and anxiety and fetal-neonatal growth" conducted by Pinto et al. (2016) on 172 pregnant women, the results revealed that the infants of anxious mothers had significant differences in terms of weight (P=0.006) and length (P=0.025) at birth compared to infants of non-anxious mothers. This suggests that anxiety leads to a reduction in the weight and length of infants at birth (18). In a systematic review conducted by Solmian and colleagues (2019) to investigate postpartum depression and its consequences on infants, based on the extraction of 122 studies, the results indicated that postpartum depression could not provide a suitable environment for maternal personal growth as well as optimal infant development. Therefore, early intervention and necessary treatments should be carried out to identify postpartum depression and prevent its harmful consequences on both the mother and the infant (1). Miksic et al. (2020) conducted a study on 566 women, and the results indicated that women lacking postpartum depression symptoms had higher breastfeeding rates compared to women with mild or severe depressive symptoms. Similarly, the same conclusion has been reached regarding anxiety (11, 19, and 20). In the present study, an increase in the score of depression (BDI and EPDS) led to an increased likelihood of using both formula and breast milk compared to exclusive breastfeeding at birth and 6 months postpartum.

The findings of the present study are consistent with the results of similar studies. If psychological disorders such as depression and anxiety can impact exclusive breastfeeding and infant growth, it is essential to emphasize psychological disorders in parents, especially mothers, from the early stages of pregnancy. This approach can contribute to desired infant growth and increased rates of exclusive breastfeeding. It is worth noting that the results obtained from other studies have solely focused on the impact of maternal postpartum depression on infant growth, development, and exclusive breastfeeding. However, in the present study, fathers were also included as subjects of investigation. This distinction sets this study apart from others. The main focus of this study was to examine the correlation between paternal psychological variables and infant growth and development and breastfeeding. Therefore, based on the findings, it is essential to pay more attention to the mental health of fathers, similar to the attention given to the mental health of mothers. The results of the present study indicated the role of the father as an influencing factor on maternal mental health. In other words, the psychological characteristics of the father impact the mother, exerting an indirect effect on the infant's growth and development. It is recommended that simultaneous attention should be given to the mental health of both parents during pre-pregnancy and pregnancy periods in health policymaking.

Limitations and Recommendations

One of the limitations of this study was the lack of inquiry into the history of pre-conception depression due to the perceived lack of validity and reliability based on the participants' self-reports. Therefore, it is recommended that future studies investigate parental depression and other psychological disorders before pregnancy to control for all potential confounding variables. Additionally, although only the head circumference of the infant had a significant relationship with paternal depression, as discussed previously, paternal mental well-being could play a significant role in maternal mental health and subsequently affect infant growth indicators and breastfeeding. Accordingly, studies with larger sample sizes should be conducted for a more comprehensive examination of this relationship.

Due to the participants' lack of cooperation in long-term longitudinal studies and the absence of consistent and long-term health records in Iran, it was not feasible to investigate child growth and development into childhood or adolescence. Therefore, the researcher decided to focus on a limited timeframe based on the participants' circumstances. It is recommended that a long-term longitudinal cohort study be conducted, encompassing various child growth and development indicators, including cognitive, social, behavioral, emotional, and learning outcomes, up to the age of 7.

Conclusion

The results demonstrated a significant relationship between psychological variables (parental depression) and infant growth indicators, including weight, length, and head circumference, as well as between maternal depression and exclusive breastfeeding. A history of depression and the presence of PPD in parents directly influenced the growth indicators and breastfeeding in this study.

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Conflicts of interest

The authors declare no conflict of interest.

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