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The Factors Affecting the Postnatal Bonding of Mothers Whose Babies were Admitted to the Neonatal Intensive Care Unit During the COVID-19 Pandemic

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What is already known on this topic?

- *The life of the whole world has changed with the COVID-19 that started at the end of 2019. As it is known, anxiety, safety behavior, maternal depression, and post-traumatic stress disorder are common during pandemics. In our country, according to the recommendation of the scientific committee of the Ministry of Health, visitors including parents are not accepted in hospitals as pandemic precautions. Due to the precautions taken during the pandemic, there may be delays in this parent–infant relationship.*

What this study adds to this topic?

- *Low gestational week and birth weight, increased maternal age, high Edinburgh Postpartum Depression Scale scores, hospitalization in the neonatal intensive care unit and not being able to see baby, and maternal anxiety due to hospitalization are the factors that affect maternal bonding. No matter how bad the conditions are, besides informing the family, optimal conditions should be provided for the mother to see the baby.*

ABSTRACT

Objective: COVID-19 pandemic has created challenges for sick preterm babies and their parents. This study aimed to explore the factors affecting the postnatal bonding of mothers who were not permitted to visit and touch their babies who were in the neonatal intensive care unit during the COVID-19 pandemic.

Materials and Methods: This is a cohort study conducted in a tertiary neonatal intensive care unit in Turkey. The participants consisted of mothers who were offered full rooming in with their baby (group 1, n = 32) and mothers whose newborns had been admitted to the neonatal intensive care unit immediately after delivery and were hospitalized for at least 7 days (group 2, n = 44). The Turkish versions of Beck Anxiety Inventory, Edinburgh Postpartum Depression Scale, Adjustment Disorder–New Module 8, and Postpartum Bonding Questionnaire were applied to mothers. Tests were performed once in group 1 at the end of the first postpartum week (test1) and twice in group 2 before the baby was discharged from the neonatal intensive care unit (test1) and 2 weeks after the discharge (test2).

Results: None of the Beck Anxiety Inventory, Edinburgh Postpartum Depression Scale, Adjustment Disorder–New Module 8, and Postpartum Bonding Questionnaire scores was abnormal. Although the scales were within normal ranges, Postpartum Bonding Questionnaire 1 and Postpartum Bonding Questionnaire 2 had statistically significant correlation with gestational week ($r = -0.230$, $P = .046$; $r = -0.298$, $P = .009$), Edinburgh Postpartum Depression Scale score ($r = 0.256$, $P = .025$; $r = 0.331$, $P = .004$), hospitalization ($r = 0.280$, $P = .014$; $r = 0.501$, $P < .001$), and neonatal intensive care unit anxiety ($r = 0.266$, $P = .02$; $r = 0.54$, $P < .001$). Postpartum Bonding Questionnaire 2 had statistically significant correlation with birth weight ($r = -0.261$, $P = .023$).

Conclusion: Low gestational week and birth weight, increased maternal age, maternal anxiety, high Edinburgh Postpartum Depression Scale scores and hospitalization negatively affected maternal bonding. Although all self-reporting scale scores were low, being in the neonatal intensive care unit and not being able to visit (touch) the baby is a major stressor.

Keywords: Bonding, COVID-19, intensive care, newborn

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INTRODUCTION

Maternal bonding is a unique type of bonding that begins with pregnancy and is considered to continue throughout the postpartum period.[1] Within the scope of many studies conducted on bonding and bonding theories, maternal bonding is considered to be the deepest and most intimate relationship period for mother and baby.[2]

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In Bowlby and Ainsworth's[2] definition of mother–child bonding, it was stated that behavioral factors such as sucking, crying, and hugging were used to prevent separation of the mother. These behaviors allow the newborn to live, and mothers who participate in this process mature and develop a sense of secure bonding to their babies.[3] It is thought that the earlier and healthier the communication and interaction that the mother establishes with her baby develops, the stronger the feeling of motherhood will develop. Bonding is essential for the survival and development of human infants.[4] Some practices facilitate mother–infant bonding in the postpartum period, such as early skin-to-skin contact, kangaroo care, and sharing the same room.

As it is known, the life of the whole world has changed with the COVID-19 that started in China at the end of 2019 and spread rapidly all over the world in a very short time.[5] Previous studies of pandemics have shown that anxiety, safety behavior, maternal depression, and post-traumatic stress disorder are common during these times.[6,7] In March 2020, the epidemic of a previously unknown disease was confirmed in Turkey and we began to take precautions against this pandemic. Social distance, ventilating closed areas, washing hands, reducing physical contact, quarantine, and wearing a face mask in public environments were recommended. In our country, according to the recommendation of the scientific committee of the Ministry of Health, visitors including parents were not accepted in hospitals as pandemic precautions. Thus, having a baby in the neonatal intensive care unit (NICU) has been an extremely stressful situation for most parents. For whatever reason, there was often anxiety about the baby's prognosis during this time when the visit was not permitted. We conducted this study assuming that the precautions taken in the hospital during the pandemic would negatively affect mother–infant bonding which is expected to develop in the first days of birth. This study aimed to investigate the factors affecting the postnatal bonding of mothers who cannot see or touch their babies hospitalized in the NICU.

MATERIALS AND METHODS

Design

This was a cohort study conducted in a tertiary NICU in Turkey. The study protocol was designed in compliance with the Declaration of Helsinki. Informed consent was obtained from participants, and the study was approved by the Marmara University Ethical Committee on October 2, 2020 with a protocol number 09.2020.1040.

Participants

The study participants were divided into 2 groups: group 1 consisted of mothers whose babies were healthy and followed up in the maternity ward in the postnatal period and there was no mother–infant separation. Group 2 consisted of mothers of newborns whose babies were admitted to the NICU immediately after delivery and had been hospitalized for at least 7 days.

Procedures and Instruments

Between October 2020 and April 2021, a face-to-face interview was conducted with mothers. In the questionnaire, gestational age, birth weight, duration of hospital stay of the infant; age, gravida, parity, marital, educational, income status, and occupation of mothers were recorded. Group 1 was questioned once at the end of the first postpartum week (test1). Mothers who did not have any contact with their babies due to COVID-19 precautions during NICU stay (group 2) were investigated on 2 occasions: at first contact in the NICU before the baby was discharged (test1) and at the outpatient clinic 2 weeks later after the discharge (test2). The Turkish versions of Beck Anxiety Inventory (BAI), Edinburgh Postpartum Depression Scale (EPDS), Adjustment Disorder–New Module 8 (ADNM), and Postpartum Bonding Questionnaire (PBQ) were applied to mothers. All of these 4 scales were applied to all participants (test1), and test2 was applied only to group 2.

- Beck Anxiety Inventory scale is a 21-question self-report inventory. Each item is scored from 0 (not at all) to 3 (severely) and the total score is 63. A total score of 0–7 is defined as minimal, 8–15 as mild, 16–25 as moderate, and 26–63 as severe levels of anxiety.[8]
- Edinburgh Postpartum Depression Scale is a screening scale developed to determine the risk of depression in women in the postpartum period. This self-assessment scale consists of 10 items including the psychological state of the individual in the last 7 days, each item is graded 0–3 and the total score is 30.[9] The higher total score indicates the severity of the depression. With a sensitivity of 0.84 and a specificity of 0.88 for depression, the cut-off point is accepted as 13.[10]
- Adjustment Disorder–New Module 8 is a self-report for the assessment of adjustment disorder. In this questionnaire aimed at examining the psychometric properties of adults, there is a list of stressful life events that have occurred in the past (1 or 2) years and people are asked to choose various expressions as never too often as to which reactions to the events imposed them.[11] A score above 47 is interpreted in favor of adjustment disorder.
- Postpartum Bonding Questionnaire has been developed to provide early diagnosis of problems in a mother–infant relationship and is filled by the mother.[12] Each item was answered on a 6-point Likert scale labeled as "always," "very often," "quite often," "sometimes," "rarely," and "never." This scale consists of 4 subunits: 12 items for "bonding disorder," 7 items for "rejection and irritability," 4 items for "stress about care," and 2 items for "risk of abuse." Cut-off points were defined as 12 for factor I, 17 for factor II, 10 for factor III, 3 for factor IV, and 26 for the scale overall.[12] A high score on this questionnaire indicates low maternal bonding.

Mothers were asked some open-ended questions; for example, "Are you worried about the COVID-19 pandemics?" (COVID anxiety), "Were you worried about your baby during the coronavirus pandemic?" (worry about baby), "How did you feel your baby was hospitalized?," and "Were you worried while your baby was in the NICU?" (NICU anxiety). They were asked to give a score between 0 (min) and 10 (max) and then share their feelings.

Statistical Analysis

Statistical Package for Social Sciences version 20 (IBM Corp.; Armonk, NY, USA) was used for statistical analysis.

Kolmogorov–Smirnov analysis, histogram, and Q–Q plot were used to evaluate the normal distribution of continuous variables. Normally distributed data were shown as mean ± standard deviation and analyzed by independent *t*-test. The median value (min-max) was shown for data that did not show the normal distribution and analyzed by the Mann–Whitney *U* test. Categorical variables were shown as numbers (%). Spearman correlation and multiple linear regression analyses were used because the number of patients with bonding problems was very small. A linear regression model was used to compare the multiple effects of independent risk factors that may be effective in the development of depression in the postpartum period. In multiple linear regression, the following variables were analyzed by backward elimination method: group, sex, diagnosis, delivery type, birth weight, NICU days, maternal age, gravida, parity, assurance, marital status, education, occupation, employment, partner's education and occupation, income, maternal depression history, family history of psychiatric illness, family social support, BAI, EPDS, ADNM, COVID anxiety, worry about baby, and NICU anxiety. A $P < .05$ value was used as the statistical significance level. The coefficient strength of the correlation and the level of relationship were as follows: 0.00-0.25 as very weak, 0.26-0.49 as weak, 0.50-0.69 as moderate, 0.70-0.89 as high, and 0.90-1.0 as very high.

RESULTS

Of the 222 patients born during the study time, 76 women who met the study criteria and agreed to participate were included in this study. The number of participants was low due to the high number of babies hospitalized in the NICU in less than 7 days, such as hyperbilirubinemia, transient tachypnea of newborn, and the high number of mothers who did not agree to participate in the study. The characteristics of group 1 (n = 32) and group 2 (n = 44) were presented in Table 1. The mean NICU hospitalization days of group 2 were 30.5 ± 6.1 which was higher than that of group 1, as expected, and there was a significant difference between the groups ($P < .001$).

Mothers spread over 3 BAI levels: minimal (n = 67), mild (n = 7), and moderate (n = 2). None of the mothers had an EPDS score higher than 13. To the ADNM-8 questionnaire, 22 participants stated a stressful event in their lives. These participants, who scored an average of 4 (0-36), were not considered to have adjustment disorders. All scale scores were within normal limits.

Table 2 shows the correlation of maternal bonding scores with sociodemographic data and scales. There was a statistically significant correlation between having a baby in the NICU and PBQ2 scores ($r = 0.518$, $P < .001$). Admission to the NICU increases bonding scores.

There was a statistically significant correlation between gestational week and PBQ1 ($r = -0.230$, $P = .046$) and PBQ2 scores ($r = -0.298$, $P = .009$). We observed that as the gestational week increased, bonding developed more and bonding problems were less in these mothers. There was a statistically significant correlation between PBQ2 scores and birth weight ($r = -0.261$, $P = .023$). It was observed that bonding improved as birth weight increased and these mothers had lower bonding problem scores.

Table 1. Descriptive Characteristics and Distribution of Baby–Mother Dyads

	Group 1 (%)	Group 2 (%)	*P*
Gestation week	38.4 ± 1.4	34.5 ± 4.5	<.001[a]
Birth weight	3211.9 ± 421	2475 ± 1003.2	<.001[a]
Sex of newborn (female)	20 (47.6)	22 (52.4)	.279[b]
Delivery type (NSD)	18 (52.9)	16 (47.1)	.085[b]
Inpatient days	1.7 ± 0.5	30.5 ± 36.1	<.001[a]
Mother age	29.1 ± 5	29.2 ± 6.5	.967[a]
Gravida	2.6 ± 1.4	2.4 ± 1.3	.661[a]
Parity	2.1 ± 1	2.1 ± 1	.869[a]
Assurance status			
No	2 (33.3)	4 (66.7)	.650[b]
Yes	30 (42.9)	40 (57.1)	
Marital status (unmarried)	0 (0)	1 (100)	.391[b]
Educational status			
Illiterate	2 (40)	3 (60)	.935[b]
Primary school	4 (44.4)	5 (55.6)	
Secondary school	8 (42.1)	11 (57.9)	
High school	12 (38.7)	19 (61.3)	
College	6 (50)	6 (50)	
Occupation			
Housewife	25 (41)	36 (59)	.143[b]
Nurse	2 (100)	0 (0)	
Doctor	0 (0)	1 (100)	
Self-employment	2 (100)	0 (0)	
Teacher	3 (30)	7 (70)	
Employment status of mother (employed)	6 (50)	6 (50)	.546[b]
Partner's education			
Primary school	6 (35.3)	11 (64.7)	.756[b]
Secondary school	9 (42.9)	12 (57.1)	
High school	9 (39.1)	14 (60.9)	
College	8 (53.3)	7 (46.7)	
Partner's employment status (employed)	31 (41.3)	44 (58.7)	.238[b]
Economic status (self-reported)			
Less than expenditure	12 (70.6)	5 (29.4)	.016[b]
Equal to expenditure	14 (30.4)	32 (69.6)	
More than expenditure	6 (46.2)	7 (53.8)	
Maternal depression history	5 (62.5)	3 (37.5)	.217[b]
Family history of psychiatric illness	5 (58.3)	4 (41.7)	.215[b]
Family social support	23 (43.4)	30 (56.6)	.729[b]

[a]Mann–Whitney *U* test; [b]Chi-square test; NSD, normal spontaneous delivery.

We found that as EPDS scores increase, PBQ scores increase. A statistically significant correlation was found between EPDS1 and PBQ1 ($r = 0.256$, $P = .025$) and between EPDS2 and PBQ2 ($r = 0.331$, $P = .004$).

Table 2. The Correlation of Maternal Bonding Scores of All Participants with Sociodemographic Data and Scale

		PBQ1	PBQ2
Spearman's rho			
Having baby in NICU	Correlation coefficient	0.200	0.518
	Sig. (2-tailed)	0.083	<0.001
Sex	Correlation coefficient	−0.004	−0.014
	Sig. (2-tailed)	0.971	0.906
Delivery mode	Correlation coefficient	0.104	0.051
	Sig. (2-tailed)	0.370	0.660
Gestation week	Correlation coefficient	−0.230	−0.298
	Sig. (2-tailed)	0.046	0.009
Birth weight	Correlation coefficient	−0.112	−0.261
	Sig. (2-tailed)	0.335	0.023
Hospitalization day	Correlation coefficient	0.280	0.501
	Sig. (2-tailed)	0.014	<0.001
Assurance status	Correlation coefficient	−0.076	−0.041
	Sig. (2-tailed)	0.514	0.725
Marital status	Correlation coefficient	−0.164	−0.070
	Sig. (2-tailed)	0.157	0.547
Economic status	Correlation coefficient	−0.107	−0.018
	Sig. (2-tailed)	0.359	0.878
Family social support	Correlation coefficient	0.114	−0.016
	Sig. (2-tailed)	0.326	0.893
PBQ1	Correlation coefficient	1.000	0.561
	Sig. (2-tailed)		0.000
PBQ2	Correlation coefficient	0.561	1.000
	Sig. (2-tailed)	0.000	
BAI1	Correlation coefficient	0.171	0.082
	Sig. (2-tailed)	0.141	0.479
BAI2	Correlation coefficient		0.427
	Sig. (2-tailed)		<0.001
EPDS1	Correlation coefficient	0.256	0.044
	Sig. (2-tailed)	0.025	0.703
EPDS2	Correlation coefficient		0.331
	Sig. (2-tailed)		0.004
ADNM1	Correlation coefficient	0.032	−0.114
	Sig. (2-tailed)	0.782	0.327
ADNM2	Correlation coefficient		0.165
	Sig. (2-tailed)		0.153
COVID anxiety1	Correlation coefficient	−0.042	−0.014
	Sig. (2-tailed)	0.716	0.905
Worry about baby1	Correlation coefficient	0.096	−0.047
	Sig. (2-tailed)	0.410	0.686
NICU anxiety	Correlation coefficient	0.266	0.540
	Sig. (2-tailed)	0.020	<0.001
COVID anxiety2	Correlation coefficient		0.425
	Sig. (2-tailed)		<0.001
Worry about baby2	Correlation coefficient		0.433
	Sig. (2-tailed)		<0.001

ADNM, Adjustment Disorder–New Module; BAI, Beck Anxiety Inventory; EPDS, Edinburgh Postpartum Depression Scale; NICU, neonatal intensive care unit; PBQ, Postpartum Bonding Questionnaire. Spearman correlation results, <0.25 very weak correlation; 0.26-0.49 weak correlation; 0.50-0.69 moderate correlation; 0.70-0.89 high correlation; 0.90-1.0 very high correlation.

Table 3. Multiple Linear Regression Associations of PBQ 1 Scores

Variable	B	95% CI	*P*
Groups 1, 2	0.230	(0.023, 0.438)	.030
BAI1	0.029	(0.005, 0.054)	.020

BAI, Beck Anxiety Inventory; PBQ, Postpartum Bonding Questionnaire.

Although the PBQ1 and PBQ2 scores of group 2 were within normal limits, there was a significant difference (7.9 ± 9.6 vs. 3.0 ± 6.4; $P < .001$). We found that bonding increased during the follow-up, and therefore, we analyzed the factors affecting it. Table 3 shows the multiple linear regression results of the variables affecting the bonding problems in the first evaluation. Hospitalization and high BAI scores affected bonding scores. As shown in Table 4, hospitalization, increased maternal age, maternal occupational status (from housewife to occupation), increased BAI score, and maternal anxiety due to hospitalization were associated with higher PBQ2 scores.

Hospitalization time statistically correlated with PBQ1 scores ($r = 0.280$, $P = .014$) and PBQ2 scores ($r = 0.501$, $P < .001$). The baby's presence in the NICU and NICU anxiety had statistically significant correlation with PBQ1 ($r = 0.266$, $P = .02$) and PBQ2 ($r = 0.540$, $P < .001$). Postpartum Bonding Questionnaire 2 was positively correlated with anxiety during the COVID-19 pandemic ($r = 0.425$, $P < .001$) and worrying about the baby during this pandemic ($r = 0.433$, $P < .001$).

DISCUSSION

The COVID-19 pandemic has not only been a health problem but has also affected psychosocial and economic life in many areas around the world.[5] When both a high-risk COVID-19 pandemic and the postpartum period overlap, the impact may be more striking. Giving birth in a hospital with visit restrictions due to the COVID-19 pandemic may affect the mother's psychological state and bonding. In our study, none of the mothers' EPDS scores were above the normal. Postpartum depression is a widespread health problem that the prevalence has been reported to vary between 5% and 13%.[4] In a study conducted with 227 pregnant women, postnatal depression was found in approximately one-third of them.[13] In a meta-analysis from Turkey, the prevalence of postpartum depression was 24%.[14] A recent study conducted in Catalonia involving 56 term infant–mother dyads investigating maternal mental health and breastfeeding in the COVID-19 pandemic reported that 25% of mothers without mother–infant separation had high EPDS scores.[15] Although it is known that this difference in prevalence may be due to variations in the diagnostic criteria used in the

Table 4. Multiple Linear Regression Associations of PBQ 2 Scores

Variable	B	95% CI	*P*
Maternal age	0.013	(0.003, 0.024)	.016
Occupation	−0.054	(−0.098, −0.010)	.017
BAI2	0.026	(0.011, 0.042)	.001
NICU anxiety	0.028	(0.004, 0.052)	.021

BAI, Beck Anxiety Inventor; PBQ, Postpartum Bonding Questionnaire.

screening methods and the timing of the evaluation, none of the mothers in our study had symptoms of depression.

In our study, 13.2% of mothers expressed COVID-19 as a stressful life event and no adjustment disorder was found in any of them. Similar to our study, in a study conducted with the parents of 25 infants who were hospitalized for at least 8 days and there were restrictions of visits due to COVID-19, 30% stated COVID-19 as a major stressor.[16]

Postpartum Bonding Questionnaire scores of group 1 and group 2 were within normal limits. A result of multiple linear regression analyses, hospitalization and not being able to see and touch the baby affected the PBQ scores significantly In this study, increased maternal age was associated with decreased maternal bonding. In a meta-analysis of 74 studies, it was stated that increasing maternal age reduces maternal attachment and is a contributing factor to postpartum depression.[17]

We also found that as the gestational week increased, bonding developed more and bonding problems were less in mothers. A study conducted at postpartum 2-18 months found that mothers of low birth weight infants had higher levels of insecure bonding.[18] In the contrary in a study conducted with mothers of premature babies with low birth weight, although they had higher levels of stress in their first year of life than controls, no significant difference was found between the 2 groups in terms of bonding.[19]

When we asked mothers whether they received social support from their families, about 70% of them affirmed this support. The hospital where this study was conducted is socioeconomically below the provincial average and generally serves in a region that receives internal migration. Most people are in a similar cultural structure, trying to maintain their kinship relations and can receive social support as most of the mothers stated. The low anxiety, depression, and maternal bonding scale scores in our study and the lack of difference between the groups may be because bonding started during pregnancy due to the cultural structure of the mother and she adopted her baby as a part of her. Petri et al[20] reported in their study that maternal bonding was the most significant variable associated with postpartum depression, anxiety symptoms, and the quality of mother–infant bonding. In a study of women from 3 different cultures in the United Kingdom, it was stated that culture plays an important role in the amount of functional support available from the social network in postnatal depression.[21] According to a study conducted in Japan, bonding failure in the postpartum period was significantly affected by mothers' self-perceived social support during pregnancy and was associated with the absence of depression in the postpartum period.[22] On the contrary, it was reported in another study that the level of depression during pregnancy and the anxiety in the postpartum period negatively affected maternal bonding and that family type and social support do not have an effect on this.[13] In our study, EPDS and BAI scores were within normal limits; similarly, we found that maternal depression and anxiety affect maternal bonding.

In our study, the majority of infants in the NICU were less than 37 weeks of gestation and hospitalization time was 30.5 ± 36.1 days. Unfortunately, group 2 mothers had very few visits to their babies. Hospitalization time, the baby's presence in the NICU, and NICU anxiety have been found to affect PBQ 1 and PBQ2. In a study of 69 mothers of very-low-birth-weight premature infants, a lower rate of maternal visit in the first 2 weeks after birth was associated with a higher maternal depression score at postnatal fourth month.[23] In the present study, mothers who could not see their baby during the pandemic had higher anxiety, but they stated that their worries generally decreased within a few days, and their worries quickly decreased after they were sure that the nurses and doctors were taking good care of their babies. It was reported both depressive and anxiety symptoms were found to be higher at the time of admission to the NICU compared to 2-4 months later.[24] A study from Italy reported that not being able to spend time with their babies due to visiting restrictions negatively affects their parenting experiences and creates additional concerns about the health of infants.[16] In a meta-analysis of mothers whose infants were hospitalized in the NICU, it was stated that different approaches such as cognitive behavioral therapy, touch, kangaroo care, parent–physician communication had a significant effect on reducing maternal depressive symptoms after intervention.[25] These approaches have also been reported in the literature to be effective in reducing maternal anxiety.[26] Although families in our study did not see their babies while they were in the NICU, it seems that giving regular phone information every day and sending weekly baby photos reduced their anxiety. If the family had anxiety, we called before they asked and gave information about the baby more than once during the day.

CONCLUSION

In our study, although PBQ scores were within normal limits, it was found that low gestational week and birth weight, increased maternal age, maternal anxiety, high EPDS scores, hospitalization in the NICU, and not being able to see the baby affected maternal bonding. Now, hospital visits have started for a while with routine family meetings, kangaroo care. Providing the best support to the mother and families should be the goal of all health care providers.

Ethics Committee Approval: Ethical committee approval was received from the Ethics Committee of Marmara University (approval No: 09.2020.1040).

Informed Consent: Informed consent was obtained from participants of the study.

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