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# Relationship between mindfulness and maternal stress and mother – Infant bonding in neonatal intensive care unit

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## Abstract:

**BACKGROUND:** Having a baby admitted to a neonatal intensive care unit (NICU) is so stressful, has a negative impact on mother well-being, and also disrupts mother-infant bonding process because the infant spend the first several weeks or months in the NICU. Previous studies have shown the positive association of the mindfulness and various health conditions. This study investigated the relationship between mothers' dispositional mindfulness and level of stress and bonding in mothers with infants in the NICU.

**MATERIALS AND METHODS:** A cross-sectional study was performed during 2019 on 140 mothers with newborns admitted to the NICUs in two hospitals in Qom city in Iran. The self-report measures of dispositional mindfulness, Parental Stressor Scale: NICU, and the Postpartum Bonding Questionnaire were administered to mothers on the 2<sup>nd</sup>–5<sup>th</sup> day after birth. The data analysis was carried out by using a stepwise multiple regression model.

**RESULTS:** The mean scores of mindfulness, stress, and bonding were  $3.32 \pm 0.52$ ,  $2.32 \pm 0.77$ , and  $0.47 \pm 0.37$ , respectively. There was a statistically significant inverse relationship between total mindfulness score and stress ( $P < 0.001$ ). Furthermore, high scores of mindfulness were associated with better bonding ( $P = 0.04$ ).

**CONCLUSIONS:** Improvement in mindfulness helps mothers to reduce stress and make better bonding with infants. It is recommended that mindfulness interventions use during pregnancy also after birth, especially for mothers that their infants admitted to in the NICUs.

## Keywords:

Bonding, mindfulness, neonatal intensive care unit, stress

## Introduction

It is well-proven that preterm birth (born <37 weeks' gestation) and hospitalization an infant in the neonatal intensive care unit (NICU) is highly stressful and exposes parents at risk to trauma symptoms.<sup>[1-4]</sup> Parenting stress in NICU that defined as an imbalance between expectations, perceived resources, and demands of caregiving<sup>[3]</sup> originates not only from uncertainty about neonate's baseline condition and prognosis but also from medical problems, such as infection and nutritional and respiratory disorders.<sup>[5]</sup>

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The NICU experienced as the stressful, noisy, and cold environment also infants in the NICU is usually less accessible to the mothers because of the monitor leads, tubes for feeding, and breathing.<sup>[5]</sup> In addition, mothers in the NICU are in the postpartum period that is accompanied by hormonal changes, family role changes, new responsibilities, fatigue, and sleep problems.<sup>[5-7]</sup> High level stress experienced by mothers in the NICU has led to depression, anxiety,<sup>[8]</sup> symptoms of acute stress disorder, and posttraumatic stress disorder in them.<sup>[9,10]</sup>

Previous research reported that 62% of mothers with NICU infants experience

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stress and 39%–63% of them experience postpartum depression.<sup>[11,12]</sup> These symptoms usually persist until after the baby is discharged from the hospital<sup>[9]</sup> and also can negatively affect the mother-infant bonding.<sup>[13]</sup> Bonding refers to the primary relationship between mother and infant that is characterized by an emotional response to the infant, especially in the 1<sup>st</sup> year after childbirth.<sup>[14,15]</sup> It denotes the development of parental feelings toward the baby and occurs within the 1<sup>st</sup> h after birth and is reinforced by bodily contact.<sup>[8]</sup>

The quality of the bonding impacts directly on the child's physical, mental, and developmental health. Hence, this communication should be intimate, warm, steady, and kindly and providing comfort and pleasure for baby also mum.<sup>[16,17]</sup> The absence of a good attachment to the primary caregiver put the babies at risk of future emotional and behavioral problems.<sup>[18,19]</sup> When the infant spends the first few weeks or months in the NICU, the formation of bonding disrupted.<sup>[20]</sup> According to above, pay attention to mother's stress and mother-infant bonding in the NICUs is important not only for improving mother's psychological health but also for improving physical and mental health of babies.

The notable point is that not all people in stressful situations respond equally and some individual features lead to better adaptation to high stress. One of the individual traits is mindfulness.<sup>[21]</sup> Mindfulness is defined as a dispositional (trait) property and as a provisional status of mind that can growth by mindfulness exercises.<sup>[22]</sup> It is "the awareness that become by focusing on the goal in the present moment, and by being nonjudgmental to the experience happening moment by moment."<sup>[23]</sup> Mindfulness leads to a lasting sense of well-being by simply accepting what is happening and knowing that this experience is also passing and then will have been replaced by new experience.<sup>[24]</sup>

Numerous studies have suggested the relationship between mindfulness and psychological symptoms, even better feelings of security and attachment.<sup>[25]</sup> Few studies have assessed the role of mindfulness during pregnancy and childbirth, and they limited to normal pregnancy and childbirth, for example, Kordi and MohamadiRizi's (2016), showed a significant relationship between mother's mindfulness and attachment to fetus and newborn during pregnancy and after childbirth.<sup>[26]</sup> However, there are not studies that have assessed consequences of mother's mindfulness in the most difficult conditions after childbirth in the NICU. Mothers of preterm infants in the NICU confront with a lot of fear from complexity of the NICU environment, they worry that their child is not going to be a healthy child, worry that this situation is somehow their fault, and worry that they won't be able to do what it's

going to take care of the infant with special needs. It is not clear in this bad situation whether the mother's mindfulness can still help them to overcome their stress and whether mindfulness can help mothers to establish a good bonding. Therefore, this study was designed to investigate the relationship between mothers' dispositional mindfulness and the level of maternal stress and mother-infant bonding in mothers with newborns admitted in the NICU.

This study was carried out to examine the relationship between mindfulness trait and maternal stress and mother-infant bonding in the NICU.

## Materials and Methods

### Study design and setting

This cross-sectional study was performed to investigate the relationship between maternal mindfulness to maternal stress and the mother-infant bonding among 140 mothers with infants admitted to the NICUs in two governmental, academic hospitals in Qom city in IRAN during 2019. In order to conduct the research after necessary coordination with the head physicians and head nurses, two research colleagues working in each NICU approached the mothers in the 2<sup>nd</sup> to 5<sup>th</sup> days of infant admitting to NICU and provided the questionnaires to them and they were available for any explanation. In case of maternal fatigue or any other problem which prevented the completing of the questionnaire in one phase, this performed in two phases. Furthermore, for mothers who wanted to complete the questionnaires at home, the questionnaires were delivered to them and they were asked to return the completed questionnaires the next day.

### Study participants and sampling

According to the sample size formula for multiple regression model, 5% type I error, 80% power, and effect size  $f^2$  equal to 0.15 as a medium value, totally 140 mothers with infants admitted to the NICUs were determined for this study. Convenient and sequential sampling performed until the sample size completed. The inclusion criteria consists of (birth gestational age <35 weeks, expected length of stay in NICU at least 10 days, Persian-speaking and have not specific illnesses and were not admitted to another ward, having at least one baby meeting in the NICU), and confirmed the informed consent were offered the opportunity to participate.

## Data Collection Tool and Technique

### Demographic questionnaire

The items of this questionnaire included the neonate information following: Birth gestational age, birth

weight, Apgar score, and mother information following: Age, educational level, job, economic statuses, delivery type, presence of other children, history of depression/anxiety, and husband support.

### Parental stressor scale: Neonatal intensive care unit

Sources of parents' stress were measured by using the Parental Stressor Scale: NICU (PSS: NICU, 2002), a well-established self-report survey in which parents rated sources of stress by using a Likert scale (1 = not at all stressful and 5 = extremely stressful) within three domains: Infant behavior and appearance (17 items), sights and sounds (6 items), and parental role alterations (11 items).<sup>[27]</sup> The higher score in this questionnaire shows the greater experience of stress.

### Construct validity of the parental stressor scale

NICU has been demonstrated through correlation with the measures of state anxiety ( $r = 0.46-0.61$ ,  $P < 0.001$ ).<sup>[28]</sup> Internal consistency of the PSS: NICU is reported as  $\alpha > 0.70$  for all domain scales and  $\alpha$  equal to 0.89-0.90 for the entire instrument.<sup>[27]</sup> The validity and reliability of the instrument have been previously confirmed in a study by Sadat *et al.* in Iran.<sup>[29]</sup> In the present study, the Cronbach's alpha for 30 mothers was reported to be 88%.

### The postpartum bonding questionnaire

Postpartum bonding questionnaire (PBQ) is a 25-item scale reflecting a mother's feelings or attitudes toward her baby (e.g., "I feel close to my baby," "My baby irritates me").<sup>[30]</sup> Participants rated how often they agreed with these statements on a 6-point Likert scale ranging from always (score = 0) to never (score = 5). When the statement reflects a negative emotion or attitude, the scoring is reversed, so low scores denoting good bonding. The PBQ has four subscales which reflect impaired bonding (Scale 1) (12 items, ranging from 0 to 60), rejection and anger (Scale 2) (seven items, scores ranging from 0 to 35), anxiety about care (Scale 3) (four items, scores ranging from 0 to 20), and risk of abuse (Scale 4) (two items, scores ranging from 0 to 10). Brockington *et al.* suggest cutoff scores to identify problematic bonding of 12 for Scale 1, 17 for Scale 2, 10 for Scale 3, and 3 for Scale 4 and for the entire scale 38.<sup>[30]</sup> In previous studies in Iran, the validity and reliability of this instrument were reported as acceptable.<sup>[31,32]</sup> In the present study, the Cronbach's alpha for the whole instrument was calculated 0.87.

### Five Facets of Mindfulness Questionnaire

Five facets of mindfulness questionnaire<sup>[22]</sup> is a 39-item self-report measure based on a factor analytic study of five independently developed mindfulness questionnaires. Analysis of these five mindfulness questionnaires yielded five factors that capture core aspects of mindfulness: (1)

Observing, (2) describing, (3) acting with awareness, (4) nonjudging of inner experience, and (5) nonreacting to inner experience. Items were rated on a 5-point Likert scale ranging from 1 (never or very rarely true) to 5 (very often or always true). The scales may be combined for an overall level of dispositional mindfulness with a sum score ranging from 39 to 195. Prior work has established that the subscales demonstrate good internal consistency ranging from 0.75 to 0.91.<sup>[22]</sup> The Cronbach's alpha for the full scale for this study was 0.84.

The Structural Equation Modeling (SEM) was used to examine the relationships between variables by moderating the effect of independent variables, the Multicollinearity assumption was checked using variance inflation factor, all cases had a VIF  $< 2$ . Goodness of fit index (GFI)  $> 0.9$ , Adjusted GFI (AGFI)  $> 0.9$ , root mean square error of approximation (RMSEA)  $\leq 0.08$  considered as model goodness of fit. Cronbach's alpha upper 0.7, GFI and AGFI upper than 0.9 and RMSEA lower 0.08 and relative Chi-square lower than 2, are the measurement of latent adequacy. The result of latent measurement adequacy is presented in Table 1. The above analyses were performed in AMOS version 18 at 5% significant level.

### Ethical considerations

The inclusion of samples in the study was completely voluntary. Prior to entering to the study, mothers were provided with the necessary information and only those who completed the informed consent form were included in the study. Mothers were reassured that their information was confidential and used for study purposes only. This research has been approved by the ethics committee of Qom University of Medical Sciences (IR. MUQ. REC.1398.006).

## Results

This study was performed on 140 mothers with premature infants admitted to the NICU.

The mean age of mothers was  $30 \pm 6.5$  years. The mean  $\pm$  standard deviation of mindfulness, stress, and bonding were  $3.32 \pm 0.52$ ,  $2.32 \pm 0.77$ , and  $0.47 \pm 0.37$ , respectively.

Most (95 patients [67%]) had a cesarean section). Mothers distribution education of participant was 48 (34%) had undergraduate, 56 (40%) had a diploma, 29 (21%) had a bachelor's degree, and 7 (5%) had a master's degree or higher. In terms of number of deliveries, 80 (57%) were first deliveries, 28 (20%) were second deliveries, and 32 (23%) were third deliveries or higher. Most of the newborns were 87 (62%) boy, 92 (66%) not twin, with a mean Apgar of 8.

### Model

In SEM, the first step is studding the measurement of Latent adequacy. The most measurement that has been studied is Cronbach’s alpha, relative Chi square, GFI, AGFI, and RMSEA. The Cronbach’s alpha upper 0.7, GFI and AGFI upper than 0.9 and RMSEA lower 0.08 and relative Chi-square lower than 2 are the measurement of latent adequacy. The result of latent measurement adequacy is presented in Table 1.

After ensuring the latent variable adequacy, the model like Figure 1 has run, and the result is presented in Table 2. The result showed that all path coefficients except bad child condition on mother stress considered in this model were significant.

After removing this coefficient from the model, the final model was reported and the model adequacy indices were calculated. According to the relative chi-score value of 1.91, GFI = 90%, RMSEA = 6% indicated the

**Table 1: The measurement of latent variable**

| latent variable | Cronbach’s alpha (%) | Relative $\chi^2$ | GFI (%) | AGFI (%) | RMSEA |
|-----------------|----------------------|-------------------|---------|----------|-------|
| Mindfulness     | 77                   | 2                 | 98      | 90       | 0.05  |
| Stress          | 70                   | 1                 | 99      | 99       | 0.01  |
| bonding         | 70                   | 1.6               | 98      | 94       | 0.05  |

GFI=Goodness of fit index, AGFI=Adjusted goodness of fit index, RMSEA=Root mean square error of approximation

**Table 2: Beta coefficient, standard beta, standard error, T and P of model fitted**

| Independent → Dependent | $\beta$ | Standard $\beta$ | SE   | T     | P      |
|-------------------------|---------|------------------|------|-------|--------|
| Mindfulness → Stress    | -0.70   | -0.40            | 0.22 | -3.24 | <0.001 |
| Mindfulness → Bonding   | -0.29   | -0.28            | 0.15 | -2.02 | 0.04   |
| Stress → Bonding        | 0.13    | 0.21             | 0.09 | 1.42  | 0.16   |

SE: Standard error

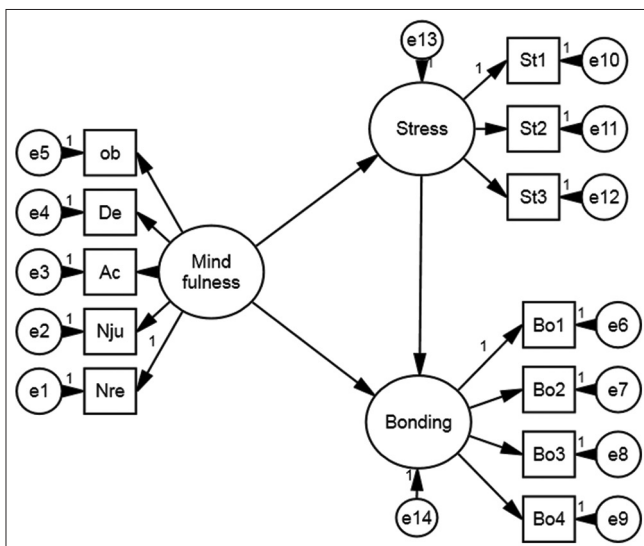


Figure 1: The first model diagram fitted in the study

adequacy index of the final model is exist. The coefficient of variation ( $R^2$ ) for stress and bonding was 17% and 14%, respectively. The modified model is reported in Figure 2.

### Discussion

This study added to our understanding about mother’s stress and mother-infant bonding in the NICU and the role of the mindfulness in this field. The findings indicated higher total scores of mindfulness were significantly associated with lower scores of stress and lower scores of bonding. Moreover, it is noteworthy that the relationships between mindfulness and stress and bonding remain significant after controlling influential mother and neonate variables. In confirmation of findings, Yamamoto *et al.* proved that the trait of the mothers’ mindfulness is inversely related to their state anxiety and trait. [33] Other researches showed that more levels of dispositional mindfulness were associated with lesser psychological symptoms [21] and better emotion regulation [34] also Hicks *et al.* (2018) showed that more levels of dispositional mindfulness in parents were associated with stronger bonding between parents and the unborn child in the sample of expectant parents. [16,21] Other studies showed dispositional mindfulness is related to greater adult attachment security, [35] and it has been emphasized that integrating mindfulness meditation and yoga into the daily life of pregnant women can improve prenatal attachment. [36]

In explaining of findings, the mothers’ mindfulness can increase their ability to tolerate negative and difficult emotional states. [37] Mindful mothers perceive internal and external events freely of negative judgments and have a great ability to face a wide range of thoughts, emotions, and experiences without cognitive distortion. [38] Hence, they become more relaxed and experienced less stress. The principles of mindfulness

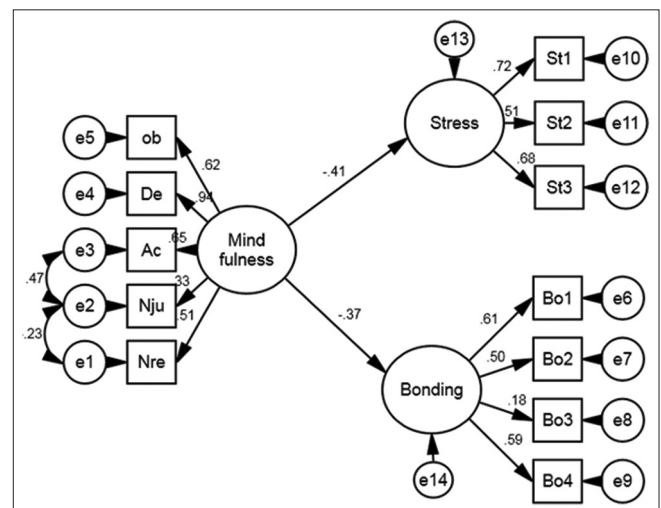


Figure 2: The final model diagram fitted in the study

help mothers to distinguish between self-centered goals and infant-centered goals and to accept the infant as a perfect human with unique character, so communicate with infant more emotionally.<sup>[2,3]</sup>

Features of the mindfulness that tend to view the situation of self and the infant objectively, help the mothers to communicate with the baby in the present experience of motherhood, free of distracting thoughts about interpreting ambiguous, and unknown circumstances.<sup>[39]</sup> For example, when they confronted with the sounds of the NICU equipment which usually lead to mother's mental imagery of a bad event for the baby, mindfulness causes the mindful mother to just listen to the sounds without judgment, also helps them to improve ability to view conditions without drowning in them, as a result they get rid of automatic behavior patterns so their stress has been reduced and they saved from unnecessary worries and to be more relaxed during care of their infants and in the other hand this cognitive-behavioral approach facilitates the acceptance of different roles simultaneously and better exposure to different parenting roles, and therefore, allow mothers to bond with their baby better. Furthermore, acting with awareness causes the mindful mothers to distance themselves from automatic thoughts so they respond to the infant's needs in accordance to the situation, therefore, they establish better emotional bonding with their baby in the 1<sup>st</sup> days after birth. Duncan *et al.* believe that observation and acting with awareness allow mother to divert her attention from the adverse conditions to the baby's current needs.<sup>[40]</sup> These features help mother to don't judge herself and her infant and to distance from negative emotions.<sup>[41]</sup> In the situation of being beside the baby's bed, mindful mothers by observing the appearance, skin wrinkles, hair, delicate nails and movements of the infant, get a deep experience of being with the infant and by acting with awareness respond to infant care needs appropriately. Ultimately, behaviors in these ways lead to the strengthening of a compassionate and deep relationship and a better mother infant bonding.

The strength of this study was the use of advanced statistical methods that reduced measurement errors and increased the validity of the results. Another point is that in the final model, no significant relationship was observed between stress and bonding, although both variables were identified as mindfulness dependent. We conclude that both variables of stress and bonding are affected by the mindfulness independently, and in other words, mindfulness takes independent paths to reduce stress and improve bonding.

### Limitations and recommendation

First since in the environment of this study due to cultural issues, fathers could not be present in the NICUs

and their communications were limited, the study was done only on mothers. Second the cross-sectional nature of the study limits the conclusions about causal relationships between variables. It is suggested that future longitudinal and experimental research be conducted for assessing the effects of mindfulness on neonatal outcomes and other parental outcomes such as breastfeeding and length of stay in the NICUs. Studies with a larger sample size and with the participation of fathers are also recommended.

## Conclusions

The results of the current study emphasize on mindfulness as a contributing feature to overcoming maternal stress and better bonding in mothers with infants in the NICUs. Based on the results and considering that mindfulness is a feature that can be enhanced through training, it is recommended that mothers use mindfulness-enhancing interventions during pregnancy along with routine pregnancy cares. Given the positive role of mindfulness in experiencing less stress and better bonding, and given that mindfulness interventions are simple, inexpensive, and applicable in the NICU, it is recommended to run mindfulness interventions for mothers during the baby's stay in the NICU.

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### Conflicts of interest

There are no conflicts of interest.

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