

**HHS PUBLIC ACCESS**

Author manuscript

MCN Am J Matern Child Nurs. Author manuscript; available in PMC 2017 July 01.

Published in final edited form as:

MCN Am J Matern Child Nurs. 2016 ; 41(4): 221–229. doi:10.1097/NMC.0000000000000248.

Mothers' Psychological Distress and Feeding of Their Preterm Infants

Jinhee Park, PhD, RN,

Assistant Professor, Boston College Connell School of Nursing, 140 Commonwealth Avenue, Chestnut Hill, MA 02467, 617-522-6542, jinhee.park@bc.edu

Suzanne Thoyre, PhD, RN, FAAN,

Francis Hill Fox Distinguished Term Professor, University of North Carolina at Chapel Hill School of Nursing

Hayley Estrem, PhD, RN,

Postdoctoral Associate, Duke University School of Nursing

Britt F. Pados, PhD, RN, NNP-BC,

Assistant Professor, University of North Carolina at Chapel Hill School of Nursing

George J. Knafelz, PhD, and

Professor, University of North Carolina at Chapel Hill School of Nursing

Debra Brandon, PhD, RN, CCNS, FAAN

Associate Professor and Director of PhD and Post-doctoral Programs, Duke University School of Nursing

Abstract

Purpose—To examine the change in psychological distress of mothers of preterm infants and its association with maternal feeding behaviors as the infant transitions to full oral feeding.

Study Design and Methods—This descriptive exploratory study used a subset of data from a study of the effects of a co-regulated feeding intervention for 34 mothers and hospitalized preterm infants in a level-III neonatal intensive care unit (NICU). Maternal psychological distress was measured by maternal worry (Child Health Worry Scale), depression (Center for Epidemiology-Depression Scale), and role stress (Parental Stress Scale: NICU-Role Alteration) at three time points: within one week prior to the first oral feeding (T1), and at achievement of half (T2) and full oral feeding (T3). Feedings were videotaped at T2 and T3. An observational coding system measured maternal feeding behaviors. Linear mixed modeling evaluated the change in maternal psychological distress and its association with mothers' feeding behaviors as the infant transitioned to full oral feeding.

Results—Maternal depressive symptoms were highest at T1 and declined over time. Maternal worry and role stress were also highest at T1 but remained stable from T2 to T3. Increased maternal psychological distress, particularly depressive symptoms and role stress, were associated

Conflict of Interest Statement: The authors declare no conflict of interest.

with less use of developmentally supportive feeding behaviors, i.e., minimizing tactile stimulation, providing steady touch to contain or stabilize the infant, and regulating milk flow.

Clinical Implications—Supporting maternal psychological well-being while infants are learning to feed orally may be an appropriate target for interventions to support mother-infant early feeding interactions.

Keywords

Psychological stress; Maternal behaviors; Feeding; Premature infants

Introduction

Feeding is one of the earliest, recurrent opportunities for development of the mother-infant relationship. Feeding requires reciprocal communication and co-regulation between the mother and infant, however the maternal contribution is critical to successful feeding as she is responsible for structuring the feeding and determining the level and type of regulation needed (Brown, Pridham, & Brown, 2014). Supportive maternal behaviors are sensitive and responsive to the infant's ongoing needs while the infant encounters feeding challenges (Brown, Thoyre, Pridham, & Schubert, 2009).

Supportive maternal behavior during feeding is particularly important for preterm infants in the neonatal intensive care unit (NICU), because they are at risk for physiologic dysregulation due to compromised respiratory function and an immature neurologic system (Weber & Harrison, 2014). To meet preterm infants' unique needs, mothers need to co-regulate the infant's physiological stability during feeding. Co-regulation is the social process by which individuals dynamically alter their actions with respect to the ongoing and anticipated actions of their partner (Evans & Porter, 2009). Co-regulated strategies for preterm infants during feeding include initiation of feeding based on the infant's readiness, regulation of milk flow to support the infant's sucking and breathing rhythms, and minimization of infant stimulation during feeding (Thoyre, Holditch-Davis, Schwartz, Melendez Roman, & Nix, 2012). At the same time, mothers of preterm infants experience significant psychological distress, in particular elevated levels of depression, anxiety, NICU-related and post-traumatic stress, and worry (Holditch-Davis et al., 2009; Rogers, Kidokoro, Wallendorf, & Inder, 2013; Tahirkheli, Cherry, Tackett, McCaffree, & Gillaspay, 2014). This increased maternal distress has been noted to be related negatively to a mother's ability to read her infants cues that signal the need for co-regulation during the interaction and to respond sensitively and consistently (Forcada-Guex, Borghini, Pierrehumbert, Ansermet, & Muller-Nix, 2011; Holditch-Davis, Miles, Burchinal, & Goldman, 2011). As a result of immature neurobehavioral development, preterm infants demonstrate less alertness, responsiveness, eye contact, and clarity of cues during feeding (Thoyre, Shaker, & Pridham, 2005), which can challenge the mother's ability to interpret and respond appropriately to infant's needs. Separation of mother and infant during hospitalization in the NICU contributes to disruption of the mother-infant relationship.

Given these challenges, mother-preterm infant dyads are at high risk for developing negative interactions during feeding, which could subsequently contribute to poor infant feeding

outcomes. Despite evidence of negative effects of maternal psychological distress on maternal sensitivity and responsiveness when interacting with the infant, little is known either about how maternal psychological distress changes over time as the infant develops feeding skills in the NICU or about the effects of distress on mothers' behaviors during early feeding interactions.

The specific aims of this study were to examine (1) changes in maternal psychological distress (depression, worry about child health, maternal role stress) as preterm infants transition to full oral feeding in the NICU and (2) the relationship between mothers' psychological distress and their behaviors during feeding when preterm infants reach half and full oral feedings. An improved understanding of the relationship between mothers' psychological condition and their feeding behaviors would assist clinicians and researchers in developing interventions to support maternal psychological well-being as a means of facilitating co-regulative maternal feeding behaviors and thereby improving infant feeding outcomes.

Methods

Study Design

This exploratory descriptive study was conducted as part of a larger study of the effects of a co-regulated feeding intervention for very preterm infants (Thoyre, Hubbard, Park, Pridham, & McKechnie, 2016). In the original study, a sequential cohort design assigned mother-infant dyads either to usual care or a co-regulated feeding intervention. In the co-regulated feeding intervention, mothers received five guided feeding sessions (one prior to the 1st oral feeding and four during the infant's early weeks of oral feeding) that covered strategies to support infant feeding regulation, such as positional support, assessment of readiness, minimization of infant stimulation during feeding, and guidance to co-regulate infant sucking and breathing rhythms through enhanced auditory assessment of sucking, swallowing, and breathing. In the usual care group, mothers were informed about feeding techniques by the infant's nurse; the types and degrees of information provided depended on infant and maternal need, maternal help-seeking, and nurse skill. In the current study, the intervention group was treated as a covariate, thereby removing the effect of the intervention on outcomes of interest. This study was approved by the Institutional Review Board at the University of North Carolina (UNC) at Chapel Hill.

Setting and Sample

The setting was a level-III NICU in NC children's hospital in Chapel Hill, NC. Study participants were 34 mother and preterm infant dyads, which were almost evenly assigned to the co-regulated feeding intervention ($n=16$) and usual care group ($n=18$). In the original study, eligible mothers were >18 years old, could read, understand, and speak English; eligible infants were born 30 weeks of gestation. Infants were excluded from the original study if they had a congenital anomaly that could interfere with feeding, grade IV interventricular hemorrhage, ventilator-dependence beyond 60 days of life, or inability to oral feed prior to 43 weeks postmenstrual age (PMA).

Procedure

Mothers were enrolled approximately one week prior to the 1st oral feeding. In the study nursery, oral feeding begins typically at 32-34 weeks of PMA once infants show oral-motor cues and physiological stability. Mothers provided informed written consent for their participation and review of their infant's medical records. At enrollment (T1), mothers completed questionnaires about their psychological well-being and demographic characteristics. Once infants began oral feeding, mothers were observed during two feeding observations: once when infants were taking 50% of feeding orally (T2) and once when infants were taking full feeding orally without any supplements by tube (T3). Each feeding was videotaped, and at the end of each observation, mothers completed the same psychological well-being questionnaires.

Measures

Psychological distress—We studied three types of maternal psychological distress: depressive symptoms, worry about child health, and stress in the NICU due to alteration in the parental role. The Center for Epidemiologic Studies Depression Scale (CES-D) was used to assess maternal depressive symptoms; 20 items measured presence and severity of depressive symptoms over the past week on a 4-point scale (0 - *rarely or none of the time* to 3 - *most or all of the time*) (Radloff, 1977). Scores range from 0 to 60, with higher scores indicating more depressive symptoms. A score of 16 and above may indicate risk for major depression (Myers & Weissman, 1980; Roberts & Vernon, 1983). The Child Health Worry Scale (CHWS) measured the degree to which mothers worried about seven aspects of their infant's health, such as concerns about medical problems, growth, normality, death, disability, and getting home (Holditch-Davis et al., 2009). Seven items are rated on a 5-point scale (1 - *not at all worried* to 5 - *very much worried*) with higher scores indicating greater worry. A subscale of the Parental Stressor Scale: Neonatal Intensive Care Unit (PSS: NICU) measured the amount of stress a mother perceived due to changes in her maternal role during the infant's hospitalization (Miles, Funk, & Carlson, 1993). Mothers rated the 12-item maternal role alteration subscale using a 5-point rating scale (1 - *not stressful* to 5 - *extremely stressful*), with higher scores indicating more stress. The CES-D, CHWS, and PSS:NICU are used commonly to measure the major psychological responses of mothers of premature infants and are identified as valid and reliable tools in this population (Holditch-Davis et al., 2014; Northrup, Evans, & Stotts, 2013). In the current study, Cronbach's alpha was .70 for the CES-D, .90 for the CHWS, and .92 for the role stress subscale (PSS:NICU).

Maternal Feeding Behaviors—Maternal feeding behaviors were measured using the Maternal Feeding Actions subscale of the Dynamic-Early Feeding Skills (D-EFS) observational coding scheme. The D-EFS is a reliable and valid observation tool developed and used for preterm infants to examine maternal feeding responses and markers of infant regulation during bottle-feeding (Thoyre, 2009; Thoyre et al., 2012). In the current study, the Maternal Feeding Action subscale was modified to encompass breastfeeding behaviors. The modified subscale consists of six maternal behavior categories: (a) preparation before feeding, (b) feeding initiation based on infant readiness, (c) oral stimulation (nipple held still, encouraging sucking, or regulating milk flow), (d) tactile stimulation (no touch, touch, or steady touch to contain or stabilize), (e) auditory stimulation (no talk, talk to others, or

talk to the infant), and (f) vestibular stimulation (no movement, repositioning, or moving in space, rhythmically). For the analysis, behaviors were grouped either into developmentally supportive or non-supportive behavioral strategies for feeding based on the potential effects on physiologic regulation during feeding in preterm infants. Specific codes and definitions are described in Table 1.

All feeding observations were videotaped, and active feeding periods were continuously coded using the Observer software program (Noldus Information Technology, Inc., Asheville, NC). Active feeding was defined as the periods when the breast or bottle nipple was in the infant's mouth. Proportion of feeding periods with each of the maternal behaviors was calculated and used for analysis. Three raters completed coding over a 12-month period. Raters were trained until the kappa coefficient was $> .80$. Inter-rater reliability was assessed between randomly paired raters on 20% of observations; the kappa coefficients were $> .70$ for all categories of the maternal feeding action subscale.

Demographic and Health Characteristics—At T1, mothers completed a demographic questionnaire about maternal age, education, marital status, and experience in caring for another infant. At T2 and T3, mothers estimated the cumulative number of breast- or bottle-feedings she had participated in with the index infant before the study feeding. Infant medical records were reviewed bi-weekly until hospital discharge to obtain information on infant medical and feeding history during the hospitalization.

Data Analysis

Data were analyzed using SAS Version 9.4. Descriptive statistics described the sample. For statistical testing, a significance level was set at $.05$. Given the exploratory nature of the study, p values less than $.10$ were considered to be an indicative trend to provide evidence of possible significance for future study. Linear mixed models were used to address the two study aims which accounted for correlations of outcomes within the same mother over time and within mothers and infants for twin births. In all models, the intervention group was controlled as a covariate when it has a statistically significant effect on outcomes. A post-hoc power analysis was conducted using nQuery Advisor Version 7 (Statistical Solutions, Inc., Saugus, MA) to calculate the effect size for tests in each of the study aims with 34 mother-infant dyads. The study sample was able to detect a change in maternal psychological distress over three time points with an effect size of 0.50 at 80% power and 5% significance level (two-sided), which is considered to be a medium effect size. The effect size for tests of the relationship between maternal psychological distress and their feeding behavior was 0.44 at 80% power and 5% significance level (two-sided), which is considered to be a medium to small effect size.

Aim 1 examined changes in three types of maternal psychological distress as the infant transitioned to full oral feeding. Each of the three maternal psychological distress measures was modeled separately. When means of the maternal distress measures changed significantly over time, each of 11 potential covariates, i.e., factors that have a potential to influence maternal distress, was included in the model one at a time to assess whether the means still changed over time after controlling for significant covariates. The covariates

included gestational age at birth, postmenstrual age at T1, T2, and T3, multiple birth, sex of the infant, severity of lung disease, presence and degree of intraventricular hemorrhage, family type, maternal age, education, race, and maternal experience in caring for another child before the index infant (see Table 2). *Aim 2* examined whether maternal psychological distress was associated with feeding behaviors when the infant reached half and full oral feedings. Each of the feeding behaviors in Table 1 was modeled separately in terms of time along with each of the three maternal psychological distress measures, one at a time. Given the medium to small effect size in the post-hoc power analysis for aim 2, we did not examine potential covariates affecting maternal distress and feeding behaviors.

Results

Sample Characteristics

Specific demographic characteristics of the infants and mothers were described in Table 2 and feeding characteristics at the time of the feeding observations in Table 3.

Maternal Psychological Distress

Figure 1 presents predicted mean scores of the three types of maternal distress over time, as generated by the linear mixed effects models. There were significant changes in maternal depressive symptoms and worry over time. Specifically mothers' depressive symptoms were highest at T1 and declined over time, $F(2, 57) = 6.46, p = .003$; maternal worry about child health also was highest at T1, but it remained stable from T2 to T3, $F(2, 55) = 4.22, p = .020$. For maternal role stress, there was a trend toward significance in changes over time, such that maternal role stress was highest at T1 and remained stable from T2 to T3, $F(2, 56) = 2.81, p = .069$.

Of 11 potential covariates, younger maternal age was significantly associated with more depressive symptoms, $F(1, 29) = 6.62, p = .016$, and there was a trend toward significance for the relationship between the presence of mothers' experience in caring for another child and increased role stress, $F(1, 26) = 4.02, p = .055$. After controlling for maternal age, the findings for the change in depressive symptoms over time remained the same, $F(2, 57) = 6.57, p = .003$. Change in role stress over time became significant after controlling for mothers' experience in caring for another child, $F(2, 50) = 8.72, p = .001$.

Maternal Psychological Distress and Feeding Behaviors

Table 4 presents the significant findings of linear mixed models for the relationships between maternal psychological distress and maternal feeding behaviors. Among non-supportive behavioral strategies, more depressive symptoms were significantly associated with more *tactile stimulation*, $F(1, 31) = 6.91, p = .013$. Among supportive behavioral strategies, more depressive symptoms were significantly associated with less *no tactile stimulation*, $F(1, 31) = 6.71, p = .015$, and less *steady touch to contain or stabilize*, $F(1, 31) = 5.40, p = .027$. After controlling for the intervention effect, there was a trend toward significance for the relationship between more role stress and more *regulating milk flow*, $F(1, 30) = 2.90, p = .099$. Worry was not significantly related either to non-supportive or supportive feeding strategies.

Discussion

This exploratory and descriptive study described how maternal psychological distress changes as preterm infants transition to full oral feeding and the relationship between maternal psychological distress and their behaviors during feeding with their preterm infants at half and full oral feedings. We found that depressive symptoms, worry about child health, and maternal role stress were highest before the first oral feeding and declined as the infant transitioned to full oral feeding. These findings are similar to previous studies with mothers of preterm infants hospitalized in a NICU that reported decreased maternal psychological distress over the course of hospitalization (Greene et al., 2015; Miles, Holditch-Davis, Schwartz, & Scher, 2007). Our study expanded on those findings by showing that maternal worry and role stress did not decline further as infants reached full oral feeding but rather remained stable. Routinely, health care providers and mothers prepare for discharge once preterm infants become a full oral feeder. If, at full oral feeding, maternal worry and role stress have not declined, mothers may continue to experience heightened concern about infant health (e.g., re-hospitalization) and their ability to care for their preterm infants after discharge.

Specific socio-demographic characteristics of mothers and infants were associated with maternal psychological distress. Younger maternal age was associated with more depressive symptoms, and mothers' experience in caring for another child was associated with more maternal role stress. Despite several studies, there is no consensus on the influence of mother- and infant-related factors on psychological distress in mothers of preterm infants. Known risk factors for increased psychological distress of mothers of preterm infants include single parenthood (Miles, Burchinal, Holditch-Davis, Brunssen, & Wilson, 2002; Miles et al., 2007), African-American race (Miles et al., 2002), increased infant illness severity and degree of prematurity at birth (Holditch-Davis, Bartlett, Blickman, & Miles, 2003; Rogers et al., 2013; Segre, McCabe, Chuffo-Siewert, & O'Hara, 2014), low maternal education (Miles et al., 2002), and younger maternal age (Bener, 2013), which are similar to results from this study. Our findings expand previous evidence by suggesting that mothers who had cared for another child experienced increased role stress. Mothers with experience in caring for a healthy newborn might have had greater role stress because their prior experience is different from their parental role caring for their preterm infants.

We found increased maternal depressive symptoms and role stress are related to maternal behaviors during feeding. Mothers with more depressive symptoms provided more tactile stimulation to the infant and less steady touch to stabilize or contain the infant during feeding. Mothers with more stress due to maternal role alteration provided less support to regulate milk flow. Tactile stimulations are one of the strategies used frequently by mothers to prompt continued sucking. However, this stimulating behavior can interfere with the preterm infant's effort to regulate sucking to achieve adequate number and quality of breaths (Thoyre, Park, Pados, & Hubbard, 2013). Steady touch to stabilize or contain the infant is a supportive strategy that provides postural stability for feeding. Regulating milk flow by tipping the bottle down is a common strategy utilized to support preterm infant feeding; its purpose is to limit the length of the sucking burst to facilitate more time for breathing (Philbin & Ross, 2011; Thoyre et al., 2013). Therefore, this study suggests that increased

psychological distress, particularly depressive symptoms and role stress, interfered with mothers' ability to use behavioral strategies that support preterm infants' feeding regulation, specifically, minimizing tactile stimulation, providing steady touch to contain or stabilize the infant, and regulating milk flow.

Limitations

Our study has several limitations. This study was limited by a small sample size. Because of the small sample size and the exploratory nature of the study, we conducted separate models for multiple related measures of maternal feeding behavior (see Table 1). In future studies with larger sample sizes, it will be more appropriate to run a single model by accounting for correlations between the measures. We examined changes in maternal psychological distress according to critical feeding milestones preterm infants need to achieve in the NICU (before oral feeding, half and full oral feeding). Therefore, the interval lengths between the measurements varied according to individual infant's rates of progression, and might not have been long enough to identify significant changes in maternal distress across the measurement time points, especially between T2 and T3 (1.5 weeks on average). Replication in studies with larger, more heterogeneous samples would strengthen confidence in the findings. However, this is one of the only published studies examining the relationship between maternal psychological distress and their behaviors during early feeding interactions in the NICU. Our study provides sufficient evidence to support further study.

Clinical Nursing Implications

Among three types of psychological distress experienced by mothers of preterm infants during NICU hospitalization, maternal depressive symptoms were highest before the first oral feeding and declined as the infant transitioned to full oral feeding. Maternal worry and role stress were also highest before the first oral feeding and declined but remained high when the infant transitioned from half to full oral feeding. Depressive symptoms and role stress were associated with less use of supportive feeding behaviors.

Nurses in the NICU and other members of the health care team play a critical role in being sensitive to needs of mothers and in targeting their patient teaching towards helping mothers feel better prepared to assume their parental role, prior to and following discharge from the NICU. Maternal psychological distress may affect the mother's ability to recognize her infant's signals and respond sensitively and responsively to the preterm infant's unique needs during feeding. Because preterm infants are already at risk for adverse feeding outcomes, non-supportive maternal behavior may compound the risk for poor feeding. Supporting maternal psychological well-being while infants are learning to oral feed may be an appropriate target for interventions to support mother-infant early feeding interactions.

Acknowledgments

The preparation of this paper was supported by the National Institute of Nursing Research (R21 NR012507) awarded to Suzanne Thoyre and Britt F. Pados.

References

- Bener A. Psychological distress among postpartum mothers of preterm infants and associated factors: a neglected public health problem. *Revista brasileira de psiquiatria*. 2013; 35(3):231–236. DOI: 10.1590/1516-4446-2012-0821 [PubMed: 24142082]
- Brown LF, Pridham KA, Brown R. Sequential observation of infant regulated and dysregulated behavior following soothing and stimulating maternal behavior during feeding. *Journal for Specialists in Pediatric Nursing*. 2014; 19(2):139–148. DOI: 10.1111/jspn.12062 [PubMed: 24417766]
- Brown LF, Thoyre S, Pridham K, Schubert C. The mother-infant feeding tool. *Journal of Obstetric, Gynecologic & Neonatal Nursing*. 2009; 38(4):491–503. DOI: 10.1111/j.1552-6909.2009.01047.x
- Evans CA, Porter CL. The emergence of mother–infant co-regulation during the first year: Links to infants' developmental status and attachment. *Infant Behavior and Development*. 2009; 32(2):147–158. doi:<http://dx.doi.org/10.1016/j.infbeh.2008.12.005>. [PubMed: 19200603]
- Forcada-Guex M, Borghini A, Pierrehumbert B, Ansermet F, Muller-Nix C. Prematurity, maternal posttraumatic stress and consequences on the mother-infant relationship. *Early Human Development*. 2011; 87(1):21–26. DOI: 10.1016/j.earlhumdev.2010.09.006 [PubMed: 20951514]
- Greene MM, Rossman B, Patra K, Kratovil AL, Janes JE, Meier PP. Depression, anxiety, and perinatal-specific posttraumatic distress in mothers of very low birth weight infants in the neonatal intensive care unit. *Journal of Developmental & Behavioral Pediatrics*. 2015; 36(5):362–370. DOI: 10.1097/dbp.000000000000174 [PubMed: 26039191]
- Holditch-Davis D, Bartlett TR, Blickman AL, Miles MS. Posttraumatic stress symptoms in mothers of premature infants. *Journal of Obstetric, Gynecologic & Neonatal Nursing*. 2003; 32(2):161–171. Retrieved from <http://www.ncbi.nlm.nih.gov/pubmed/12685667>.
- Holditch-Davis D, Miles MS, Burchinal MR, Goldman BD. Maternal role attainment with medically fragile infants: Part 2. relationship to the quality of parenting. *Research in Nursing & Health*. 2011; 34(1):35–48. DOI: 10.1002/nur.20418 [PubMed: 21243657]
- Holditch-Davis D, Miles MS, Weaver MA, Black B, Beeber L, Thoyre S, Engelke S. Patterns of distress in African-American mothers of preterm infants. *Journal of Developmental & Behavioral Pediatrics*. 2009; 30(3):193–205. DOI: 10.1097/DBP.0b013e3181a7ee53 [PubMed: 19412125]
- Holditch-Davis D, White-Traut RC, Levy JA, O'Shea TM, Geraldo V, David RJ. Maternally administered interventions for preterm infants in the NICU: Effects on maternal psychological distress and mother–infant relationship. *Infant Behavior and Development*. 2014; 37(4):695–710. doi:<http://dx.doi.org/10.1016/j.infbeh.2014.08.005>. [PubMed: 25247740]
- Miles MS, Burchinal P, Holditch-Davis D, Brunssen S, Wilson SM. Perceptions of stress, worry, and support in Black and White mothers of hospitalized, medically fragile infants. *Journal of Pediatric Nursing*. 2002; 17(2):82–88. Retrieved from <http://www.ncbi.nlm.nih.gov/pubmed/12029601>. [PubMed: 12029601]
- Miles MS, Funk SG, Carlson J. Parental Stressor Scale: neonatal intensive care unit. *Nursing Research*. 1993; 42(3):148–152. [PubMed: 8506163]
- Miles MS, Holditch-Davis D, Schwartz TA, Scher M. Depressive symptoms in mothers of prematurely born infants. *Journal of Developmental & Behavioral Pediatrics*. 2007; 28(1):36–44. DOI: 10.1097/01.DBP.0000257517.52459.7a [PubMed: 17353730]
- Myers JK, Weissman MM. Use of a self-report symptom scale to detect depression in a community sample. *American Journal of Psychiatry*. 1980; 137(9):1081–1084. Retrieved from <http://www.ncbi.nlm.nih.gov/pubmed/7425160>. [PubMed: 7425160]
- Northrup TF, Evans PW, Stotts AL. Depression among mothers of high-risk infants discharged from a neonatal intensive care unit. *MCN: The American Journal of Maternal Child Nursing*. 2013; 38(2): 89–94. DOI: 10.1097/NMC.0b013e318270f8b8 [PubMed: 23426050]
- Philbin MK, Ross ES. The SOFFI Reference Guide: text, algorithms, and appendices: a manualized method for quality bottle-feedings. *Journal of Perinatal & Neonatal Nursing*. 2011; 25(4):360–380. DOI: 10.1097/JPN.0b013e31823529da [PubMed: 22071621]

- Radloff LS. The CES-D Scale: A Self-Report Depression Scale for Research in the General Population. *Applied Psychological Measurement*. 1977; 1(3):385–401. DOI: 10.1177/014662167700100306
- Roberts RE, Vernon SW. The Center for Epidemiologic Studies Depression Scale: its use in a community sample. *American Journal of Psychiatry*. 1983; 140(1):41–46. Retrieved from <http://www.ncbi.nlm.nih.gov/pubmed/6847983>. [PubMed: 6847983]
- Rogers CE, Kidokoro H, Wallendorf M, Inder TE. Identifying mothers of very preterm infants at-risk for postpartum depression and anxiety before discharge. *Journal of Perinatology*. 2013; 33(3):171–176. DOI: 10.1038/jp.2012.75 [PubMed: 22678144]
- Segre LS, McCabe JE, Chuffo-Siewert R, O'Hara MW. Depression and anxiety symptoms in mothers of newborns hospitalized on the neonatal intensive care unit. *Nursing Research*. 2014; 63(5):320–332. DOI: 10.1097/NNR.000000000000039 [PubMed: 25171558]
- Tahirkheli NN, Cherry AS, Tackett AP, McCaffree MA, Gillaspay SR. Postpartum depression on the neonatal intensive care unit: current perspectives. *International Journal of Women's Health*. 2014; 6:975–987. DOI: 10.2147/IJWH.S54666
- Thoyre SM. Dynamic Early Feeding Skills: An Observational System for Coding the Dynamics of Early Infant Feeding. *Advances in Neonatal Care*. 2009; 9(4):188–189. DOI: 10.1097/01.ANC.0000360174.05327.2c
- Thoyre SM, Holditch-Davis D, Schwartz TA, Melendez Roman CR, Nix W. Coregulated approach to feeding preterm infants with lung disease: effects during feeding. *Nursing Research*. 2012; 61(4):242–251. DOI: 10.1097/NNR.0b013e31824b02ad [PubMed: 22565102]
- Thoyre S, Hubbard C, Park J, Pridham K, McKechnie A. Implementing co-regulated, cue-based feeding with mothers of preterm infants. *MCN The American Journal of Maternal Child Nursing*. 2016; 41(4)
- Thoyre SM, Park J, Pados B, Hubbard C. Developing a Co-Regulated, Cue-Based Feeding Practice: The Critical Role of Assessment and Reflection. *Journal of Neonatal Nursing*. 2013; 19(4):139–148. DOI: 10.1016/j.jnn.2013.01.002 [PubMed: 25814831]
- Thoyre SM, Shaker CS, Pridham KF. The early feeding skills assessment for preterm infants. *Neonatal Network*. 2005; 24(3):7–16. Retrieved from http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Citation&list_uids=15960007. [PubMed: 15960007]
- Weber AM, Harrison TM. Maternal behavior and infant physiology during feeding in premature and term infants over the first year of life. *Research in Nursing & Health*. 2014; 37(6):478–489. DOI: 10.1002/nur.21618 [PubMed: 25223730]

Callouts

1. Depressive symptoms in mothers of preterm infants during NICU hospitalization were highest before the first oral feeding and declined as the infant transitioned to full oral feeding.
2. Maternal worry and role stress were highest before the first oral feeding but remained stable as the infant transitioned from half to full oral feeding.
3. Younger maternal age was associated with more depressive symptoms.
4. Mothers' experience in caring for another child was associated with more role stress.
5. Increased maternal psychological distress was associated with less use of developmentally supportive feeding behaviors.

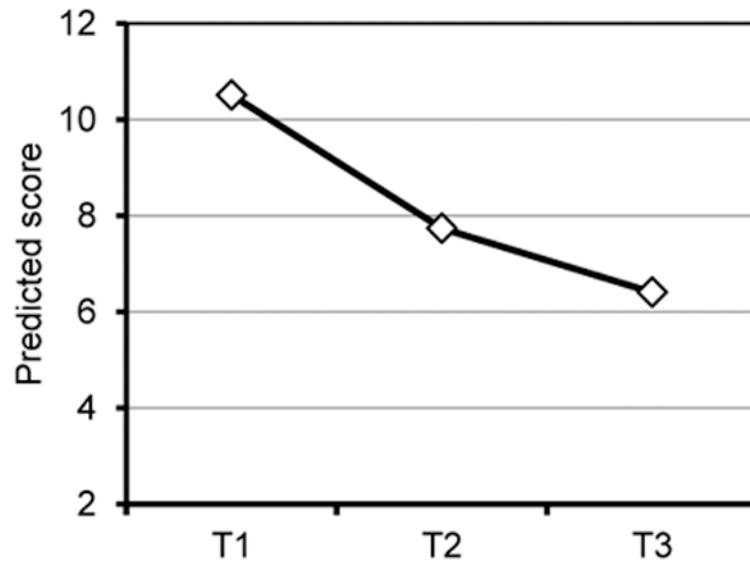
Suggested Clinical Implications

Nurses should be aware of socio-demographic factors that may be associated with elevated psychological distress of mothers of preterm infants in the NICU, such as younger maternal age and mother's prior experience in caring for another child.

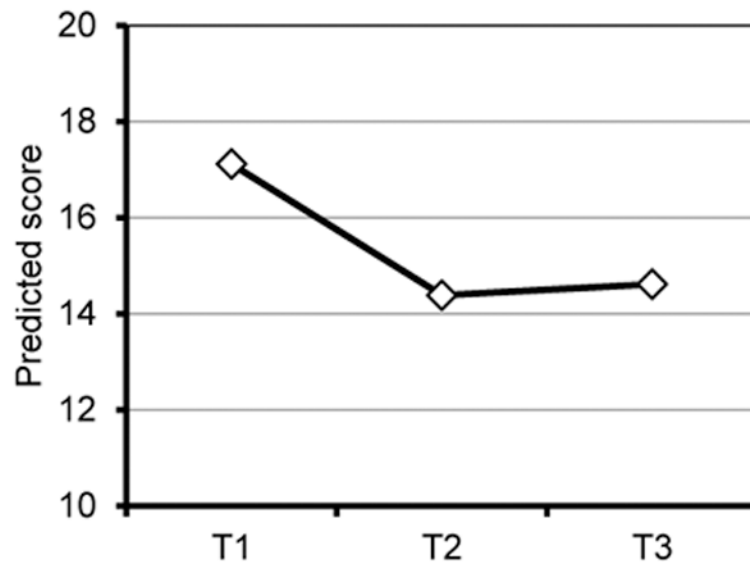
Nurses should be sensitive to the psychological needs of mothers and support them in preparing for their parental role prior to and following discharge from the NICU.

Provision of supportive interventions and timely referral for mental health interventions may enhance mothers' ability to engage in infant care and help mothers and infants develop positive interactions during feeding.

A. Depressive Symptoms



B. Child Health Worry



C. Role Stress

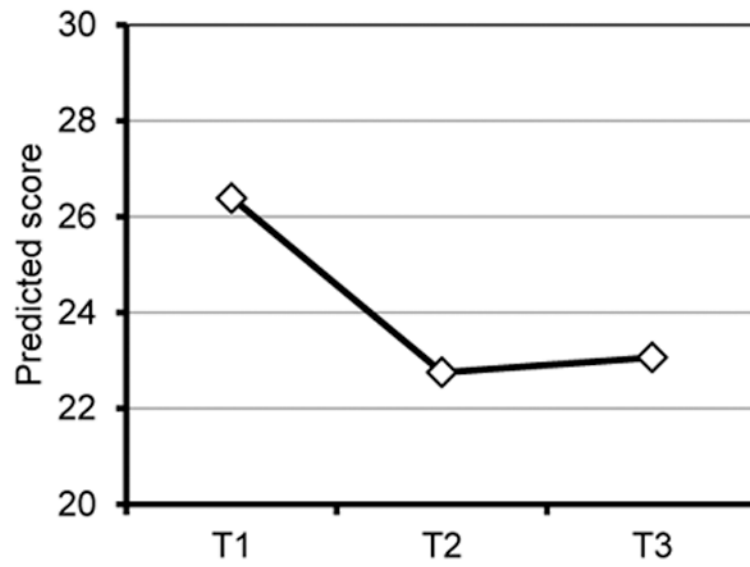


Figure 1. Maternal Psychological Distress at T1, T2, and T3

Note. T1 = one week prior to the 1st oral feeding, T2 = half oral feeding, T3 = full oral feeding.

Author Manuscript

Author Manuscript

Author Manuscript

Author Manuscript

Table 1
Code Definitions for Maternal Feeding Behaviors

Behavioral Strategies Considered Developmentally Non-supportive for Preterm Infant Feeding	
Codes	Definitions
Nipple-in without full readiness	• Mother places the nipple into infant's mouth when the infant is partially ready or not ready for feeding.
Encouraging sucking	• Mother moves the bottle thereby increasing stimulus to suck.
Tactile stimulation	• Mother provides tactile stimulation, including pulsing or stroking head/arm/hands, or squeezing cheeks.
Auditory stimulation	• Mother talks to others or to the infant.
Vestibular stimulation	• Mother repositions the infant, rocks, or bounces rhythmically.
Behavioral Strategies Considered Developmentally Supportive for Preterm Infant Feeding	
Codes	Definitions
Nipple-in with full readiness	• Mother places the nipple into infant's mouth when the infant is fully organized for feeding.
Preparation before nipple-in	• Mother offers preparation before placing the nipple.
Nipple held still	• Mother does not move the bottle while feeding.
Regulating milk flow	• Mother moves the bottle down, back, or to the side to decrease the milk flow or remove milk from nipple.
No tactile stimulation	• Mother does not provide additional touch beyond holding.
Steady touch to contain or stabilize	• Mother touches the infant to contain or stabilize extremity, body, neck, or head.
No auditory stimulation	• Mother does not talk.
No vestibular stimulation	• Mother does not move the infant.

Table 2
Demographic Characteristics of the Infants and Mothers

Infant characteristics (n=34)	Mean ± SD	Range
Gestational age (weeks)	27.4 ± 2.1	23.6-30.9
Birth weight (grams)	949.0 ± 299.7	500-1488
APGAR score at 1 minutes	4.6 ± 2.7	1-8
APGAR score at 5 minutes	6.5 ± 2.2	2-9
PMA at discharge in weeks	39.1 ± 4.3	34.3-57.9
	N (%)	
Sex: Female	18 (52.9)	
Ethnicity: Hispanic	5 (14.7)	
Race		
White	15 (44.1)	
Black	13 (38.2)	
More than one race	6 (17.7)	
Multiple birth: Twins	6 (17.6)	
Intraventricular hemorrhage		
None	27 (79.4)	
Grade I	4 (11.8)	
Grade II	2 (5.9)	
Grade III	1 (2.9)	
Bronchopulmonary dysplasia		
None	10 (29.4)	
Mild	8 (23.5)	
Moderate	9 (26.5)	
Severe	7 (20.6)	
Necrotizing enterocolitis: Yes	3 (8.8)	
Patent ductus arteriosus: Yes	16 (47.1)	
	N (%)	
Maternal characteristics (n=31)	Mean ± SD	Range
Maternal age	28.5 ± 6.6	19-41
Maternal education (years) ^a	14.8 ± 3.7	10-24
	N (%)	
Maternal ethnicity: Hispanic	7 (22.6)	
Maternal race		
White	19 (61.3)	
Black	11 (35.5)	
More than one race	1 (3.2)	
Mothers without experience in caring for another child ^b	18 (60.0)	
Family type		

Infant characteristics (n=34)	Mean ± SD	Range
Two parents	30 (88.2)	
Single parent	3 (8.8)	
Other	1 (2.9)	

Note. PMA = postmenstrual age

^a maternal education was calculated from grade school, i.e., a 12-year of education indicates the mother had a high school diploma.

^b *n*=30, one mother had missing data and was not included in this descriptive statistics.

Author Manuscript

Author Manuscript

Author Manuscript

Author Manuscript

Table 3
Feeding Characteristics of the Infants and Mothers

	T1 (34 infants, 31 mothers)	T2 (33 infants, 30 mothers)	T3 (31 infants, 29 mothers)
Infant PMA (weeks)	32.3 ± 1.4	36.4 ± 2.1	37.8 ± 2.5
Infant feeding experience ^a	-	54.5 ± 23.8	121.5 ± 43.8
Maternal feeding experience ^b	-	13.5 ± 9.5	22.4 ± 11.2
Supplemental oxygen: Yes	-	15 (45.5%)	11 (35.5%)
Method of feeding	-		
By bottle		30 (90.9%)	30 (96.8%)
By breast		3 (9.1%)	1 (3.2%)
% intake ^c (<i>n</i> = 30 infants)	-	66.3 ± 27.1	91.8 ± 16.0

Note. T1 = one week prior to the 1st oral feeding, T2 = half oral feeding, T3 = full oral feeding, PMA = postmenstrual age.

^a number of oral feedings either at bottle or breast before the study.

^b number of oral feedings either at bottle or breast performed by mother before the study.

^c milk consumed (ml)/ milk prescribed (ml) * 100.

Table 4
Mixed Effects Model Results for Relationships between Maternal Psychological Distress
and their Feeding Behaviors at T2 and T3

Models	Estimate (SE)	p-value
Non-supportive Behavioral Strategies		
1. Tactile stimulation		
Time: half oral feeding	0.92 (3.73)	.807
Depressive symptoms	1.49 (0.57)	.013
Supportive Behavioral Strategies		
1. Regulating milk flow		
Time: half oral feeding	-0.23 (2.41)	.924
Role stress	-0.43 (0.25)	.099
Usual care group	-15.44 (7.52)	.049
2. No tactile stimulation		
Time: half oral feeding	-1.72 (3.79)	.653
Depressive symptoms	-1.48 (0.57)	.015
3. Steady touch		
Time: half oral feeding	0.09 (0.10)	.361
Depressive symptoms	-0.04 (0.02)	.027

Author Manuscript

Author Manuscript

Author Manuscript

Author Manuscript