Screening of postnatal maternal mental health in a level IV neonatal intensive care unit

Cernimiento de salud mental materna postnatal en una unidad de cuidado intensivo neonatal de nivel IV

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Abstract

Having an infant in the Neonatal Intensive Care Unit (NICU) can be traumatic for mothers, and can have long-lasting consequences for infant bonding and subsequent health. We assessed maternal anxiety/depression, and NICU sources of stress as a function of perinatal complications and social/spiritual support. We interviewed 110 mothers of infants admitted to the NICU. Measures included: STAI-6 (anxiety); PHQ-9 (depressive symptoms); PSS:NICU (stress); MSPSS (social support) and spiritual support. Perinatal complications were obtained from medical records. Maternal mean age was 27.1. Infant's mean gestational age was 34 +/- 5 weeks; mean birth weight: 2,050g +/- 1,03g. NICU mothers reported slightly high anxiety symptoms (M=41.7, SD=13.8) and mild depression symptoms (M=5.6, SD=4.70). The overall NICU stress symptoms experienced was low to mild (M=1.98, SD=1.06), although parental role alterations (M=2.92, SD=1.03) was higher than unit's sights/sounds (M=1.95, SD=1.11), infant behavior/appearance (M=1.69, SD=1.04), and staff behavior/communication (M=1.37, SD=1.08). Higher maternal NICU stress symptoms (infant behavior/appearance) were associated with having higher perinatal complications (p=.01). Higher maternal anxiety symptoms (p=.04), depression symptoms (p=.03), and stress symptoms (p=.02) were reported by mothers who had lower social support. Higher maternal anxiety symptoms were associated with lower spiritual support (p=.01). These findings have implications for the delivery of services for NICU mothers who report low social support.

Key Words: behavioral Sciences, health psychology, mental health, neonatology

Resumen

Tener un bebé en la Unidad de Cuidados Intensivos Neonatales (NICU) puede ser traumático para las madres y afectar el vínculo materno-infantil y la salud posterior del infante. Evaluamos la ansiedad/depresión materna, fuentes de estrés del NICU y las asociaciones entre las complicaciones perinatales y apoyo social/espiritual con síntomas maternos. Se entrevistaron 110 madres de bebés en el NICU. Los instrumentos incluyeron: STAI-6 (ansiedad); PHQ-9 (depresión); PSS:NICU (estrés); MSPSS (apoyo social) y apoyo espiritual. Se obtuvo también información demográfica y complicaciones perinatales de los récords médicos. La edad promedio de las mamás: 27.1 años; edad gestacional promedio: 34+/-5 semanas; peso promedio al nacer: 2,050g+/-1.03g. Las madres en el NICU presentaron niveles de sintomas de ansiedad levemente altos (M=41.7, DT=13.8) y sintomas de depresión leve (M=5.6, DT=4.70). Los niveles de sintomas de estrés en el NICU reportados fueron de una magnitud bajo-leve (M=1.98, DT=1.06), aunque las alteraciones al papel de los padres (M=2.92, DT=1.03) fueron mayores que el estrés asociado con imágenes/sonidos de la unidad (M=1.95, DT=1.11), con el comportamiento/apariencia del infante (M=1.69, DT=1.04) y con el comportamiento/comunicación del personal (M=1.37, DT=1.08). Un nivel más alto de sintomas de estrés materno en el NICU (comportamiento/apariencia infantil) se asoció con mayores complicaciones perinatales (p = .01). Madres que reportaron menor apoyo social informaron mayor sintomas de ansiedad materna (p = .04), más sintomas de depresión alta (p = .03) y sintomas de estrés (p = .02). Más sintomas de ansiedad materna también se asoció con un menor apoyo espiritual (p = .01). Estos hallazgos tienen implicaciones para la prestación de servicios a madres con bajo apoyo social.

Palabras Claves: ciencias del comportamiento, psicología de la salud, salud mental, neonatología

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Premature birth and other serious perinatal complications represent an important public health problem. In 2019, there were 383,061 infants in the USA born prematurely. This represents 10.2% of live births (Martin et al., 2019). In Puerto Rico, the rate of premature births is slightly higher with 11.8% live births during 2019 (National Center for Health Statistics, 2021), representing a serious problem since preterm labor may lead to permanent disabilities in infants (Halimi et al., 2017).

In most cases, preterm birth seems to be triggered by multiple interacting biological and environmental factors. Nevertheless, a history of preterm birth or twins, maternal age, obesity, and certain uterine and/or cervical problems are the strongest risk factors for preterm birth (March of Dimes, 2021). During 2017-2019, the United States preterm birth rates were highest for women ages 40 and older (14.5%), followed by women under age 20 (10.4%), ages 30-39 (10.3%), and ages 20-29 (9.5%). In 2019, 61.9% of multiple births were preterm in the USA. Even though obesity is not directly correlated to the cause of preterm birth, it does increase rates of medical complications like hypertension that contribute to preterm birth. In the USA, 31.6% of women of childbearing age were obese in 2019 (March of Dimes, 2021).

Because of an unexpected early birth, the presence of maternal chronic diseases and/or obstetric, pre and perinatal complications, these infants are admitted to the Neonatal Intensive Care Unit (NICU). Their stay can be only days or months, until metabolic and other complications are resolved and they're ready to breathe on their own, perhaps with some oxygen, and are gaining weight (Martin et al., 2019).

Mothers of newborn infants who are hospitalized in the Neonatal Intensive Care Unit exhibit significant symptoms of anxiety, depression, and stress (Bonacquisti et al., 2020; Gerstein et al., 2019; Obeidat et al., 2009; Segre et al., 2014; Vizcarrondo-Oppenheimer et al., 2019). It is important to document these symptoms to identify the need for preventive intervention with mothers while their infants are in the NICU. Recommendations by the National Perinatal Association suggest that there should be one full-time social worker and one full or part-time psychologist for any NICU with more than twenty beds (Hynan et al., 2015). Preventing mental health problems in this population is crucial as these infants are at risk for neurodevelopmental problems and maternal mental health can ameliorate or exacerbate these problems (Bush et al., 2020).

Anxiety Symptoms

Parents may feel anxious about their infants' well-being while they're in the NICU (Erdem, 2010; Heydarpoor et al., 2019; Segre et al., 2014). They cannot take care of their infant as expected; to some, the infant might appear to be very fragile, and this leads to feelings of powerlessness and alienation (Obeidat et al., 2009). High levels of anxiety in the NICU have been found due to the uncertainty of the longevity of the stay, lack of information about the baby's health, and the inability to provide care and comfort to the baby (Mizrak et al., 2015). Furthermore, Trumello et al. (2018), suggested that premature birth and the child's hospitalization might exert a negative effect on the mothers' emotional state, their perception of parental self-image, and consequently, the early bond with the child. It's crucial to identify symptoms and work with NICU mothers to resolve their anxiety about the process of recovery and the actual

and future prospects of the infant (Vizcarrondo-Oppenheimer et al., 2019).

Depression Symptoms

Maternal depressive symptoms after giving birth can be common (Centers for Disease Control and Prevention, 2021). However, mothers who have early interactions with their newborns and report having a personal connection with their newborns report fewer depressive symptoms (Muzik et al., 2012).

These conditions are absent for many mothers whose infants are admitted to the NICU (Alkozei et al., 2014). Postpartum depressive symptoms can be exacerbated by the infant's sudden hospitalization in the NICU (Bonacquisti et al., 2020; Miles et al., 2007; Soghier et al., 2020; Trumello et al., 2018). It has been shown that 25.5% of mothers present symptoms of depression during their infants' stay in the NICU (Segre et al., 2014). In a particular study that measured these symptoms at the time of discharge, 45% in parents of a sample of 300 parents presented depressive symptoms (Soghier et al., 2020). Gerstein et al. (2019) has argued that early screening is essential for detecting maternal health problems in the NICU since so many of them experience depression at discharge.

Stress Symptoms

The NICU environment by itself can be another source of stress. It has been shown that 43% of mothers report elevated levels of NICU stress (Soghier et al., 2020). The physical environment in the NICU is characterized by monitoring equipment, noises, and tubes and wires connected to the baby. Nevertheless, the most prevalent source of NICU stress reported by mothers is the separation from their baby and the loss of their parental role (Trumello et al., 2018; Bouet et al., 2012; Ionio et al., 2019).

According to Harris et al. (2018), studies have shown that psychologically stressed mothers have trouble engaging in positive parenting behaviors such as discipline, attending appointments, and providing activities. Therefore, preventive interventions are necessary to alleviate the NICU stress, so there are no long-term consequences for the infant.

Perinatal Complications and Maternal Psychological Symptoms

Even if these maternal psychological symptoms are prevalent in NICU populations, not all mothers are affected in the same manner. In some cases, mothers of very preterm infants (<32 weeks) may be more concerned and worried about their babies' survival as compared to those of moderately preterm infants (>32 weeks) (Trumello et al., 2018). Targeting mothers who are most at risk will use the extant NICU resources more efficiently.

Koutra et al. (2018), found that a higher number of perinatal complications were associated with negative effects on maternal mood in the postpartum period. Perinatal complications are not only of serious consequences for the infant but may affect the psychological state of the mother. It has also been shown that mothers whose infants have more perinatal complications or have serious health problems are more stressed than others (Mizrak, 2015). For example, there is evidence of a higher prevalence of distress in mothers with very low birth weight infants (Greene et al., 2019). Despite these findings, many mothers whose infants are very low birth weight or have more perinatal complications have not been identified nor are receiving support services (Greene et al., 2015).

Social and Spiritual Support

Social support provides women with increased confidence and satisfaction with motherhood. It has been shown that there is a correlation between depression and low perceived social support (Erbaba & Pinar, 2020; Soghier et al., 2020). Having a source of social support can help the mother to reduce or balance the negative effects of life events that are associated with psychological distress. Mothers that perceived high social support show less depression and a more positive mother-infant relationship (Hergüner et al., 2014). For other mothers, spiritual support, the belief in a higher source of support, can be helpful in difficult circumstances. It has been reported that perceiving more spiritual support while being in the NICU, significantly diminished maternal stress (Küçük et al., 2018).

The purpose of this study was to document the presence of maternal anxiety, depression, and stress symptoms at the Neonatal Intensive Care Unit at the University Pediatric Hospital in Puerto Rico. We also aimed to identify levels of maternal anxiety, depression, and stress symptoms as a function of each infant's perinatal complications as well as the mothers' social and spiritual support. What is the prevalence of maternal anxiety, depression, and stress symptoms? Are perinatal complications worsening these symptoms in mothers? Are these symptoms associated with the amount of social and spiritual support perceived by the mother? The goal is to use this information to design preventive interventions for mothers with infants in the NICU who are experiencing psychological distress.

Method

Participants

A convenience sample of 110 mothers with infants from 2 to 8 weeks of age in the Neonatal Intensive Care Units (North or South), at the Pediatric Hospital, San Juan Medical Center, was recruited to participate in this cross-sectional and correlational study between June 2017 and September 2019. Institutional Review Board (IRB) approval was obtained before initiating the study. Mothers were excluded from the study if they were unable to consent (without a tutor, if minors) if they were deemed unable to answer questionnaires, or their child had congenital anomalies. All other mothers were asked for consent and participation in the study during any other routine visit. Interviews were held in the NICU and lasted 30 to 45 minutes.

Procedures

To identify potential participants, a census of new admissions to the NICU was provided weekly to the researchers. It included information about infants and mothers. A member of the research team, who was not involved in the direct care of the infant, approached mothers 2- 8 weeks after NICU admission. If they agreed to take part in the study, a time and date were arranged for the interview.

The interviews were held at the baby's bedside inside the NICU during visiting hours. The researcher administered the questions and the mothers responded verbally while data was collected with pen and paper questionnaires. Mothers were asked to provide demographic data and complete psychological measures in an interview format. The interview took between 30-45 minutes, while providing comfort for the mother and minimizing possible surrounding influences in her responses. A list of mental health support programs was provided to all mothers at the end.

Once the interview was concluded, information was extracted from the infant's medical chart. Perinatal complications to date were recorded. Perinatal complications were grouped in seven categories: neurological, respiratory, cardiac, gastrointestinal, hematologic, renal, and ophthalmologic. These were scored present or absent.

Measures/Instruments

The following demographic information was obtained during the interview with the mother: maternal age, religious affiliation, marital status, household composition with education and employment of each member, previous mental health conditions, and sex of the infant.

State Trait Anxiety Inventory (STAI-6)

The Trait Anxiety Inventory (STAI-6) is a 6-item scale used to measure anxiety symptoms. The development of the STAI inventory was originally intended for high school and college students (MacDowell, 2006) but the instrument is now used for anybody over 12 years (Bellon, et al., 2017). A longer version was created by Spielberger (Spielberger, 1983), but Marteau and Bekker (1992) developed a shorter 6 item version that showed a Cronbach alpha of .82 and a correlation with the full version of .94 (Marteau & Bekker, 1992). A Spanish version of the short form was found, with good reliability, and validity (Cronbach alpha = 0.89), maintaining the original factorial structure (Perpiñá-Galvañ et al., 2011). In Spanish, the 6 items are rated on a three point scale from 0 being nothing, 1 being something, 2 being quite and 3 being a lot (Marteau & Bekker, 1992). The score ranges from 20 to 80 (Graff et al., 2019), with scores of 20-37 indicative of "no or low anxiety symptoms", 38-44 "moderate anxiety symptoms", and 45-80 "high anxiety symptoms" (Ozcan, 2017). Recommended cutoff scores of 40 have been considered to define the clinical level of anxiety (Emons, 2019). Internal consistency was satisfactory (α=.79) in the current sample. All item-test correlations were >.40.

Patient Health Questionnaire – 9 (PHQ-9)

The Patient Health Questionnaire – 9 (PHQ-9) is a 9-item scale used to measure depressive symptoms in 12-year-olds or older. This questionnaire was developed by Kroenke, Spitzer, and Williams (Kroenke et al., 2001). PHQ-9 has good internal reliability: a Cronbach alpha of 0.89 in the PHQ Primary Care Study and 0.86 in the PHQ Ob-Gyn Study (Kroenke et al., 2001). In this particular study, a Spanish version of this instrument was used (Asian/American Center at Queens College), where the psychometrics of the Spanish version demonstrated unidimensionality with eigenvalues less than 2.0, local independence with it correlation of 0.3 or higher, adequate fit for the Rasch IRT model with a Rasch factor of 1.6 and moderate reliability (Zhong et al., 2014), with small idiomatic adaptations ("Desesperanzada" instead of "sin esperanzas"). The PHQ-9 asks "Over the last 2 weeks, how often have you been bothered by any of the following problems?" (Kroenke et al., 2001) Answers ranged from 0-not at all to 3 being almost every day. The score ranges from 0 to 27, with a score of 0-4 indicative minimal depression, 5-9 mild depression, 10-14 moderate depression, 15-19 moderately severe, and 20-27 severe depression (Kroenke et al., 2001). The Spanish PHQ-9 is available for public use and was provided by the authors of the PHQ (Spitzer et al.,1999). Internal consistency was satisfactory (α=.75) in the current sample.

Parental Stressor Scale: NICU

The PSS:NICU is a 46-item scale used to measure parents' perceived stress in the NICU. This questionnaire was developed by Miles et al. (1993). The PSS:NICU can be scored in several ways. One of the methods is Metric 1: the Stress Occurrence Level that measures how stressful a particular situation is when experienced by mothers, and a second method called Metric 2: the Overall Stress Level that is the overall level of stress engendered by the NICU environment. In both methods, only those who reported having the experience receive a score on the item. Scale scores are calculated by averaging these stress responses for the items on each scale and the total scale (Miles et al., 1993; Miles & Funk, 1987). Both methods were used in this study providing important information regarding different aspects of perceived stress in the NICU.

The Cronbach alpha for every subscale was >.70 and for the whole instrument an alpha of .94 for Metric 1 and .81 for Metric 2 (Miles et al., 1993). A Spanish adaptation used with parents of critically ill newborns in Mexico was used for this study (Aguiñaga-Zamarripa et al., 2016). The scale is composed of four subscales that measure mothers' stress regarding (a) the sights and sounds of the unit (5-items), (b) the appearance and behavior of the baby (19-items), (c) their role as mothers and relationship with the infant (10-items), and (d) staff communication and behavior (11-items). The last item is a question about overall, general stress experienced with having their infant in the unit. This scale has a 5-point Likert-type scale on which mothers rate their perceived level of stress from 1 (not at all stressful) to 5 (extremely stressful) (Miles et al., 1993). Scores are derived for each of the subscales and total stress associated with the NICU. In the current sample, internal consistency coefficients were computed for each

subscale (mean coefficient alpha=.87, min=.81, max=.91) and the complete scale (α=.93). Maternal stress was quantified using Likert scale as low (1–2.9), moderate (3–3.9), and high (4–5). The data was analyzed using SPSS Ver.16 (Chourasia et al., 2013).

Multidimensional Scale of Perceived Social Support (MSPSS)

MSPSS is a 12-item scale that assesses parents' perception of social support from three sources: family, friends, and a special person using a 7-point Likert scale (1-very strongly agree to 7-very strongly disagree) (Zimet et al., 1988). The 12 items on the MSPSS are divided into factor groups relating to sources of support (i.e., Family, Friends, or Significant Other) with four items in each group. The MSPSS was validated in 1988, with a Cronbach coefficient alpha of 0.88. For the subscales of Significant Other, Family, and Friends the values of reliability were .91, .87, and .85, respectively. In the present study, a Spanish version of this instrument was used (American Academy of Pediatrics, 2010). The psychometric properties of the Spanish version reported good reliability and validity. The reliability analysis yielded a Cronbach's alpha greater than 0.85 for both the subscales and the total scale (Diaz et al., 2015). Internal consistency was supported by a strong Cronbach's Alpha (.88) for the total scale and had a positive correlation between the Spanish Self-efficacy General support scale and the Spanish version of MSPSS (Hannan et al., 2016).

There are four scores derived: (1) support from family, (2) support from friends, (3) support from a special person, and (4) total support. Higher summative scores indicate greater perceived social support. In the current sample internal consistency coefficients were satisfactory for the scale as a whole (α=.91), as well as

for each subscale: family support (α=.88), friends support (α=.96), and special person support (α=.78).

A mean score ranging from 1 to 2.9 could be considered low support; a score of 3 to 5 could be considered moderate support; a score from 5.1 to 7 could be considered high social support (Zimet et al., 1988).

Spiritual Support

Spiritual support is a 2-item scale created by the researchers using the same scale as MSPSS, a 7-point Likert. This scale goes from 1, very strongly agreeing to 7, very strongly disagreeing. The first item is "I believe in a supreme being that gives me spiritual support" and the second item is "I relate to this supreme being through praying, meditating, asking for help, etc." In this approach, just like MSPSS, a mean score ranging from 1 to 2.9 could be considered low support; a score of 3 to 5 could be considered moderate support; a score from 5.1 to 7 could be considered high social support (Zimet et al., 1988). Internal consistency was satisfactory (α=.79) in the current sample. All item-test correlations were >.40.

Perinatal Complications

Perinatal complications were collected from the infants' medical records immediately after completing the maternal interview. These were divided into seven categories: neurological, respiratory, cardiac, gastrointestinal, hematology, renal, and ophthalmologic. Neurologic complications were considered present if the patient had Intraventricular Hemorrhage, Hydrocephalus, Hypoxic Ischemic Encephalopathy, or Seizures. Respiratory complications were present if the infant had Apnea, Bronchopulmonary Dysplasia, Respiratory Distress Syndrome, Pulmonary Artery Hypertension, or Pneumonia. Cardiac complications were present if the infant had Patent Ductus Arteriosus, Coarctation of the Aorta, Septal Defects, Hypoplastic Heart, or other congenital cardiac conditions. Gastrointestinal complications were present if the infant had Hyperbilirubinemia, Cholestasis, Bowel Obstruction, Gastroschisis, Omphalocele, Hirschsprung, Ileostomy, or Colostomy. Hematology was present if the patient had Necrotizing Enterocolitis, Clinical Sepsis, Positive Cultures, Anemia, Thrombocytopenia, Zika, or STD. The renal diagnosis was present if the patient had Acute Kidney Injury, Polycystic Kidney, or Multicystic Kidney. To conclude, for ophthalmologic, Retinopathy of Premature, and Laser Treatment were considered as present. The total score ranges from 0 to 7.

Data Analysis

All data was checked for accuracy before being entered. During the data collection phase, the researchers tried to get complete data on all participants using more than one way to obtain important demographic variables such as age, gestational age, and educational level. Mothers were contacted by phone if any data was questionable or missing (ie, demographics) or the medical staff was consulted for accuracy of coding of perinatal complications. After this initial screening, the raw data was entered into an Excel datasheet. For data quality and integrity of the database, a double-entry procedure and a randomly selected list of electronic records checked against the original questionnaires were used to improve the quality of data and assure a high level of data accuracy. These procedures significantly reduced data-entry errors including invalid entries, out-of-range values, inconsistent data, and

possible duplicate records. In those circumstances where an invalid entry or any other error was found, the researcher went back to the questionnaire to attempt to remediate these data problems.

The data obtained from the instruments were analyzed using IBM SPSS Statistics version 27. Standard descriptive statistics like means, frequency, range, standard deviations were computed and used to summarize demographic data (ie, mother's age and educational level, gestational age, birth weight). The Pearson product-moment correlation coefficients with a two-tailed test of significance were used to evaluate linear relationships on the variables of interest (ie, maternal anxiety, depression, social and spiritual support, PSS: NICU total, and four subscales and infant's perinatal complications). Assessment of the normality of continuous study variables was conducted using graphical methods which include histogram and normality plots. Also, two numerical measures of shape – skewness and kurtosis – were used. Results showed data follow a normal distribution. Missing data occurred on the PHQ-9, the MSPSS, and in the overall PSS-NICU stress score. A total of four participants failed to complete the PHQ-9 and MSPSS scales. Two additional participants didn't complete the overall NICU stress score. Also, three participants failed to inform their educational level.

The Bonferroni correction was used for adjusting alpha (α) if multiple significance tests were done. Correlations were computed based on the number of pairs with non-missing data. For frequency analysis missing values were excluded. Percentages were based on the number of non-missing values.

Results

Maternal and infant characteristics

Our sample consisted of 110 mothers whose average age was 27 years, with a minimum age of 15 and maximum age of 47. The infants' average gestational age was 34 +/- 5 weeks and the average birth weight: 2,050 g +/- 1,030 g.

Table 1
Maternal and Infant Demographic Characteristics

Variables	Mean	Standard Deviation
Age (years)	27	13.8
Gestational Age (weeks)	34	4.7
Birth weight (g)	2053	1.06

Note. N = 110.

Maternal demographic data showed that 40% (n = 43; three mothers had missing data) reported completing a high school level education, followed by mothers who had completed a bachelor's degree, 23% (n = 25).

Table 2
Maternal Education Level Frequency Distribution

Education Level	Frequency	Percent
Did not complete high school	4	3.7
High School	43	40.2
Technical Degree	9	8.4
Associates Degree	12	11.2
Some University	6	5.6
Bachelor's Degree	25	23.4
Master's Degree	6	5.6
Doctorate's Degree	2	1.9

Note. N = 107 (3 missing scores).

Maternal Anxiety, Depression, and Stress

For maternal anxiety, the range for this scale goes from 20-80, where more than 50 was considered high levels of anxiety. NICU mothers presented slightly high

anxiety (M = 41.7, SD = 13.8). Maternal slightly high anxiety symptoms were reported by 40.9%, while mothers who experienced moderate anxiety symptoms were reported by 20.9%, and finally, mothers with no symptoms of low anxiety composed 38.2% of the sample.

For maternal depression, NICU mothers were found on average reporting mild depression symptoms (M = 5.6, SD = 4.70) being the scale 0-27, where scores between 5-9 reflected mild depression. NICU mothers who presented minimum to no symptoms of depression composed 53.6% of our sample, while 25.5% of mothers

presented mild symptoms of depression, and 21% presented moderate to severe symptoms of depression.

In the overall NICU stress score, which includes all four subscales, mothers reported low to mild stress associated with the NICU (M = 1.98, SD = 1.06). Results also showed that the highest mean score for maternal stress was parental role alterations (M = 2.92, SD = 1.03). This was followed by sights and sounds of the unit (M = 1.95, SD = 1.11), infant behavior and appearance (M = 1.69, SD = 1.04), and staff behavior and communication (M = 1.37, SD = 1.08).

Figure 1
NICU Stress Reported by Mothers
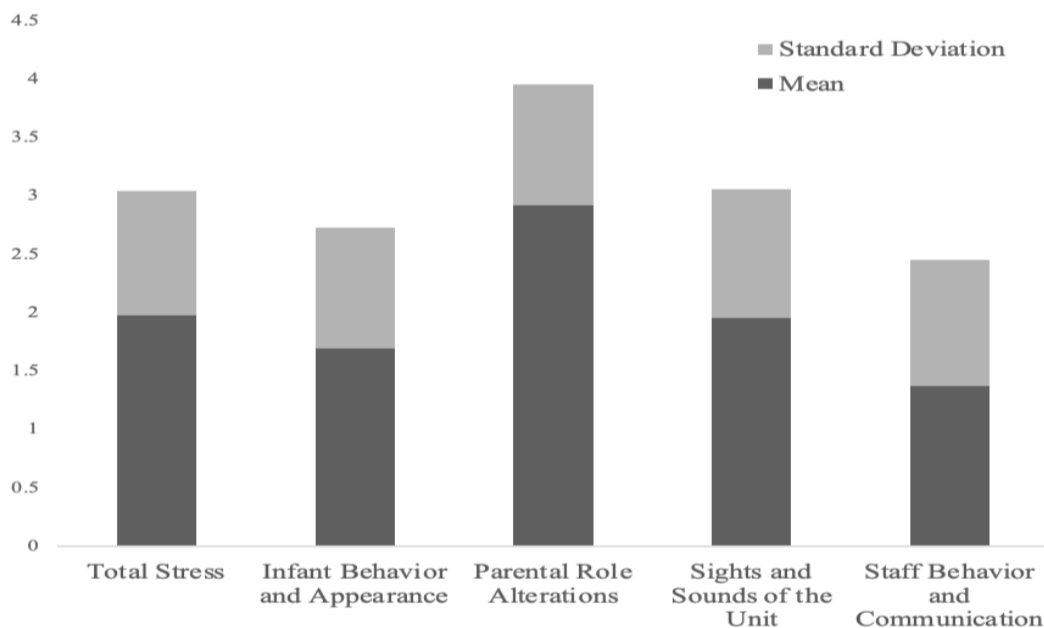
Note. N = 110

In the total scale, including all four subscales, 64.9% of mothers reported low levels of stress, 7.4% reported moderate levels and 27.7% reported high levels of stress. For each subscale, these percentages varied. For the sights and sounds of the unit subscale, 70.9%, 10.4%, and 18.7% of

mothers reported low, moderate, and high levels of stress respectively. For the second subscale, staff behavior and communication, 78%, 4.6%, and 17.4% of mothers reported low, moderate, and high levels of stress respectively. In the parental role alterations, 41.5%, 6.5%, and 52%

reported low, moderate, and high levels of stress respectively. Lastly, in the infants' behavior and appearance subscale, 69.1%, 8.1%, and 22.8% of mothers reported low, moderate, and high levels of stress respectively.

Perinatal Complications and Social and Spiritual Support

One of the purposes of this study was to see if there were associations between the number of perinatal complications and maternal psychological symptoms. We found that a higher number of perinatal complications were associated with higher maternal NICU stress, $r(107) = .23, p = .01$. There was no evidence of an association between the number of perinatal complications and the symptoms of maternal anxiety and depression.

Another purpose of this study was to ascertain the relation between different kinds of support and maternal psychological symptomatology. We found that fewer anxiety symptoms were reported by mothers who have experienced spiritual support throughout the process in the NICU, $r(107) = -.24, p = .01$. Less depressive symptoms were associated with more support from friends, $r(102) = -.21, p = .03$. Less overall NICU stress was related to higher family ($r(102) = -.23, p = .02$) and friend support, $r(106) = -.22, p = .03$. Specifically, less NICU stress in response to staff behavior/communication was reported by mothers reporting more friends support, $r(102) = -.23, p = .02$.

Discussion

This study aimed to document anxiety, depression, and stress symptoms reported by mothers in a NICU. In addition, we wanted to identify if maternal anxiety, depression, and stress symptoms vary as a function of perinatal complications (higher perinatal complications, more symptomatology) and social and spiritual support (the higher the support, the less symptomatology).

Our results suggest that, in general, mothers of neonates admitted to the NICU experience higher anxiety than depression and NICU stress. These findings are consistent with another study using the STAI with mothers in Malaysia who reported similar means (Ong et al., 2018). Moreover, in a previous study in the same population, clinically significant symptoms of generalized anxiety were found in 43% of the sample (Vizcarrondo-Oppenheimer et al., 2019).

The participants also experienced minimum to severe depression. We saw that for our sample, 53.6% of mothers presented minimum to no symptoms of depression, 25.5% presented mild symptoms of depression, and 21% presented moderate to severe symptoms of depression. Previous studies in other populations have shown higher levels of depression than we reported (Helle et al., 2015). The lower to milder levels of depression experienced in our sample could be linked to various cultural and/or social factors in and out of the NICU. More specifically, the open layout of our unit and easily reachable personnel could pose as a supportive environment for our mothers. Additionally, the influence of preeminent family values in the culture could have operated as a depression buffer (Vizcarrondo-Oppenheimer et al., 2019).

Maternal stress findings showed various levels of stress associated with the NICU. Our mothers reported relatively high levels of NICU stress associated with the parental role alterations, in comparison to other sources of stress in the NICU. This is very significant since studies have shown that psychologically stressed mothers whose

parental role has been altered, have difficulty demonstrating positive child-rearing behavior (Craig et al., 2015). These findings suggest the need of supporting parental roles in the NICU to strengthen the lifelong relationship with their baby, the infant's physical, cognitive, and psycho-social development (Craig et al., 2015). These findings point out the need for changes in NICU practices that allow mothers to be involved in the care of their infant as much as possible, given the medical conditions of the infant.

Some limitations of our study should be noted. First, the extensive nature of the questionnaires might have caused the mothers to get tired of responding and start repeating the same answer for each phrase without thinking of their feelings. Second, perinatal complications were quantified in seven categories: neurological, respiratory, cardiac, gastrointestinal, hematologic, renal, and ophthalmologic. But only presence and absence were scored, not the total of complications in each category. This coding (presence/absence) made it difficult to analyze the severity of the infant's medical conditions since they could have more than one complication in each category. Third, mothers tended to go to the NICU with the fathers or other relatives, and sometimes these relatives interfered with the mother's responses.

These results are important since they provide evidence that mothers of NICU infants experience high rates of anxiety, stress associated with their lack of involvement in their infants' care, and some depressive symptoms. This maternal symptomatology has been associated in other samples, with infant outcomes, both short-term while in the NICU, as well as long-term neurodevelopmental and behavioral outcomes (Ouyang et al., 2020).

Conclusions

Mental health symptoms in mothers in the NICU range from low to moderate levels. These levels seem to be similar to those found in other countries and indicate the need for screening and treatment to be incorporated into the services provided by NICU systems.

Further, it seems the existence of social support in a mother's life can help them cope with the situation and can be used to screen the mothers in most need of intervention. For example, mothers who report higher reliance on spiritual support tend to report lower anxiety scores. Also, lower depressive symptoms in mothers are associated with reports of higher support from friends. Tapping these natural emotional and social resources might be important during and after the NICU, and these practices can be encouraged by the NICU staff.

In general, these findings make it imperative to monitor the psychological symptoms of mothers during their infant stay in the NICU. Mothers can be very vulnerable while their infants are staying in the NICU; tapping into their natural support systems or providing them with the support they need is essential to support their long-term relationship with the baby. Efforts to continue multidisciplinary interventions at the NICU, with the support of social services and psychologists, and to continue efforts in establishing family-centered care during the baby's hospital stay are needed to improve the maternal-infant bonds and long-term wellbeing.

Compliance with research ethics standards

Conflict of interest: The authors declare

no conflict of interest regarding the publication of this article.

Approval of the Institutional Board for the Protection of Human Beings in Research: This study is approved by the Institutional Review Board - University of Puerto Rico, Medical Sciences Campus. IRB Number: 0420116

Consent or Assessment forms: Subjects were given a consent form to participate in research questionnaires when their infant was admitted to the Unit.

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