Original Article

The Level and Sources of Stress in Mothers of Infants Admitted in Neonatal Intensive Care Unit

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ABSTRACT

Background: Hospitalization of a new-born child is stressful for parents. This study was done to determine the level and sources of stress in mothers of infants admitted in Neonatal Intensive Care Unit (NICU) and variance in stress by infant and maternal characteristics. **Materials and Methods:** Parental Stressor Scale for NICU was used as the primary outcome measure. Maternal socio-demography, maternal and infant characteristics such as gravidity, number of prenatal visits, perceived support from family members, perceived level of discomfort that the baby underwent, pregnancy and delivery complications, gestational age, sex, birth weight, length of NICU stay and ventilator support, and neonatal morbidity were also collected from maternal and infant hospital records. **Results:** Amongst these rural and poorly educated mothers, the appearance of the baby, sights and sounds of NICU environment were major sources of stress. Higher maternal stress was found to be associated with poor family support during pregnancy, mothers' perception of the baby's discomfort, lower birth weight of the baby, baby on ventilator, post-partum depression, and moderate to severe anxiety symptoms. Mothers who had higher levels of education and those with pregnancy complications were more stressed. **Conclusions:** Before designing remediation programs for parents, local demography and the predominant NICU stressors need to be kept in mind. Possibility of screening at-risk mothers by questioning them about perception of baby's discomfort needs to be evaluated further.

Key words: *Maternal stress, Neonatal Intensive Care Unit environment, parental role alteration, PSS-NICU*
Key messages: *Looks and behavior of the baby followed by parental role alternation were major sources of maternal stress. Higher stress was seen amongst mothers of Very Low Birth Weight infants and those needing ventilation. Lower education level may mitigate maternal stress.*

Hospitalization of a child in the Neonatal Intensive Care Unit (NICU) can be particularly stressful for the parents.[1] The effects may persist beyond the admission and influence later family functioning and parents' mental health.[2]

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Stress on the mother can be conceptualized using the 'Parental NICU stress model' which considers the following factors contributing to it:[3] (A) NICU environment stressors such as sights and sounds, babies' appearance and behavior, parental role alteration, and staff behaviors have a direct influence on the mothers' stress response. Parental role alternation means the impact of the admission on the parent-infant relationship, due to the nurses being the primary caregivers. (B) Factors influencing the parents' experience of the NICU environment are (1) situational factors (2) personal characteristics of the parent including depression and anxiety, and (3) personal resources.

Parental Stressor Scale: Neonatal Intensive Care Unit (PSS: NICU) has been widely used in the Western population to measure the parental stress response and environmental stressors due to the admission of the infant in NICU.[4] However, there are few studies in the Indian population.[1,5] A Ludhiana study (2011) conducted amongst 343 parents found baby appearance, followed by parental role alteration as the major sources of stress.[1] A Pondicherry study (2012) carried out amongst urban, homemaker, and educated group of mothers, reported parental role alteration followed by baby appearances as the major sources of stress.[5]

Sources of maternal stress may vary according to sociocultural population and the NICU environment; hence this study was done to determine the level and sources of stress in mothers of infants admitted in our NICU and variance in maternal stress by infant and maternal characteristics including depression and anxiety.

SUBJECTS AND METHODS

A cross-sectional survey was conducted in mothers of infants admitted for >48 hours in a level 3 NICU. Over a period of 1 year, mothers of all consecutive admissions to the NICU were approached for inclusion in the study. Mothers who were unable to visit their babies in the NICU or whose babies succumbed during treatment were excluded. A trained NICU nurse conducted interviews with the mothers. She approached the mothers for an interview between the 6th to 8th day of admission. Data was also collected from maternal and infant hospital records. Approval was taken from the Institutional Ethics Committee, HM Patel Center for Medical Care and Education, Karamsad, Anand, Gujarat before the study. The survey was administered in the NICU after taking written informed consent of the mother.

Data collected consisted of:

(1) Maternal socio-demographic and other characteristics like gravidity, number of prenatal visits, perceived support from family members, perceived level of the discomfort that the baby is going through, pregnancy, and delivery complications

(2) Infant characteristics such as gestational age, sex, birth weight, length of NICU stay and ventilator support, and neonatal morbidity. Neonatal Morbidity Scale (NMS)[6] was used to evaluate the objective severity of morbidity in infants. The score is based on 20 of the most common significant problems seen in sick children, scored as none, mild, moderate, and serious based on anchors provided in the scale. From the first day of admission in NICU till discharge from NICU, neonatal morbidity score was calculated once daily. Cumulative neonatal morbidity was calculated from the daily scores

(3) Parental Stressor Scale: Neonatal Intensive Care Unit (PSS: NICU)[4] was used to measure maternal stress. It is a 46-item instrument that measures mothers' perceptions of stress within the NICU. The scale consists of four subscales that measure stress related to (a) sights and sounds of the unit (5 items), (b) appearance and behaviors of the infant (19 items), (c) impact on the mothers' role and her relationship with her baby (10 items), and (d) mothers' relationship and communication with the staff (11 items). It also has a general stress-level question that summarizes the mothers' overall feeling of stress related to having an infant in the NICU. The responses to the PSS: NICU are scored on a 5-point Likert scale from 1 (not at all stressful) to 5 (extremely stressful). If a mother reports an item as not being applicable, it would be scored 0. The overall stress metric was used in this study. Chourasia *et al.* have suggested arbitrary classification of the PSS: NICU mean score into high (4.0–5.0), medium (3.0–3.9), and low levels (1.0–2.9).[5] Gujarati version of PSS: NICU was developed using a translation-back translation methodology and pilot tested on 10 mothers before use for study purpose. The validity of contextually appropriate translation was checked before administration of the Gujarati version of PSS: NICU

(4) Edinburgh Postnatal Depression Scale (EPDS)[7] was used to evaluate depressive symptoms. The 10-item EPDS is a valuable and efficient way of identifying patients at risk for peri-natal depression. Mothers who scored above 12 are likely to be suffering from post-partum depression. It has previously been validated in Gujarati[8]

(5) Generalized Anxiety Disorder - 7 (GAD-7)[9] was used to evaluate anxiety symptoms. It is a 7-item scale, rated on a Likert scale from 0 to 3. Scores of 5, 10, and 15 are taken as the cut-off points for mild, moderate and severe anxiety, respectively. A previously translated version was used from the authors' site, but it has not been validated in this population.

PSS: NICU score (maternal stress) was the outcome variable. Variance in maternal stress with maternal and infant characteristics, cumulative neonatal morbidity, depression (EPDS score) and anxiety symptoms (GAD-7 score) was calculated. Descriptive statistics were calculated for demographics, Analysis of variance (ANOVA) was used to compare PSS: NICU mean score between various categories of maternal and infant characteristics, neonatal morbidity, depression, and anxiety at the univariate level. Pearson correlation coefficient was calculated for PSS: NICU mean score with maternal and infant characteristics and cumulative neonatal morbidity score. Backward regression analysis was performed to determine the factors influencing the stress at the multivariate level. The threshold for statistical significance was set at a *P* value of 0.05. The analysis was performed using STATA version 14.2.

RESULTS

One hundred and fifty-one mothers were recruited over a period of one year. The mean (SD) age of mothers was 25.47 (4.98) years. All mothers were married. Majority of them came from a rural background, were illiterate (11.2%) or had less than high school level of education (59.6%), and most of them were homemakers (90.7%). Forty-one percent of the mothers were primigravida, 76.4% reported more than five prenatal check-up visits, 53% reported pregnancy complications, and 55.6% delivered by normal labor. Most of the mothers (94.7%) perceived good family support during pregnancy; 41.1% perceived that their baby was suffering from severe discomfort.

Majority of the infants were premature (62.9%), and 75.5% weighed less than 2500 gm at birth. Seventy-five percent of the infants were males. Seventy-eight percent of the infants required ventilator support. Mean length of NICU stay for the infants was 21.5 days (range 8–75). Mean cumulative neonatal morbidity score for infants on the day of the interview was 20.97 (range 0–106).

The mean (Standard Deviation, SD) maternal stress level on PSS: NICU was 1.62 (0.47). The mean (SD) scores for sub-scales sights and sounds, baby look and behavior, parental role alteration, and staff behaviors were 1.98 (0.83), 1.45 (0.45), 1.76 (0.54), and 1.03 (0.12) respectively. "Tubes and equipment on or near my baby" (2.50) followed by "presence of monitors and equipment" (2.46) were stressors with the maximum score on the PSS: NICU. Thirteen percent of mothers had clinically significant depressive symptoms (EPDS ≥12). All mothers had anxiety symptoms (GAD-7 ≥5).

Variance in maternal stress with the infant and maternal characteristics at the univariate level is shown in Table 1. Higher maternal stress was found to be associated with poor family support during pregnancy, mothers' perception of the baby's discomfort, extremely low birth weight of the baby, baby being on ventilator, likely post-partum depression, and moderate to severe anxiety symptoms. Regression analysis revealed that education level ($P = 0.01$), perceived family support ($P = 0.01$) and baby discomfort ($P = 0.02$), baby being on ventilator ($P = 0.05$), EPDS scores ($P = 0.003$), and GAD-7 scores ($P = 0.03$) were significantly associated with PSS: NICU scores. The coefficient of determination of the model was satisfactory ($R^2 = 0.4$).

DISCUSSION

We have discussed our findings in light of the "Parental NICU stress model."[3] For this study, parental stress response was calculated using the overall stress metric (PSS: NICU mean score). The NICU environmental stressors are analogous with the four subscales of the PSS: NICU. Situational factors considered in our design were the perceived severity of the baby's illness, first look at the baby, and infant characteristics such as baby's sex, birth weight, gestational age, and need for ventilation. Personal factors included maternal age, past experiences such as gravidity and abortions, education, and family support.

The intensity of overall maternal stress (1.62) was in the low-level range (1.0–2.9 on a scale of 1.0–5.0) as compared to 3.78 in the Ludhiana study.[1] The Pondicherry study did not use the overall stress metric, and hence the overall maternal stress could not be compared.[5] Mean scores for the subscales sights and sound, appearance and behavior, parental role alteration, and staff behaviors were 1.98, 1.45, 1.76, and 1.03 respectively as compared to 2.55, 4.1, and 4.12, and not evaluated respectively in the Pondicherry study and not reported, 4.25, 3.64, and not reported respectively in the Ludhiana study.[5] A more recent study from Indore reported a moderate level of overall maternal stress 2.73 (2.04, 3.32, 3.74, 1.92 for the subscales listed as above).[10] Compared to the Indore study, our scores were significantly lower on all subscales (including staff behaviors) except sights and sound. Mothers in the Indore study had a mean age of 27.3 years, but only half were homemakers, and 27% were illiterate.

Lower stress levels in our population may be explained by parental resources (education, family support) and staff behavior. Lower education of the majority of

Table 1: Variance in maternal stress with maternal and infant characteristics

Variable	Group	n (%)	PSS: NICU score mean (SD)	P
Age (n=151)	18-25	87 (57.6)	1.60 (0.44)	0.456
	>=26	64 (42.4)	1.65 (0.49)	
Level of education (n=151)	Illiterate	17 (11.2)	1.36 (0.32)	<0.001
	Less than High School	90 (59.6)	1.56 (0.44)	
	High School	27 (17.9)	1.96 (0.48)	
	Graduate	17 (11.2)	1.65 (0.44)	
Gravidity (n=151)	Primigravida	62 (41.0)	1.60 (0.45)	0.672
	Multigravida	89 (59.0)	1.63 (0.48)	
Prenatal visits (n=148)	<4	35 (23.6)	1.73 (0.63)	0.200
	>=4	113 (76.4)	1.58 (0.40)	
Pregnancy complications (n=151) *	Reported	80 (53.0)	1.61 (0.44)	0.725
	Not reported	71 (47.0)	1.63 (0.49)	
Good family support in pregnancy (n=151)	Yes	143 (94.7)	1.59 (0.45)	0.004
	No	8 (5.3)	2.08 (0.53)	
Type of delivery (n=151)	Normal labor	84 (55.6)	1.56 (0.41)	0.103
	C-Section	67 (44.4)	1.69 (0.53)	
Mothers perception of baby discomfort (n=151)	None/Mild	89 (58.9)	1.47 (0.38)	<0.001
	Severe	62 (41.1)	1.83 (0.50)	
Baby gender (n=151)	Male	113 (75.2)	1.60 (0.44)	0.275
	Female	38 (24.8)	1.69 (0.53)	
Gestational age (n=151)	Extremely Premature	4 (2.7)	1.62 (0.39)	0.876
	Premature	95 (62.9)	1.63 (0.47)	
	Full term	52 (34.4)	1.59 (0.46)	
Birth Weight (n=151)	Average (2500 g)	37 (24.5)	1.69 (0.49)	0.003
	LBW (1500-2500 g)	59 (39.1)	1.52 (0.36)	
	VLBW (1000-1500 g)	48 (31.8)	1.60 (0.50)	
	ELBW (<1000 g)	7 (4.6)	2.17 (0.51)	
Baby put on ventilator (n=151)	Yes	118 (78.1)	1.67 (0.46)	0.013
	No	33 (21.9)	1.44 (0.44)	
Own a house (n=151)	Yes	120 (79.5)	1.65 (0.48)	0.080
	No	31 (20.5)	1.49 (0.38)	
EPDS (n=151)	Unlikely Post-Partum Depression (<12)	131 (86.8)	1.56 (0.45)	<0.001
	Likely Post-Partum Depression (≥12)	20 (13.2)	1.99 (0.43)	
GAD7 (n=147)	Mild (5-9)	131 (87.3)	1.56 (0.44)	<0.001
	Moderate-Severe (≥10)	16 (12.7)	2.07 (0.47)	

*Missing data were assumed as "not reported". EPDS – Edinburgh postnatal depression scale; GAD – Generalized anxiety disorder; LBW – Low Birth Weight; VLBW – Very low birth weight; ELBW – Extremely low birth weight; PSS: NICU – Parental stressor scale: Neonatal intensive care unit

our study population seems to be protective against maternal stress [Table 1]. While the Ludhiana study[1] did not report the socio-economic profile of their study population, Pondicherry study[5] was done amongst urban, homemaker, and a more educated group of parents. Majority of the mothers in our study reported good family support during pregnancy [Table 1]. However, those who reported poor support during pregnancy had higher maternal stress score. In our routine observations, we had noted that parents get help from various sources such as grandparents, friends, and neighbors during hospitalization, which may be instrumental in mitigating some of the parental stress.

The lower level may also be explained by the mitigating effect of staff behavior (PSS: NICU staff behavior subscale mean 1.03 on a scale of 1–5, where a lower score means favorable staff behavior). However, lower levels of staff behaviors may also be explained by giving of a socially desirable response to the questions on staff behaviors, as the interviews were conducted by one of the staff nurses.

Sights and sound of the NICU environment, followed by parental role alteration, were major sources of stress in our study. Consistent with these findings, 'tubes and equipment on or near my baby' (2.50) followed by 'presence of monitors and equipment' (2.46) were stressors with the maximum score on the PSS: NICU. The Ludhiana study[1] had found baby appearance, followed by parental role alteration, as the major sources of stress, and the Pondicherry study[5] had reported parental role alteration, followed by baby appearances, as the major sources of stress. While the major sources of stress may vary, the common thread in all three studies is the parental role alteration (the inability of the parent to care for the child, who is largely taken care of by the NICU nurse). So, remediation programs for parents should be designed keeping in mind the local demographic profile and

predominant stressors in that environment but should always have a component that addresses parental role alteration.

As expected, the mothers' perception of the baby's illness severity was strongly associated with their stress response. Single question screeners using mothers' perception of the baby's illness severity may be useful and practical to identify mothers in distress who require more staff support. An earlier study[11] had shown high patient to nurse ratio in Gujarat, making it pertinent to have brief instruments to screen mothers. Other situational factors such as the baby having extremely low birth weight (<1000 g) and the need for ventilator support were significantly associated with maternal stress response. Singer *et al*.[12] found that at 1-month post-delivery, mothers of very low birth weight (VLBW) infants had more psychological distress than mothers of term infants. They also recommended that follow-up programs should incorporate psychological screening and support services for mothers of VLBW infants in the immediate postnatal period, with a monitoring of mothers of high-risk VLBW infants.

Busse *et al*. found that amongst parents, PSS: NICU total score was significantly correlated with anxiety (r = 0.61), depression (r = 0.36), and sleep disturbance (r = 0.60).[13] We found that all the mothers had anxiety symptoms, but the majority had mild symptoms only. Twelve percent had moderate-severe anxiety symptoms, and about 13% of the mothers were likely to be having post-partum depression. It can be expected that without intervention, such symptoms may continue even after discharge from the hospital and may hamper mother-child bonding. This subgroup of patients would benefit from interventions as described above for mothers of VLBW infants.

Limitations of the study are that we have not considered many factors that could be part of the parental NICU stress model such as uncertainty about illness, concurrent life events, cognitive and financial resources, perceptions about support by staff, etc., Generalizability may be limited as there is a male bias in the study sample of neonates. Additionally, compared to previous studies, our interviews were conducted at different time points in the study. Also, mothers were not formally evaluated for major psychiatric disorders.

Conclusions: Looks and behavior of the baby, followed by parental role alternation, were the major sources of maternal stress, which is associated with significant psychological morbidity. Higher stress was seen amongst mothers of VLBW infants and those needing ventilation. Lower education level may mitigate maternal stress. Remediation programs for parents should be designed, keeping in mind the local demography and the predominant stressors but should always have a component that addresses parental role alteration. The possibility of screening at-risk mothers by questioning them about the perception of baby's discomfort needs to be evaluated further.

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Conflicts of interest
There are no conflicts of interest.

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