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Assessment of stress levels of mothers in the Neonatal Intensive Care Unit

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Abstract

Background: The hospitalization of a neonate in the Neonatal Intensive Care Unit (NICU) is usually stressful for the mother and all the other family members. Identifying aspects of babies, mothers and the environment that can cause stress may be useful in assisting health personnel in understanding their importance and in improving the quality of care.

Methods: The study was conducted in the Level III NICU of a tertiary care hospital which caters to outborn patients only. All the neonates admitted to the NICU for >7 days during the study period who met inclusion and exclusion criteria were recruited for the study. An allowable error sample size of 129 was calculated. This study used the PSS: NICU (Parental Stress Scale: NICU) Questionnaire which was administered to the mothers and the data was analyzed.

Results: Stress levels are significantly higher in young mothers (<25 years) than in mothers older than 25 years ($p < 0.0001$) and stress levels in mothers with education up to primary/ high school were significantly higher than those who had completed intermediate/ graduate level education. Stress levels in primigravida mothers were higher than in multigravida mothers ($p < 0.0001$), higher in those with preterm neonates than with term neonates. Among the three subscales of the questionnaire, the mean stress score was highest (3.91) for 'Relationship and parental role' compared to the other two subscales ($p = 0.03$).

Conclusion: Factors such as maternal age, maternal education, gestational maturity, and duration of hospital stay influenced the stress levels of mothers significantly.

Keywords: Neonate, Stress, Parental stress scale

Introduction

The hospitalization of a neonate in the NICU is usually stressful for the mother and all the other family members. This stressful nature of the NICU environment for parents especially mothers is well documented in Western literature [1]. NICU mothers experience multiple stressors related to preterm birth, the medical condition of the baby, complexity of the NICU environment, and the perceived vulnerability of the infant, in addition to stressors associated with the normal transition process to motherhood [2]. Identifying aspects of babies, mothers and the environment that can cause stress may be useful in assisting health personnel in understanding their importance and in improving the quality of care. A systematic examination of the sources of stress in the NICU environment will be useful in leading to solutions. Understanding maternal stress may also help health personnel in assisting them towards improving their ability to meet the needs of their babies and to develop the skills required for fulfilling their role. This study was conducted to determine levels of stress experienced by mothers of babies admitted in NICU using Parental Stress Scale: Neonatal Intensive Care Unit (PSS: NICU) and to identify infant and maternal characteristics which significantly influence their stress level [4].

Environmental factors that can influence a mother's reaction to having an infant in NICU might include a) Difficulty in fulfilling her maternal role b) Medical equipment used for intervention and c) Communication patterns and behavior of the staff [5]. Maternal stress resulting from experiences with infants hospitalized in NICU is well documented in Western literature. Less literature review is found for developing countries. Increased information about how mothers of hospitalized high-risk infants perceive NICU, and also an understanding of the needs of such mothers may enable NICU staff to identify parents at risk and plan interventions for improving mental health in NICU mothers [6, 7].

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Methods

The study was conducted in the Level III NICU of a tertiary care hospital which caters to outborn patients only over a period of 3 months

- **Study design:** Cross-sectional Observational study
- **Sample size:** 129

Inclusion criteria

The study included mothers of neonates admitted to the NIC

1. Who is willing to take part in the study
2. Whose neonate has completed 7 days of stay in NICU for >7 days

Exclusion criteria

The study included mothers of neonates admitted to the NICU

1. Who diagnosed with a temporary or long-standing psychiatric illness
2. Who cannot visit to the NICU regularly

PSS: NICU (Parental Stress Scale: NICU) Questionnaire (Annexure 1) was used in this study. It is a 27-item self-report instrument to measure the mother's perceptions of stress within the NICU. It has 3 subscales that measure stress related to

1. Sights and sounds in the unit (6 items)
2. Appearance and behavior of the infant (11 items)
3. Parental role and relationship with their baby (10 items)

Experts translated the questionnaire into Hindi and Marathi non-medical languages. This translated version was compared with the original and validated by language experts. The responses to the PSS: NICU were scored on a 5-point Likert scale on which the mothers could rate the level of stress for each item from 1 (not at all stressful) to 5 (extremely stressful). There was also a not applicable (N/A) option, which was scored 0 when using one of the scale's scoring methods.

Ethical approval was obtained from the Institutional Ethics Committee before the enrollment of participants. Informed consent was obtained. Information was obtained from mothers and/ or from the medical records available. Information so obtained was entered in a pre-designed Case

Record form. Mothers were recruited as per the inclusion criteria for the current study. The researcher approached the mothers at a time when they would be visiting but not holding their baby. Questionnaires were administered at that time. Collected data was compiled, entered in the Microsoft Excel package of Office 365, corrected for typographic and other errors, and analyzed. The data was processed and analyzed using the IBM Statistical Packages for Social Sciences, SPSS software version 22. The results of continuous data were measured as frequency, mean, and standard deviation. The results of categorical data were presented as numbers (%). Kruskal-Wallis test and Mann-Whitney U test were used to compare the different types of data. A p-value less than 0.05 was considered statistically significant

Results

During the study period, there were a total of 212 admissions to the Neonatal Intensive Care Unit (NICU). Of these, 140 mothers met eligibility criteria and were approached; 134 consented to participate, and after five withdrew for personal reasons, the final study cohort comprised 129 mothers (see Figure 1).

Sociodemographic and Clinical Profile

The mean age of participating mothers was 28.4 years (SD 4.6). The majority (62.8%) were between 25 and 35 years of age, with 27.9% under 25 years and 9.3% above 35 years (Table 1). Primigravidae accounted for 51.9% of the cohort, while 48.1% were multigravidae. With regard to educational attainment, 15.5% had completed only primary schooling, 24.8% high school, 19.4% intermediate, and 40.3% were graduates.

Among the infants admitted, 55.8% were born preterm and 43.4% were of term gestation. Very preterm infants (gestational age 28–32 weeks) represented the largest subgroup among the preterm category (24%). Most mothers (42.6%) were assessed after 7–14 days of NICU admission, with the mean duration of hospital stay at assessment being 19.7 days (SD 11.2). Regarding illness categories, prematurity or low birth weight accounted for the majority of cases (38.7%), followed by infection (14.7%), respiratory (13.2%), and other categories as detailed in Table 1.

Table 1: Sociodemographic and Clinical Profile of Study Participants (N = 129)

Variable	Category	n	%	Mean (SD)
Maternal Age	<25 years	36	27.9	
	25–35 years	81	62.8	
	>35 years	12	9.3	
	Total	129	100	28.4 (4.6)
Gravida	Primigravida	67	51.9	
	Multigravida	62	48.1	
Education	Primary	20	15.5	
	High School	32	24.8	
	Intermediate	25	19.4	
	Graduate	52	40.3	
Infant Maturity	Extreme Preterm (<28 wks)	15	11.6	
	Very Preterm (28–32 wks)	31	24.0	
	Moderate Preterm (32–34 wks)	14	10.9	
	Late Preterm (34–37 wks)	13	10.1	
	Term (≥37 wks)	56	43.4	
NICU Stay at Assessment	7–14 days	55	42.6	
	14–21 days	37	28.7	
	21–28 days	15	11.6	
	28–35 days	10	7.8	

	>35 days	12	9.3	19.7 (11.2)
Infant Diagnosis	Prematurity/LBW	50	38.7	
	Infection	19	14.7	
	Respiratory	17	13.2	
	Miscellaneous	15	11.6	
	Neurological	13	10.0	
	Surgical	11	8.5	
	Cardiac	4	3.1	

Maternal Stress Scores and Associated Factors

The mean overall maternal stress score in the study population was 3.803 (SD 0.515), with observed scores ranging from 2.0 to 5.0 (Table 2). Analysis of sociodemographic and clinical factors influencing stress scores is detailed below:

- **Maternal Age:** Stress scores were significantly higher (mean 4.136, SD 0.373) for mothers younger than 25 years compared to those aged 25–35 years (3.678, SD 0.519) and over 35 years (3.641, SD 0.425); this difference was highly significant ($p < 0.0001$).
- **Education:** Mothers with lower educational attainment (primary or high school) recorded significantly higher stress levels compared to those with intermediate or graduate qualifications. Notably, the difference between primary and graduate education was significant ($p = 0.021$), as was the difference between high school and intermediate ($p = 0.008$), and high school versus graduate ($p < 0.0001$).
- **Gravidity:** Primigravidae experienced significantly greater stress (mean 4.020, SD 0.494) than multigravidae (3.565, SD 0.428; $p < 0.0001$).
- **Infant Maturity:** Mothers of preterm infants (especially very and extreme preterm) exhibited higher mean stress scores than those with term infants (Table 2, Figure 2). Intergroup comparisons revealed significant differences between extreme, very, and moderate preterm groups as compared to late preterm and term categories, with p -values ranging from 0.007 to <0.0001 .
- **Duration of NICU Stay:** There was no significant difference in stress scores according to the duration of hospital stay at the time of assessment ($p = 0.606$).
- **Infant Diagnoses:** Mothers whose infants were admitted for prematurity or low birth weight had the highest mean stress scores (3.92, SD 0.72), but the difference among illness categories did not reach statistical significance ($p = 0.606$).

Table 2: Maternal Stress Scores by Demographic, Obstetric and Infant Variables

Parameter	Subgroup	Mean Stress Score	SD	p-value
Overall Stress	—	3.803	0.515	
Maternal Age	<25 years	4.136	0.373	<0.0001
	25–35 years	3.678	0.519	
	>35 years	3.641	0.425	
Education	Primary	3.870	0.474	<0.0001
	High School	4.134	0.372	
	Intermediate	3.791	0.503	
	Graduate	3.580	0.507	
Pairwise	Primary vs Graduate			0.021
	High School vs Intermediate			0.008
	High School vs Graduate			<0.0001
Gravida	Primigravida	4.020	0.494	<0.0001
	Multigravida	3.565	0.428	
Infant Gestational Age	Extreme Preterm	3.973	0.669	<0.0001
	Very Preterm	4.151	0.421	
	Moderate Preterm	3.964	0.300	
	Late Preterm	3.623	0.410	
	Term	3.563	0.447	
Pairwise	Extreme vs Late Preterm			0.008
	Very vs Late Preterm			0.008
	Moderate vs Late Preterm			0.007
	Extreme vs Term			0.0001
	Very vs Term			<0.0001
	Moderate vs Term			<0.0001
Duration of Stay	7–14 days	3.869	0.469	0.606
	14–21 days	3.711	0.561	
	21–28 days	3.866	0.487	
	28–35 days	3.810	0.450	
	>35 days	3.700	0.671	
Category of Illness	Prematurity/LBW	3.920	0.720	0.606
	Cardiac	3.850	0.685	
	Respiratory	3.711	0.561	

Subscale Analysis of Stress: Examining the three subscales of the stress questionnaire (Table 3), the highest mean stress

score was observed in the ‘Relationship and Parental Role’ domain (mean 3.91, SD 0.55). This subscale score was

significantly higher compared to 'Sight and Sound' ($p = 0.022$) and to the combined mean of the other two subscales

($p = 0.03$), indicating that disruptions in parental role contributed most to maternal stress during the NICU stay.

Table 3: Subscale Analysis of Maternal Stress Scores

Subscale	Mean Score	SD	Comparison	p-value
Sight and Sound	3.72	0.56	Pair 1 vs Pair 2	0.800
Look and Behaviour	3.77	0.58	Pair 1 vs Pair 3	0.022
Relationship and Parental Role	3.91	0.55	Pair 2 vs Pair 3	0.109
			(Pair 1 + Pair 2) vs Pair 3	0.03
Overall ANOVA				0.022

Discussion

In the present study, there were 129 participants. The lowest mean stress score was 2 and the highest was 5. The overall stress scores were found to be high with a mean score of 3.803 (Table 8) which depicts that most mothers are under immense stress with babies admitted to the NICU. In the study, it was found that stress scores were significantly higher in mothers less than 25 years old compared to older mothers with a p -value of <0.0001 (Table 9). A similar result was observed in a study done by Dudek-Shriber, titled "Parent Stress in the Neonatal Intensive Care Unit and the Influence of Parent and Infant Characteristics", by Meyer E titled "Psychological Distress in Mothers of Preterm Infants" and by Reid T titled "Using the Parental Stressor Scale: NICU with a British sample of mothers of moderate risk preterm infants" where they found that younger parents experienced more stress owing to their less experience in the parental role.

In the present study, it was found that mothers who were graduates had significantly lower stress levels compared to mothers with primary or high school education with a p -value of 0.0001 (Table 9). In a study by Dudek-Shriber³⁵, stress levels were found to be higher in parents with a high school education and those with a bachelor's degree. In a study by Chourasia N *et al.* [1] which is an Indian study, stress levels were found to be independent of the education of the mother.

Mean stress scores were calculated about gravida. In a study by Chourasia N *et al.* [1], stress levels were independent of the mother's gravida. In the present study, we found that stress levels were found to be significantly higher in primigravida mothers than in multigravida mothers with a p -value of <0.0001 (Table 9). A probable explanation for this might be the inexperience of primigravida mothers leading to their inability to cope with the stressful NICU environment.

As per studies by Dudek-Shriber, Miles M, Miles and Funk [2], Shields-Poe and Pinelli [3], Chourasia N¹, and Carter J having a preterm baby resulted in significantly higher stress scores and was predictive of stress and these findings seem sensible also since extremely premature babies are physiologically unstable, demonstrate many aspects in their physical appearance that are different and are less responsive to social interaction than infants who are born later in pregnancy. In the present study too, mothers with preterm infants had significantly higher stress levels compared to those with term infants with a p -value of <0.0001 (Table 10). Among the preterm infants, the stress levels of mothers with extreme, very, and moderate preterm infants were higher than those of late preterm infants and the difference was statistically significant.

The present study included mothers of neonates with NICU stay for at least 7 days. In a study by Dudek-Shriber³⁵, by

Chourasia N *et al.* [1], the length of stay of the baby had been a consistent predictor of stress with a longer NICU stay being significantly associated with a higher maternal stress level. However study by Miles and Funk titled, "The stress response of mothers and fathers of preterm infants" [2], indicated that these parents were highly anxious during the first week after admission but were significantly less anxious a week later in their study. The present study did not show any correlation between the length of stay and difference in the level of stress of mothers.

In our study we observed that stress scores of mothers whose infants were admitted for prematurity/Low birth weight related disorders than those with other disorders but the difference is not statistically significant.

Using the PSS:NICU scale, Miles *et al.* identified that the most stressful domain for parents ($n=122$) in their study was an alteration in the parent-infant relationship and the appearance of the infant while the sights and sounds of the unit domain caused relatively lesser stress. A study by Chourasia N *et al.* [1] and Frank L also showed a similar pattern of results. The findings of the present study are consistent with that of the above studies. In the present study, the mean subscale stress score was highest for the Parental role and relationship domain (3.91), followed by Looks and behavior of the infant domain (3.77), and least for Sights and sound of the unit domain (3.72).

Conclusion

The study showed that the highest stress levels experienced by mothers were in the alteration in parental role and relationship with the baby followed by how the baby looked and behaved. The sights and sounds of the unit caused comparatively lower levels of stress. Young mothers, mothers who were less educated, primigravidae, and mothers having preterm babies were found to have significant stress levels. Understanding these aspects helps counsel the mothers appropriately and increases their comfort levels. However, the present study had certain limitations such as the short duration of the study and enrolment of only mothers as participants and not other caretakers in a family which provides scope for further research considering the above factors.

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