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Original Research Article

Assessment of level and source of stress in mothers of newborns admitted to neonatal intensive care unit in tertiary care hospital

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ABSTRACT

Background: The hospitalization of a neonate is stressful for the mother and all family members Severe stress can affect mother–baby relationship and thus affect newborn development subsequently. The parent-infant bonding process during the newborn period establishes the foundation a lifelong relationship. This process is affected when the newborn spends the first several weeks in NICU. Quantifying stress levels of parents and identifying environmental stressor is useful in assisting the health personnel in improving the quality of medical care. To study the level and source of stress in mothers of Newborns admitted in the Neonatal intensive care unit and to quantify the stress levels by parental stressor scale.
Methods: In this cross-sectional study included 400 mothers of newborn babies admitted in NICU of Basaveshwar Hospital and Sangameshwar hospital attached to Mahadevappa Rampure Medical College, Kalaburgi with semi structured validated interview-based questionnaire consisting of parenteral stressor scale: NICU (PSS: NICU) comprising three subscales and questions related to maternal and neonatal characteristics will be used.
Results: Among the study population the mean stress score was maximum in parental role domain of PSS: NICU stress scale. The maternal stress was higher among preterm and non-breast-fed babies in looks and behaviour and parental role. Maternal stress was statistically significant among rural, illiterate and home maker participants in all 3 domains.
Conclusions: NICU mothers are under significant stress and appropriate counselling targeted towards specific stressors is required and before designing remediation programs for parents, local demography and the predominant NICU stressors need to be kept in mind. maternal stress, neonatal intensive care unit environment, baby looks and behaves.

Keywords: Maternal stress, PSS: NICU

INTRODUCTION

Stress is a pervasive issue affecting various aspects of life, with significant impacts on individuals, relationships, and society. This study explores stress associated with a critical life event: having an infant in a neonatal intensive care unit (NICU).[1-6] NICUs specialize in caring for ill or premature newborns, and the environment can be highly stressful due to factors like bright lights, noisy equipment and chemical odors. Parents, especially mothers, often experience heightened stress due to the unexpected nature of their infant's condition, which can disrupt their expectations and parenting plans. Stress in NICU settings can lead to anxiety, depression and impact parent-infant bonding, which is crucial for the child's development.[7-9] Existing research highlights the severe psychological distress faced by mothers, including higher rates of depression and anxiety compared to those with healthy infants. Despite this, there is limited data on NICU-related stress

in the Indian context, underscoring the need for targeted research in this area.[10,11] Research indicates that mothers of infants in Neonatal Intensive Care Units (NICUs) experience significant stress and symptoms of depression.[12-17] Key stressors include adjustments to parental roles, concerns about the baby's appearance, and the stressful NICU environment. Factors contributing to heightened maternal stress include inadequate family support, lower birth weight, reliance on ventilator support, postpartum depression, and pregnancy complications.[18,19] Mothers generally face more intense stress than fathers, highlighting the need for targeted interventions and family-centered care in NICUs.[20]

Theoretical models like Lazarus's transactional model of stress and coping suggest that cognitive appraisal, gender differences, personality traits and social support influence stress responses. Tools like the Parental Stressor Scale: NICU (PSS: NICU) measure stress related to parental role changes, NICU sights and sounds, and infant behavior. Effective interventions are crucial due to the profound psychosocial impact on mothers. The review emphasizes the need for standardized mental health assessments and the importance of comprehensive support that addresses biological, psychological, social, and spiritual needs. Practical support, empathetic staff, and psychological interventions have been shown to improve maternal well-being and coping in NICU settings.[21]

In recent decades, India has seen a notable increase in the number of neonatal intensive care units (NICUs) and special care newborn units (SCNUs), driven by initiatives from the national neonatology forum (NNF), the National Rural Health Mission (NRHM), UNICEF, and other agencies. This growth has been supported by more trained neonatologists and affordable neonatal care equipment. NICUs are specialized hospital areas equipped with advanced technology and skilled staff to care for critically ill newborns, including those who are premature or have birth defects. The transition from the womb to independent life can be challenging for newborns, particularly for those born preterm or with complications, necessitating specialized care to support their adaptation and survival.[22,23]

The NICU (Neonatal Intensive Care Unit) environment has evolved from open bays to single-family rooms, each with distinct impacts on infants, parents, and staff. Single-family rooms offer benefits like increased privacy, better infection control, and improved infant outcomes, but concerns about parental isolation and staff communication exist. Open-bay layouts, while promoting communication and ease of monitoring, may lack the same level of patient care benefits.

Family-centered care is becoming standard in NICUs, emphasizing respect, information and collaboration, which enhances parent-infant bonding, mental health, and overall satisfaction. The March of Dimes' NICU Family Support program, launched in 2001, supports families during hospitalization and promotes this care model, showing positive impacts on both families and NICU staff.[24,25]

Maternal stress during pregnancy is associated with negative outcomes for both the mother and child, including complications like low birth weight, premature birth, and intrauterine growth restriction. Psychosocial stress occurs when an expectant mother feels overwhelmed by demands, which can affect both her and the developing fetus, potentially damaging the mother-infant relationship.[26-30]

Although mild stress may benefit fetal development, excessive stress can lead to long-term issues such as altered nervous system development in the fetus.[31-34] Factors like living conditions, socioeconomic status and support systems influence stress levels, with multiparous women generally experiencing less stress than first-time mothers.

Mothers of babies admitted to the NICU face significant stressors, including their baby's medical conditions, the NICU environment and separation from their infant.[35] This stress can disrupt bonding, increase the risk of postpartum depression, anxiety and PTSD, and affect breast milk production. Factors contributing to maternal stress in the NICU include maternal age, NICU stay duration, frequency of visits and the infant's health.

Effective strategies to reduce stress include early maternal involvement in neonatal care, psychological support, nurse-led educational interventions, and pre-labor NICU tours. Early identification of maternal stress and appropriate interventions are crucial for providing holistic, family-centered care and fostering strong mother-infant relationships.[36]

Maternal stress during pregnancy negatively affects both maternal and fetal health, leading to complications such as preterm delivery, sensory processing difficulties in children, and disruptions in maternal behavior and emotional regulation. Stress impacts fetal neurodevelopment through changes in maternal hormones and inflammatory activity, resulting in both immediate and long-term consequences for the child. Postpartum stress can further hinder infant growth, cognitive development, and sleep, while prenatal stress may alter infant gut microbiota, increasing risks for gastrointestinal issues and allergic reactions. Addressing maternal stress is essential for optimizing health outcomes for both mother and child.[37]

The hospitalization of a neonate is stressful for the mother and all family members. This stressful nature of NICU environment especially mothers of sick babies is well documented in western literature. Since there is very less data regarding the stressful nature of NICU in Indian

literature and our setup, hence this study is being conducted.

Objectives of the study to study the level and source of stress in mothers of Newborns admitted in the Neonatal intensive care unit, to quantify the stress levels by parental stressor scale.

METHODS

Study type

This study was single-centered, randomized cross-sectional study.

Study place

Conducted in mothers of newborn babies admitted in NICU of department of paediatrics, after obtaining clearance from the institutional ethics committee, at the Basaveshwar Teaching and General Hospital and Sangameshwar teaching and general hospital attached to Mahadevappa Rampure Medical College, Kalaburgi.

Study duration

The study period was of 18 months from August 2022 to January 2024.

Sample size

The study sample size was 400.

Inclusion criteria

This includes mothers of both in-born and out-born neonates admitted to NICU. Mother of newborns admitted in NICU for more than 48 hours. Mother age of 18 years to 42 years. Mothers of newborns admitted to NICU through any mode of delivery.

Exclusion Criteria

Mother having medical illness at the time of data collection. Mothers who have significant life event at the time of data collection. Mothers of Newborns with life threatening illness were excluded.

400 mothers were included in the study based on inclusion criteria. To measure the perception of stress in mother's PSS: NICU Questionnaire was used, which is a self-report instrument consisting of 26 items. It has 3 subscales which measures stress related to Sight and Sound in the unit (6 items), appearance and behavior of the infant (13 items), parental role and relationship with their baby (7 items). The questionnaire was translated into Kannada by non-medical language expert. Data were collected from mothers in the morning hours in the counselling room, 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.

Data analysis

Descriptive statistics were used to evaluate demographic data and maternal perceived stress, The data was processed and analyzed using IBM SPSS software version 25. Continuous data results were measured as frequency, mean, and standard deviation. Categorical data results were presented as numbers (%). The Kruskal-Walli's test and Mann-Whitney U test were used to compare different types of data, with a p value of less than 0.05 considered statistically significant.

RESULTS

The study included 400 mothers whose babies were admitted in NICU fulfilling inclusion criteria. In the study 64.7% participants had babies with BW>2.5 kg, while 35.3% had birth weight of <2500 gm. Mean age of mother participated in the study was 25.58years with range between 19 and 35 years of which 44.5% mothers were primigravidae and 55.5% were multigravida. The present study showed there's no statistically significant difference was observed in mean stress scores for gravida and mode of delivery indicating that stress levels were independent of these factors.

As depicted in Table 2, All 3 domains i.e., sights and sounds, Baby looks and behavior and the parental role showed Statistically Significant (p valve =0.001) association with education status of mother showing greatest level of stress in illiterate mothers.

As depicted in Table 3, All 3 domains i.e., sights and sounds, Baby looks and behavior and the parental role showed statistically significant (p valve=0.001) association with socio-economic status of mother showing greatest level of stress in lower class socio-economic status mothers. As illustrated in Table 4 The mean stress score was maximum in domain "parental role" (4.57±0.34).

The table 5 illustrate the stress experienced by mother in each component of PSS:NICU scale. The mean score was highest for question "The sudden noise of Monitor Alarm" (4.98) followed by question "when my baby seemed to be in pain" (4.93). The mean score was highest for the question "the sudden noise of monitor alarm" in sight and sound domain of PSS:NICU scale.

The highest mean value for domain looks and behavior of infant is "when my baby seemed to be in pain" followed by "my baby being fed by intravenous line or tube." The mean score was maximum in the question "Not feeding my baby by myself" followed by "Feeling helpless and unable to protect my baby from pain and painful

procedures" in parental role domain of PSS:NICU scale. Maternal stress was higher among preterm and non-breast-fed babies in looks and behavior and parental role. Maternal stress was higher among rural, illiterate and home maker participants in all 3 domains.

Table 1: Illustrating the demographic data of study participants.

Parameters	Category	Number of patients	%
Maturity of baby	Preterm	134	33.5
	Term	266	66.5
	Total	400	100.0
Birth weight of newborns	AGA	259	64.7
	LBW	96	24.0
	VLBW	45	11.3
	Total	400	100.0
Mode of feeding	Direct	254	63.5
	Expressed	46	11.5
	NBM	100	25.0
	Total	400	100.0
Mother's age	<25	168	42.0
	>25	232	58.0
	Total	400	100
Maternal education	Illiterate	110	27.6
	<High school	129	32.3
	High school	109	27.3
	Graduate	52	13.0
	Total	400	100
Occupation	Working	60	15.0
	House wife	340	85.0
	Total	400	100
Residency	Rural	277	69.3
	Urban	123	30.8
	Total	400	100
Gravida	Primi	178	44.5
	Multi	222	55.5
Mode of delivery	NVD	239	59.8
	LSCS	161	40.0
	Total	400	100
Socioeconomic status	Lower class	63	15.8
	Lower middle class	281	70.3
	Middle class	10	2.5
	Upper lower class	21	5.3
	Upper middle class	25	6.3
	Total	400	100.0

Table 2: Comparison of mean stress score of each domain of PSS:NICU scale with education of study participants.

Education	Sights and sound		Looks and behaviour		Parental role	
	Mean	Std deviation	Mean	Std deviation	Mean	Std deviation
Illiterate	4.8800	0.303	4.10	0.21008	4.2016	0.23697
<High school	4.0141	0.28651	4.0681	0.31276	4.0225	0.23968
High school	4.2139	0.18908	3.8210	0.22444	3.9838	0.27499
Graduate	3.5613	0.42823	3.7579	0.27039	3.6890	0.32325
Significant value	P=0.001*		P=0.001*		P=0.001*	

*: Statistically significant

Table 3: Comparison of mean stress score of each domain of PSS:NICU scale with socio-economic status of study participants.

SES	Sights and sound		Looks and behaviour		Parental role	
	Mean	Std deviation	Mean	Std deviation	Mean	Std deviation
Lower class	4.6019	0.40630	3.8792	0.26715	4.0446	0.33940
Lower middle class	4.2290	0.47532	3.9965	0.27975	4.0553	0.25569
Middle class	4.2200	0.76274	3.9660	0.16098	3.8800	0.37591
Upper lower class	4.1986	0.63328	3.8352	0.25388	3.8838	0.39784
Upper middle class	3.6192	0.44132	3.6896	0.28549	3.6972	0.35211
Significant value	P=0.001*		P=0.001*		P=0.001*	

Table 4: Mean stress score of individual domains.

	Lights and sounds	Baby looks and behaves	Parental role
MEAN	3.76	3.52	4.57
Std deviation	0.5051	0.2967	0.3422

Table 5: Mean stress scores of each component of PSS: NICU scale.

S. no.	Domains	Mean	Std deviation	Minimum	Maximum
1.	The presence of monitors and equipment	3.96	0.728	2	5
2.	The constant noises of monitors and equipment	3.95	0.758	2	5
3.	The sudden noises of monitor alarm	4.98	0.131	4	5
4.	The other sick babies in the room	3.93	0.797	2	5
5.	The large number of people working in the NICU	4.14	0.706	2	5
6.	Having a machine (respirator) breathe for my baby.	1.61	2.324	0	5
7.	Tubes and equipment on or near my baby.	4.25	0.517	3	5
8.	Bruises, cuts or incisions on my baby.	4.47	0.529	3	5
9.	The unusual color of my baby (for example looking pale or yellow jaundiced).	3.35	0.611	2	5
10.	My baby's unusual or abnormal breathing patterns	4.07	0.753	2	5
11.	The small size of my baby.	3.98	0.637	2	5
12.	The wrinkled appearance of my baby.	3.53	0.749	2	5
13.	Seeing needles and tubes put in my baby.	4.52	0.571	2	5
14.	My baby being fed by an intravenous line or tube.	4.57	0.686	2	5
15.	When my baby seemed to be in pain.	4.93	0.312	3	5
16.	When my baby looked sad	4.46	0.552	3	5
17.	The limp and weak appearance of my baby.	4.46	0.538	3	5
18.	Jerky or restless movements of my baby.	4.44	0.531	2	5
19.	My baby not being able to cry like other babies.	4.26	0.496	2	5
	Being separated from my baby.	4.47	0.561	3	5
	Not feeding my baby myself.	4.85	0.424	3	5
	Not being able to care for my baby myself (for example, diapering, bathing).	4.27	0.564	2	5
	Not being able to hold my baby when I want	4.62	0.563	3	5
	Feeling helpless and unable to protect my baby from pain and painful procedures.	4.83	0.469	2	5
	Feeling helpless about how to help my baby during this time.	4.44	0.564	3	5
	Not having time to be alone with my baby.	4.46	0.791	3	5

DISCUSSION

Maternal stress in the NICU is often an overlooked issue, with limited studies in India that quantify stress among mothers in this setting. It is essential for NICU staff and doctors to recognize specific stressors faced by mothers so that appropriate interventions can be designed to alleviate their fears, reduce stress and improve their ability to adapt to the complex NICU environment, The present study aimed to contribute to this understanding.

The study conducted by Ansari et al, involved a sample size of 120 participants over a study period of 12 months and was a prospective study.[34] Jagdish R. Varma et al, conducted a cross-sectional study with 151 participants over 12 months. Jaquiele Jaciara Kegler et al, carried out a descriptive study with a sample size of 127 over 8 months. Tebogo Tshiamo Orapeleng et al, conducted a cross-sectional study with 104 participants over 6 months. Bishnu Maya Banjade et al, performed a cross-sectional study with 104 participants, though the study period was not specified.[8,37-39] In contrast, the present study involved 400 participants over a period of 18 months and was a cross-sectional study.

In my study Mean stress score of Parental role domain showed maximum stress (mean score 4.57) it was similar to studies by Bishnu Maya Banjade et al, Mean stress score for parental role domain-4.35, Tebogo Tshiamo Orapeleng et al, Mean stress score for parental role domain-3.61, Jaquiele jaciara Kegler et al, Mean stress score for parental role domain-3.49, and Ansari et al, Mean stress score for parental role domain-4.2 The Present Study results differed from study Jagdish R Varma et al, Maximum Mean stress score was seen in Sights and sounds domain-1.98.[8,34,37-39]

In the present study, the mean score was highest for question “The sudden noise of Monitor Alarm” (4.98) followed by question “when my baby seemed to be in pain” (4.93) The mean score was highest for the question “the sudden noise of monitor alarm” in sight and sound domain of PSS:NICU scale. "Looks and Behavior of the Infant," with the highest score for “when my baby seemed to be in pain” followed by “my baby being fed by intravenous line or tube”. "Parental Role and Relationship," The mean score was maximum in the question “Not feeding my baby by myself” followed by “Feeling helpless and unable to protect my baby from pain and painful procedures” whereas in The study conducted by Ansari et al, found The highest mean score was recorded for the question, "Being separated from my baby" (4.43±0.58), followed by "Feeling that staff are closer to my baby than I am" (4.39±0.60).[34] "Sight and Sound" of the unit. The highest mean score in this domain was for "The other sick babies in the room" (2.3±0.57), followed by "The sudden noises of monitors and alarms" (2.09±1.41). "Looks and Behavior of the Infant," with the highest score for "Seeing my baby looking sick" (4.36±0.53), followed by "The baby being fed by an intravenous line or tube" (4.18±0.67). "Parental Role and Relationship," where "Being separated from my baby" again had the highest score (4.43±0.57), whereas in the study conducted by Tebogo Tshiamo Orapeleng et al, found the highest mean score was recorded for the question, "Having a machine (respirator) breathe for my baby".[38] in "Sight and Sound" of the unit. In the domain "Looks and Behavior of the Infant," with the highest score for " My baby's unusual or abnormal breathing patterns", followed by " Bruises, cuts or incisions on my baby".

In the present study out of 400 Participants 27.6% were illiterate, 13.0% are graduated and 59.6% were high school. Mean stress score of all 3 domains showed significant association with illiterate mothers, which was similar to study done by Tebogo Tshiamo Orapeleng et al, Maureen masumo et al The present study differed from Jagdish R Varma et al, Study where it showed significant stress associated with literate mothers.[8,38,39]

The present study showed 15.0% were working Mother’s and 85.0% are House wife. Mean stress score of all 3 domains showed significant association with Occupation, which was similar to study done by Ansari et al, the present study differed from Bishnu Maya Banjade et al, Nitish Chourasia et al, Study where it showed significant stress associated with literate mothers.[6,34,37]

CONCLUSION

Maternal stress quantification is a crucial part of overall quality care of newborns. It was not given much emphasis few years back but maternal stress assessment is important key role in overall neonatal outcome, the needs of psychosocial support of parents at the NICU are complex listening to them and communicating with them about their needs and preferably at the outset of their NICU stay, informing parents of infants admitted in NICU about the types of support available would-be essential steps in helping them cope with stresses of their infants prolonged hospitalization.

NICU baby’s mothers are under significant stress and appropriate counselling targeted towards specific stressors is required. Higher maternal stress found to be significantly associated with mother’s age, education, occupation, Place of living and the socio-economic status. Before designing remediation programs for parents, local demography and the predominant NICU stressors need to be kept in mind. Helping the mother to experience motherhood safely, developing skills to care for newborn, establishing a daily relationship that will help to develop the attachment of the newborn and strengthening their bond

The study has several limitations like results cannot be generalised because of the study population restricted to one geographical location. Father’s stress was not measured as both are involved in upbringing the child.

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