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Original Research Article

Stress perception and its determinants among parents of NICU-admitted neonates: a tertiary care study

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ABSTRACT

Background: Admission of a newborn to the Neonatal Intensive Care Unit (NICU) is frequently associated with significant psychological stress among parents due to uncertainty regarding prognosis, complex medical interventions, and disruption of expected parental roles. Assessing parental stress and identifying influencing factors are essential for strengthening family-centered neonatal care.

Methods: A single-center, hospital-based cross-sectional study was conducted among 60 parents (60 couples) of neonates admitted to the NICU of LNMC & JK Hospital, Bhopal. Parents of neonates admitted for ≥24 hours were enrolled using consecutive convenience sampling. Sociodemographic and neonatal clinical details were recorded using a semi-structured proforma. Parental stress was assessed using the validated Parental Stressor Scale: NICU (PSS:NICU). Data were analyzed using R statistical software. Descriptive statistics, paired and independent t-tests, and Pearson's correlation were applied. A p-value <0.05 was considered statistically significant.

Results: Mothers reported significantly higher stress scores than fathers in sight and sound (63.11±12.23 vs 56.85±13.33), infant appearance (79.83±6.84 vs 72.53±6.19), and parental role alteration (87.48±5.22 vs 77.90±5.39) domains ($p<0.001$). Staff-related stress was comparable ($p=0.653$). Parental role alteration was the highest stress domain overall. A significant negative correlation was observed between parental age and stress (fathers $r=-0.441$; mothers $r=-0.351$; $p<0.001$). Birth weight and NICU stay duration were not significantly associated with stress levels.

Conclusions: Parental stress in the NICU is significant and predominantly affects mothers. Early identification of vulnerable parents and implementation of structured counseling and family-centered interventions are essential to enhance coping and improve neonatal care outcomes.

Keywords: Family-centered care, Gender differences, Neonatal intensive care, NICU, Parental stress, PSS:NICU

INTRODUCTION

The admission of a newborn to the Neonatal Intensive Care Unit (NICU) is often an unexpected and emotionally distressing experience for parents, as it exposes them to uncertainty regarding the infant's survival, complex medical interventions, and an unfamiliar hospital environment.[1] Parents of high-risk neonates frequently experience psychological stress due to fear, anxiety, and disruption of the expected parental role during the hospitalization period.[2] The technologically advanced and restrictive NICU environment further intensifies emotional strain, often causing feelings of helplessness and reduced parental bonding with the newborn.[3] Mothers, in particular, are reported to experience higher levels of stress related to concerns about the infant's prognosis, financial burden, and separation from their babies.[4] Prolonged NICU admission has been associated with poor psychological well-being, sleep disturbances, and long-term emotional consequences among parents, especially mothers.[5] Studies conducted in tertiary healthcare settings have consistently reported moderate to

severe levels of parental stress, emphasizing the need for structured psychological support.[6]

Prematurity and neonatal complications remain major causes of NICU admission and are strongly associated with increased parental emotional distress.[7] The prevalence of stress among mothers of NICU-admitted neonates has been widely documented across various healthcare settings, indicating the global nature of this issue.[8] Factors such as low birth weight, prematurity, and duration of hospitalization significantly influence parental stress levels.[9] The mode of delivery and neonatal health status also play a crucial role in determining parental emotional responses and caregiving challenges.[10] Evidence suggests that counseling and parental education programs can effectively reduce stress and improve coping mechanisms during NICU hospitalization.[11] Socio-demographic factors such as maternal education, economic status, and regional disparities also influence neonatal outcomes and parental stress.[12] Cultural factors, including gender-based neonatal preferences, may further contribute to variations in parental stress experiences.[13] Globally, parental stress in NICU settings is increasingly recognized as a significant public health concern, necessitating family-centered care approaches and psychosocial interventions.[14] This study aimed to rigorously quantify stress levels among parents of NICU-admitted neonates within a tertiary-level Central Indian NICU setting and systematically identify determinants of parental stress responses, with particular emphasis on gender differences, age-related vulnerabilities, and sociodemographic predictors to inform evidence-based targeted intervention development.

METHODS

This was a single-center, hospital-based cross-sectional observational study conducted to assess stress levels among parents of neonates admitted to the Neonatal Intensive Care Unit (NICU) of the Department of Paediatrics, LNMC & JK Hospital, Bhopal, Madhya Pradesh. The hospital is a tertiary-level healthcare facility equipped with Level III NICU services including mechanical ventilation, continuous positive airway pressure (CPAP), phototherapy, and advanced monitoring systems. Ethical approval was obtained from the Institutional Ethics Committee prior to the commencement of the study, and written informed consent was obtained from all participants. The study was conducted over a period of 18 months.

The study population included parents (both mothers and fathers) of neonates admitted to the NICU for at least 24 hours. Parents unwilling to participate, those with pre-existing psychiatric disorders, and parents of neonates admitted for less than 24 hours were excluded. The sample size was calculated using Slovin's formula, resulting in a total sample of 60 parents. Participants were selected using consecutive convenience sampling.

Data were collected using a semi-structured questionnaire to record sociodemographic characteristics of parents and clinical details of neonates. Parental stress was assessed using the validated Parental Stressor Scale: Neonatal Intensive Care Unit (PSS:NICU). The validated PSS:NICU comprises 46 items distributed across four subscales: (1) Sights and Sounds (13 items); (2) Infant Appearance and Behaviour (16 items); (3) Parental Role Alteration (11 items); (4) Staff Behaviour and Communication (6 items) expressed as a percentage of the maximum possible score. Items employ 5-point Likert scaling (1=not stressful to 5=extremely stressful). The questionnaire was administered in a bilingual (Hindi and English) format.

Data were collected through structured interviews and medical record reviews. Statistical analysis was performed using R statistical software. Descriptive statistics were expressed as frequencies, percentages, and mean ± standard deviation. Paired and independent t-tests were used for comparison of stress scores, and Pearson's correlation coefficient was applied to assess relationships between variables. A p value of <0.05 was considered statistically significant.

RESULTS

Demographic characteristics

Sixty parents completed the study. Maternal age ranged 20–35 years (mean 27.56±2.64), with 63.3% aged 26-30 years. Paternal age ranged 26-40 years (mean 30.80±2.58), with 50% aged 26-30 years. Among mothers, 45% completed secondary education, 28.3% achieved graduate status, and 88.3% were homemakers. Fathers demonstrated higher educational attainment (65% secondary, 35% graduates), with 43.3% employed as skilled workers/private employees. Nuclear family structure predominated (70%), with most families classified as lower middle class (58.3%) (Table 1).

Obstetric and neonatal profile

The majority of mothers were primiparous (65%), with 96.7% singleton pregnancies. Lower segment caesarean section constituted the predominant delivery mode (75%), with 88.3% intramural deliveries. Gestational age distribution revealed 56.7% term, 26.7% late preterm, 15% early preterm neonates and post-term neonate (1.7%, n=1). Mean birth weight was 2.39±0.70 kg (48.3% normal weight, 40% low birth weight, 11.7% very low birth weight). Sex distribution was balanced (48.3% male, 51.7% female). Critically, no families reported previous NICU admission history or neonatal death experiences (Table 2).

Parental stress scores

Significant gender-based differences were observed across several parental stress domains. Mothers reported

significantly higher stress levels than fathers in the sight and sound domain (63.11±12.23 vs 56.85±13.33; t=2.95, p<0.001), infant appearance domain (79.83±6.84 vs 72.53±6.19; t=6.84, p<0.001), and parental role alteration domain (87.48±5.22 vs 77.90±5.39; t=10.76, p<0.001). In contrast, no significant difference was noted between mothers and fathers in the staff behaviour domain (40.87±8.32 vs 41.60±9.31; t=0.27, p=0.653). Among all domains, parental role alteration emerged as the highest source of stress for both mothers and fathers (Table 3, Figure 1).

Table 1: Sociodemographic characteristics of parents.

Parameter	Frequency (N)	Percentage (%)
Mother's age in years		
20-25	15	25.00
26-30	38	63.30
31-35	7	11.70
>35	0	0.00
Mean±SD: 27.56±2.64; Median = 28.00		
Father's age in years		
20-25	0	0.00
26-30	30	50.00
31-35	27	45.00
>35	3	5.00
Mean±SD: 30.80±2.58; Median = 30.50		
Mother's education		
Illiterate	0	0.0
Primary	16	26.7
Secondary	27	45.0
Graduate	17	28.3
Postgraduate	0	0.0
Father's education		
Illiterate	0	0.0
Primary	0	0.0
Secondary	39	65.0
Graduate	21	35.0
Postgraduate	0	0.0
Mother's occupation		
Homemaker	53	88.3
Employed	7	11.7
Father's occupation		
Unemployed/shop owner/farmer	22	36.7
Skilled worker/private job	26	43.3
Professional	4	6.7
Business	8	13.3
Family type		
Nuclear	42	70.0
Joint	18	30.0

Age-related stress patterns

Robust negative correlations emerged between parental age and stress intensity: Fathers r=-0.441 (p<0.001); Mothers r=-0.351 (p<0.001). Parents <25 years experienced 18-22% higher stress than those >30 years.

Table 2: Obstetric and neonatal characteristics.

Parameter	Frequency (N)	Percentage (%)
Birth order		
Primiparous	39	65.0
Multiparous	21	35.0
Type of pregnancy		
Single	58	96.7
Twin	2	3.3
Mode of delivery		
Normal vaginal delivery	15	25.0
Lower segment caesarean section	45	75.0
Place of birth		
Intramural	53	88.3
Extramural	7	11.7
Gestational age in weeks		
Term (≥37)	34	56.7
Late preterm (34-36)	16	26.7
Early preterm (28-33)	9	15.0
Post term (>42)	1	1.7
Birth weight in kg		
Normal (≥2.5)	29	48.3
Low birth weight (1.5-2.49)	24	40.0
Very low birth weight (1.0-1.49)	7	11.7
Extremely low birth weight (<1.0)	0	0.0
Mean±SD: 2.39±0.70 kg		
Sex of neonate		
Male	29	48.3
Female	31	51.7

Table 3: Comparison of stress sources between mothers and fathers.

Stress source	Mothers (n=60) Mean±SD	Fathers (n=60) Mean±SD	P value
Sights and sounds	63.11±12.23	56.85±13.33	<0.001
Infant appearance and behaviour	79.83±6.84	72.53±6.19	<0.001
Parental role alteration	87.48±5.22	77.90±5.39	<0.001
Staff behaviour and communication	40.87±8.32	41.61±9.31	0.653
Overall stress	67.82±5.88	62.22±6.19	<0.001

Neonatal variables

Birth weight demonstrated no significant correlation with parental stress (mothers: r=0.087, p=0.512; fathers: r=0.124, p=0.347). Similarly, NICU stay duration showed no significant relationship with stress intensity (p=0.632) (Table 4) (Figure 2).

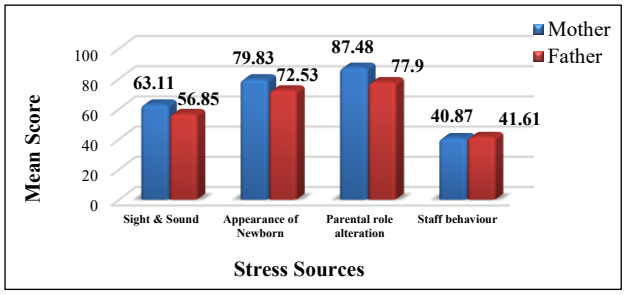

Figure 1: Average stress scores across PSS:NICU domains between mothers and fathers.

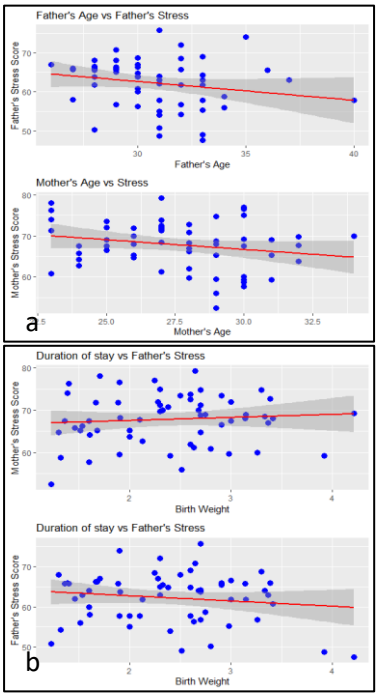

Figure 2 (a and b): Correlation between parental age and parental stress score (top panel) and correlation between birth weight and parental stress score (bottom panel).

Association between stress levels and sociodemographic factors

The analysis of stress levels in relation to sociodemographic and neonatal factors showed no statistically significant associations. Stress levels among mothers and fathers did not differ significantly based on neonatal gender (p=0.789 for mothers, p=0.401 for fathers) or family type (p=0.657 for mothers, p=0.580 for fathers) (Table 5) (Figure 3).

Table 4: Correlation analysis-stress levels and continuous variables.

Variable	Correlation Coefficient (r)	P value
Parental age		
Father's age	-0.441	<0.001
Mother's age	-0.351	<0.001
Duration of NICU stay	-0.063	0.632
Birth weight	0.065	0.619

Table 5: Association between stress levels and sociodemographic factors.

Factor	Mother Stress Mean±SD	P value	Father Stress Mean±SD	P value
Neonatal gender				
Male	79.6±5.8	0.789	71.8±6.04	0.401
Female	80.1±7.9		73.2±6.46	
Family type				
Nuclear	79.6±7.2	0.657	72.2±6.27	0.580
Joint	80.4±6.2		73.2±6.30	
Education level				
Secondary	80.6±7.02	0.170	73.3±5.87	0.208
Graduate and above	77.9±6.36		71.1±6.81	
Occupation				
Employed	77.0±5.13	0.251	72.2±6.36	0.580
Unemployed/ homemaker	80.2±7.05		73.2±6.08	
Socio-economic status				
Upper/upper middle	79.2±6.21	0.619	71.4±6.89	0.324
Lower middle/lower	80.2±7.27		73.1±5.91	
Gestational age				
Term	80.5±6.24	0.376	-	-
Preterm	78.9±7.70		-	
Birth weight in kg				
Normal (≥2.5)	80.2±6.09	0.716	72.9±5.45	0.580
Low birth weight (<2.5)	79.5±7.66		72.4±6.54	
Duration of NICU stay in days				
<7	80.9±6.23	0.459	73.6±4.80	0.446
≥7	79.4±7.15		72.2±6.70	
Mode of delivery				
Normal vagin-al delivery	79.5±6.86	0.814	-	-
Lower segment caesarean section	80.0±6.98		-	
Type of pregnancy				
Single	79.8±6.84	0.655	-	-
Twin	82.0±11.3		-	

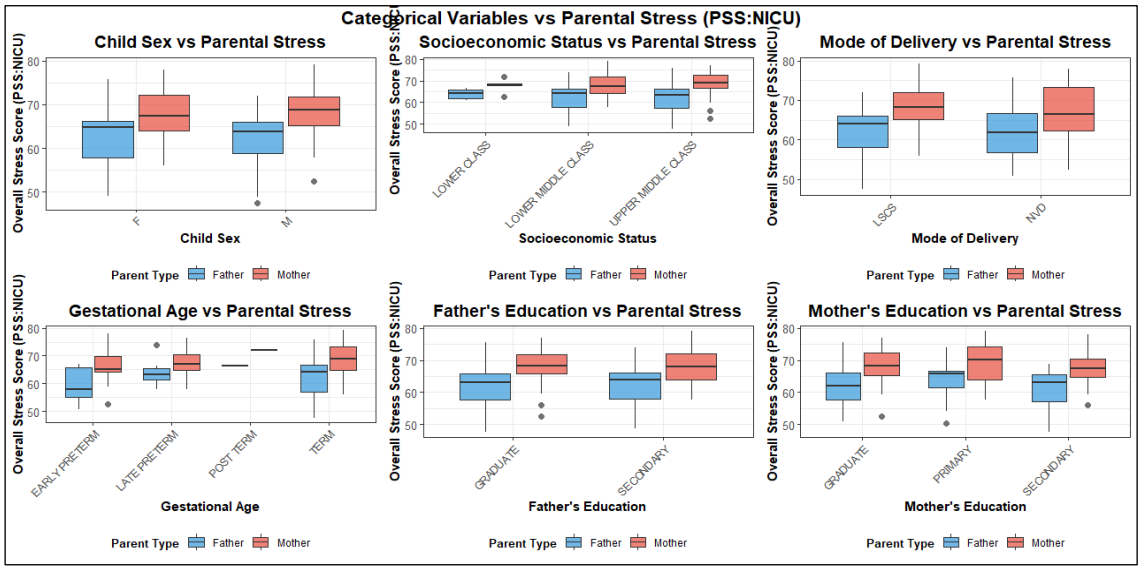

Figure 3: The association between parental stress levels and sociodemographic factors including neonatal gender, family size, education level, occupation, socio-economic status, gestational age, birth weight, duration of NICU stay, mode of delivery, and type of pregnancy.

DISCUSSION

The present study evaluated parental stress among parents of NICU-admitted neonates using the validated PSS:NICU instrument and found that stress levels were substantially elevated, with mothers consistently reporting greater distress than fathers across most domains. Maternal stress scores exceeded paternal scores in sight and sound (63.11±12.23 vs 56.85±13.33), infant appearance and behavior (79.83±6.84 vs 72.53±6.19), and parental role alteration (87.48±5.22 vs 77.90±5.39), all reaching statistical significance ($p<0.001$). By contrast, stress pertaining to staff behavior and communication did not differ meaningfully between parents (40.87±8.32 vs 41.60±9.31; $p=0.653$), suggesting that professional interactions within the NICU are perceived comparably by both parents, regardless of gender. These results corroborate the findings of Siva et al, who documented heightened maternal vulnerability among parents of high-risk neonates through a systematic review and meta-analysis of Indian studies.[1] Joshi et al similarly reported that NICU parents, especially in the initial days of admission, are susceptible to severe anxiety and psychological distress, underscoring the importance of early psychosocial assessment.[2]

Among all PSS:NICU domains, parental role alteration emerged as the primary stressor, with mothers recording the highest mean score (87.48±5.22). This finding reflects the profound disruption experienced when parents are unable to fulfill fundamental caregiving functions such as feeding, holding, or comforting their newborn. Sisodia et al similarly identified restricted participation in routine parenting activities as a leading source of NICU-related stress.[3] Basamma et al reinforced this observation by reporting that enforced separation from the neonate and limited involvement in care were major contributors to maternal psychological burden.[4] The findings of Jha et al, which linked elevated maternal stress in NICU settings to compromised psychological well-being and poor sleep quality, further substantiate the clinical relevance of this domain and point to the systemic impact of role deprivation on maternal health.[5]

With respect to demographic predictors, the present study identified a significant inverse relationship between parental age and stress, with fathers demonstrating a stronger correlation ($r=-0.441$) than mothers ($r=-0.351$; $p<0.001$ for both). Parents below 25 years of age reported stress scores that were 18-22% higher than their counterparts above 30 years, suggesting that younger parents may lack the emotional maturity, life experience, and coping resources needed to navigate the NICU environment effectively. This is consistent with Ganguly et al, who observed that younger parents in a tertiary care setting exhibited diminished adaptive responses and heightened emotional reactivity during neonatal hospitalization.[6] While prematurity and neonatal clinical complications are widely recognized as potent stressors in the literature, as documented by Parida et al, the present study did not establish a significant association between neonatal clinical parameters and parental stress.[7] Specifically, birth weight (mean 2.39±0.70 kg) showed no significant correlation with stress in either mothers ($r=0.087$, $p=0.512$) or fathers ($r=0.124$, $p=0.347$), and the duration of NICU stay likewise bore no significant relationship with stress intensity ($p=0.632$).

This absence of association between clinical neonatal variables and parental stress diverges from the findings of Mukhtar et al and Hendy et al, both of whom reported that prematurity and low birth weight independently predicted increased parental distress in their respective

study populations.[8,9] One plausible explanation for this discrepancy lies in the gestational age composition of our cohort, wherein 56.7% of neonates were born at term and only 15% were classified as early preterm. This relatively lower prevalence of clinical severity may have attenuated the expected relationship between neonatal parameters and stress perception. Similarly, mode of delivery which was caesarean section in 75% of cases did not significantly influence parental stress scores, a finding that contrasts with the observations of Das and Rout, who posited that operative delivery may heighten parental apprehension about neonatal wellbeing.[10]

The potential role of structured psychological interventions in mitigating parental stress is well established. Pal et al demonstrated that targeted counseling programs significantly reduced maternal stress scores in NICU populations, reinforcing the value of integrating psychosocial support into routine neonatal care protocols.[11] The absence of a significant association between stress and sociodemographic variables such as family type or neonatal sex in the present study contrasts with the findings of Singh et al, who documented gender-based disparities in neonatal outcomes across South Asian populations' disparities, that may indirectly shape parental emotional responses through cultural expectations and biases.[12] This discrepancy warrants further investigation in larger, culturally diverse cohorts. Although socioeconomic and demographic factors are often linked to neonatal health outcomes, as emphasized by Kumar et al, no significant association with parental stress was identified in this cohort.[13]

The predominance of nuclear family structures (70%) and lower middle-class socioeconomic status (58.3%) observed in this study population may have compounded parental stress by limiting access to extended social networks and financial buffers. These structural vulnerabilities align with the conceptual framework proposed by Caporali et al, whose global meta-analytic review identified environmental stressors, perceived infant fragility, and disruption of parental identity as central determinants of NICU-related distress.[14]

CONCLUSION

In conclusion, the present study affirms that parental stress in the NICU is considerable and disproportionately experienced by mothers, with parental role alteration constituting the most prominent stressor. The lack of significant association with neonatal clinical variables implies that psychological and relational factors may exert greater influence on stress perception than biomedical parameters alone. Younger parental age emerges as a particularly salient vulnerability marker. These findings collectively underscore the imperative for early, systematic parental stress screening and the integration of family-centered care models, individualized counseling, and structured psychological support pathways into NICU practice to optimize both parental coping and neonatal outcomes.

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