

REVIEW ARTICLE

Stress and stressors experienced by the parents of high-risk neonates admitted in neonatal intensive care unit: Systematic review and meta-analysis evidence available from India

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Abstract

The aim of the systematic review and meta-analysis is to determine the stress and stressors experienced by the parents of high-risk neonates admitted to the neonatal intensive care unit (NICU) in India. We included both quantitative and qualitative studies. The Joanna Briggs Institute Critical Appraisal Checklist and Critical Appraisal Skill Programme checklist were used to assess the quality of included studies. A systematic search was conducted in PubMed, EMBASE, SCOPUS, EBS-COhost, Web of Science, ProQuest, Microsoft Academic, DOAJ, Indian Citation Index, and J-Gate to identify relevant studies. Additionally, online hand searching was performed on Indian websites of relevant institutions, women and child health departments, repositories, registries, and paediatric journals. Twelve of the 21 quantitative studies found that maternal stress was higher than fathers due to the separation from their babies and the medical condition of the neonate. One qualitative study reported that financial burden, alterations in the parenting role, and concern over domestic issues are significant causes of fathers' stress. A meta-analysis of the included studies assessed the prevalence of maternal, paternal, and parental stress and reported that mothers experienced higher stress levels than fathers across all subscales. The most typical stressors for parents were changes in neonatal looks, behaviour, and altered parental roles. Beyond the immediate NICU care and interactions, other triggering factors of stress among parents must be considered to design multicomponent interventions in a local (Indian) context. Moreover, parental psychological support and regular counselling can be incorporated into the standard neonatal intensive care policy.

KEYWORDS

father, health, high risk, mother, neonates, NICU, parents, stress

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1 | INTRODUCTION

The term high-risk neonate is defined irrespective of birth weight or gestational age; neonates have a higher risk of morbidity or mortality due to medical conditions or circumstances associated with birth and adaptation to extrauterine existence (Kyle & Carman, 2015). High-risk neonates are susceptible to complications due to difficulty breathing, inadequate regulation of body temperature, poor feeding, and risk of infection. Approximately 14.84 million neonates were born at high risk in 2014 worldwide, and this number is increasing (Cao et al., 2022). Globally, the preterm birth rate is 10.6%, with regional variations between 8.7% and 13.4% (Chawanpaiboon et al., 2019). Additionally, there are considerable regional differences in the preterm birth rate, which is rising in most developed nations (Cao et al., 2022). Since mothers in developed countries are well informed about high-risk newborn birth and baby care during the antenatal period, the survival rate of every preterm and extremely low birth weight baby is high (WHO, 2020). Globally, high-risk neonatal births are occurring more frequently, despite more than 60% of preterm births occurring in South Asia, especially in the Indian subcontinent (Perin et al., 2022). Low- and middle-income countries (LMICs) parents continue to suffer from a lack of health literacy regarding high-risk pregnancy and preterm birth due to inefficient utilization of healthcare resources and technology (Perin et al., 2022). The uncertainty of preterm birth or neonatal admission to the NICU causes a higher level of distress among parents, especially for mothers (Ionio et al., 2016).

Considering that 99% of all neonatal deaths globally occur in LMICs, preterm birth, birth asphyxia, neonatal sepsis, and perinatal depression are leading causes of infant morbidity and mortality (Iqbal et al., 2023; Phagdol et al., 2022). Mothers living in LMICs are disproportionately exposed to various cumulative socioeconomic and risk factors related to the environment, which may threaten the mother's mental health and the development of the child. Some of the risk factors include poverty and lack of health literacy, healthcare services and support (Bolan et al., 2021; Burger et al., 2020). However, there are considerable variations in LMICs' healthcare expenditure and service delivery, as well as maternal and infant health burdens such as low birth weight and prematurity (Burger et al., 2020). As a result of the continued discrepancies in maternal psychological stress outcomes, parental stress is increasingly being incorporated into global health research, especially in LMICs. India is a developing country that is geographically and culturally diverse. Cultural practices, health care accessibility, and financial support differ from one geographic area to another (King et al., 2021; Lakshmanan et al., 2022; Murthy et al., 2021). Understanding families' cultural practices (e.g., regional, religious, and daily life routines) and making support systems available are critical for recognising parental requirements during NICU admission. Moreover, understanding parental competencies in designing and implementing FCC interventions or navigation programs are pivotal in successful high-risk neonatal care (Ramezani et al., 2014). There are studies reported statistics of parental stress and stressors; however, they did

not describe the attributing factors, which can affect the parent-child interaction and parenting style (Hane et al., 2015; Roque et al., 2017). Qualitative research allows exploration of life experiences and facilitates the understanding of subjective interactive experiences in depth (Speziale et al., 2011).

Admission of a newly born baby to the NICU is highly stressful for parents and family members (Maghaireh et al., 2016). Parents and family members are more likely to be concerned about a neonate's survival and well-being (Siva et al., 2023). In addition, mothers are more stressed about separation from their neonates (Roque et al., 2017). Unfamiliar environments, potential challenges in communication and accessing information with healthcare personnel are the primary stressors. These stressors may affect parental mental health, which can cause long-term effect on maternal psychological health, parental interaction, mother-child bonding, growth and development (Busse et al., 2013; Govindaswamy et al., 2019; Maghaireh et al., 2016). Research on parental experiences at NICUs, especially from developed or high-income countries, has prompted a framework in neonatal care design such as family centred care (FCC), and family integrated care interventions (Murthy et al., 2021). This research has influenced creative policy guidelines for coordinating mental health practitioners, peer support, and communication modifications in neonatal care (Hynan et al., 2015; Niranjana et al., 2015).

The NICU environment is stressful, with periods of unusual light and noise and repeated disruptions from procedures that interfere with parent-child interactions (Chourasia et al., 2013). Separation from parents can sometimes be stressful for both the infant and the parent (Dongre et al., 2020). FCC or family integrated care is a method of assisting and involving parents in the care of their infants (Benzies et al., 2013); it is a method of planning, delivering, and evaluating healthcare that is centred on collaboration between medical care providers and patient families (Hane et al., 2015; Murthy et al., 2021). FCC emphasises four fundamental values: dignity and respect, information sharing, family involvement in care, and family collaboration (Ramezani et al., 2014). It seeks to incorporate families in the planning, implementation, and assessment of care and to make their perspectives as valuable as those of healthcare professionals (Ding et al., 2019).

Previous quantitative and qualitative studies have reported that parents of neonates admitted to the NICU are more likely to experience psychological health issues such as stress, anxiety, and depression (Ding et al., 2019; Maghaireh et al., 2016). Parental stress in the NICU includes any intrinsic or extrinsic feeling of emotional or physical tension that evokes a biological response known as stress, and stressors include a chemical or biological element, emotional consequences, an environmental condition, and an external stimulus that causes stress (Busse et al., 2013). Hence, we aimed to synthesize the evidence from all available research and determine the prevalence of stress and stressors experienced by parents of high-risk neonates admitted to the NICU to address the existing gaps. This review will assist healthcare professionals and nurses in understanding parental stress and stressors during NICU admission in India; therefore, it will motivate nurses to support parents and

encourage them to participate in kangaroo mother care (KMC) and routine neonatal care in the NICU to facilitate early maternal-child bonding and improve mother-infant positive clinical outcomes.

Review questions

What are the stress and stressors experienced by the parents of high-risk neonates admitted to the NICU?

Review purpose

The purpose of this systematic review is to identify the specific stress and stressors experienced by parents during their high-risk neonatal admission to the NICU and to conduct a meta-analysis to synthesise the evidence from the Indian context to inform the healthcare system concerning possible measures to reduce parental stress and incorporate into NICU standard care.

2 | METHODS

This systematic review was conducted on both quantitative and qualitative studies, addressing high-risk neonatal stress and parental stress in the NICU. This review is reported in accordance with the 'Preferred Reporting Items for Systematic Review and Meta Analysis' (PRISMA) guidelines (Page et al., 2021). A protocol was developed for this review and prospectively registered with 'International Prospective Register of Systematic Reviews' PROSPERO, which can be accessed on the research square preprint platform. This review involved two phases of searching. First, global databases for Indian studies were searched, and second, Indian databases, repositories, registries, journal publishers' websites and organizational websites were searched (Figure 1). All relevant articles were retrieved and screened based on the study eligibility criteria.

2.1 | Phase I: Searching in global databases

A comprehensive search was conducted in global databases: CINAHL via EBSCO host, MEDLINE via PubMed, EMBASE,

SCOPUS, Web of Science (WOS), ProQuest, Microsoft academic, and DOAJ. Search fields were searched using free text and database-specific subject headings. A search strategy was built for PubMed using medical subject headings (MESH) and subsequently tailored for the other databases. The search terms used are given in Appendix 1.

2.2 | Phase II: Searching in Indian databases and other methods

An advanced search was conducted in various Indian databases, such as the Indian Citation Index, J-Gate, and Journal of Clinical and Diagnostic Research (JCDR). Indian institutional and noninstitutional repositories such as Shodhganga, National Institute of Science Communication and Information Resources, and Indian Institute of Science ePrints@IIsc. Indian clinical trial registry (CTRI), publication websites such as A&V publications, Jaypee Publications, Mansa STM Publishers, Red flowers publication, and Indianjournals.com. Other websites include Healthy New-born Network India, Indian Science Abstract (ISA), UNICEF India, Perinatology (Journal of Perinatal and Neonatal Care) and Semantic Scholar. Additionally, reference lists of included studies and systematic reviews were screened for potentially relevant studies.

2.3 | Screening process

Independent screening was performed by two reviewers (NS and TP) on Rayyan software. The study titles were screened first, and then their abstracts were read. Only selected articles that met the inclusion criteria (Table 1) were retrieved for full text screening. Disagreements between the two reviewers were resolved through discussion with a third reviewer (BSN).

2.4 | Data extraction and quality assessment

Two authors (NS and EGM) performed data extraction and quality assessment of the included studies using a piloted data extraction form. Data collected from the quantitative studies were first author name and year of publication, state, title of the study, study objectives, sample size, sample, size calculation, funding, study design, participants, sampling technique, duration of the study, data collection instrument, inclusion criteria, exclusion criteria, statistical analysis, parents characteristics, neonatal characteristics, mother stress, fathers stress, parental stress, high-risk neonatal stressors, stress, and outcome. The Joanna Briggs Institute (JBI) Critical Appraisal Checklist was used for quality appraisal of quantitative studies to identify the risk of bias and selection bias (Munn et al., 2020). Disagreements during data extraction and quality assessment were resolved through discussion and consensus with a third reviewer (BSN).

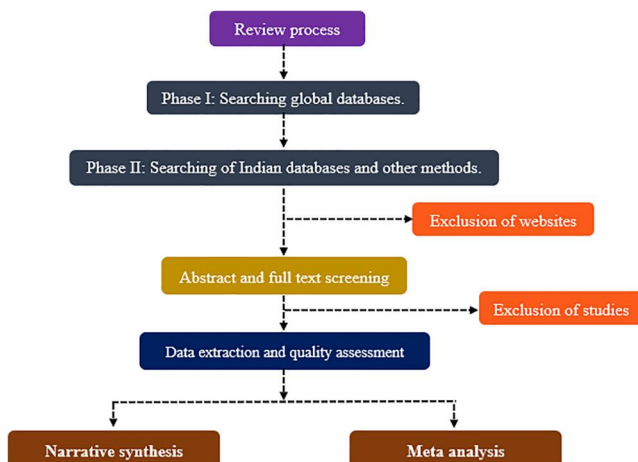


FIGURE 1 Systematic review process.

TABLE 1 Inclusion and Exclusion criteria for inclusion of article in study.

PICO component	Inclusion criteria	Exclusion criteria
Population (P)	High-risk neonates (defined as neonate irrespective of birth weight or gestational age; have a higher risk of morbidity or mortality due to medical conditions or circumstances associated with birth and admitted to NICU) & their parents irrespective of the father's age, maternal age, gestational age, type of delivery, neonatal medical condition, gender, and neonatal birth weight.	- Stress level of family members (other than parents) of high-risk neonates admitted into the NICU. - Neonates were admitted to NICU for 24 h of observation. - Mothers with a history of diagnosed prenatal and postnatal psychiatric illness and postnatal depression.
Exposure (E)	Stress and stressors experienced by parents	Parental anxiety, maternal anxiety, fathers' anxiety, and postnatal depression.
Outcome (O)	Stress and stressors experienced by the parents of high-risk neonates admitted to NICU. Stress and stressors experienced by the high-risk neonates admitted to NICU.	
Time (T)	Articles published from January 2011 to December 2021 with full text available in the English language.	
Study design (S)	Hospital-based observational studies, cross-sectional surveys, descriptive studies, qualitative studies, and mixed-method studies	Randomized control trials, experimental studies, case reports, letters, editorials, case-control, cohort studies, study protocols, and narrative reviews.

2.5 | Data synthesis

A meta-analysis of quantitative studies was undertaken to determine the prevalence of maternal stress, paternal stress, and parental stress. Studies that utilised the PSS:NICU scale and explained the stress occurrence level (sub scale wise mean and standard deviation), that is, Matric 1, were included in the meta-analysis. The analysis was performed using STATA software version 13.1 by a statistician (RS). A random effect model was used to perform the meta-analysis.

3 | RESULTS

3.1 | Search outcomes

Search outcomes are reported in Figure 2.

3.2 | Study characteristics

A total of 21 descriptive quantitative studies ($n = 1889$) and one qualitative study ($n = 173$) were included in this review. Nineteen studies reported mothers' age, in that the majority of the mothers were in the age group between 28 and 33 years, with a mean age of 30 years. Four studies reported father age, and most of the fathers were between 30 and 34 years, with a mean age of 32 years. All studies were conducted in urban tertiary care hospitals. A total of 11 studies reported parental education level and family income, in that the majority of the parents' education level was below graduation and income was between 10,000 and 15,000 INR per month. A total

of 10 studies were conducted in the South Indian region, three studies in Maharashtra state, seven studies in North India, and one study in Northeast region. Further study characteristics are explained in the results table (Table 2).

3.3 | Quantitative study results

3.3.1 | Maternal stress

Twelve studies have reported that others experienced severe stress (Agrawal & Gaur, 2016; Ashwani et al., 2017; Chourasia et al., 2013; Das & Krishna, 2020; Ganguly et al., 2020; Kumar & Mallick, 2020; Mulla & Patel, 2021; Niranjana et al., 2015; Patil, 2014; Rai & Rani, 2019; Reetha, 2020; Varma et al., 2019). Five studies have reported that mothers experienced a moderate level of stress (Sheeba & Prabhu T, 2019; Gurgani & Jogi, 2018; Rajalakshmi & Kalavathi, 2017; Sharma, 2019; Sidhu, 2016). Two studies have reported that mothers experienced mild stress levels during neonatal admission to the NICU (Shanmugam & Ramachandra, 2015; Vinod, 2017). Mothers who directly breastfed their babies had significantly lower stress than mothers who did not (Chourasia et al., 2013). Studies have highlighted that the age of mothers, education, occupation, monthly incomes of family, birth order of child and type of family (Patil, 2014; Sharma, 2019; Sidhu, 2016; Vinod, 2017), religion, number of children (Rajalakshmi & Kalavathi, 2017), number of days of hospitalisation, and maternal occupation have significantly associated with on mothers' stress (Reetha, 2020). Mothers had severe stress in the physiological domain, emotional domain and cognitive domain (Gurgani & Jogi, 2018; Reetha, 2020; Sidhu, 2016). Preterm birth, low birth

PRISMA 2020 flow diagram for new systematic reviews which included searches of databases, registers, and other sources.

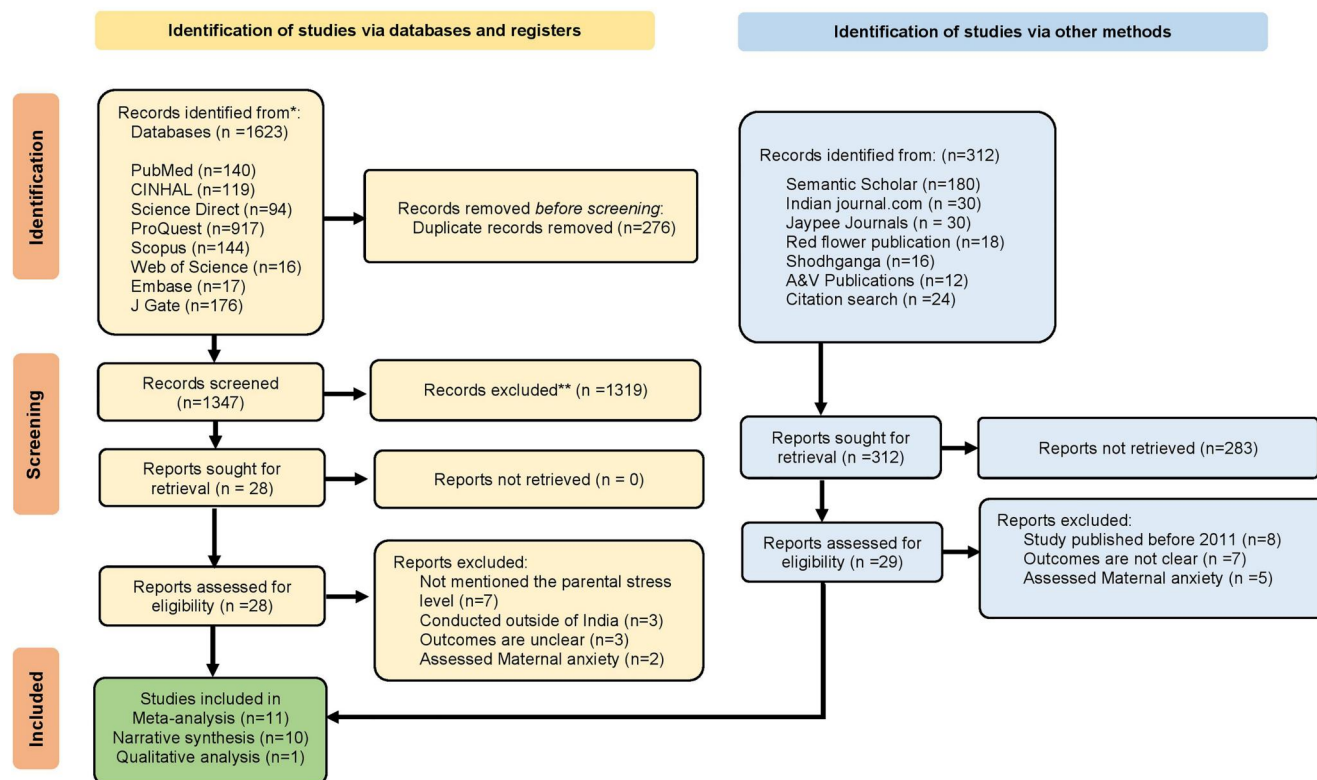


FIGURE 2 PRISMA flow diagram at each stage of the selection process.

weight and increasing days of hospital stay are the triggering factors for higher level of maternal stress (Vinod, 2017).

Five studies were considered for meta-analyses, findings reported parental stress based on the PSS: NICU Stress Scale (Metric 1). The mean scores of parental stress in the areas, baby looks and behaviour, relationship with baby and parental role alteration, and sight and sound (Miles et al., 1993) were considered for subscale analysis. A higher score on the scale indicates a higher level of maternal stress. Meta-analysis was carried out in three areas of the stress scale by using a random effect model by the statistician who is also a coauthor in the paper. The results showed that the pooled mean stress score in the area of 'relationship with baby and parental role' was 3.33 [95% CI, 2.53–4.13, $I^2 = 99.8\%$ ($p = .001$)], 'baby looks and behaviour' was 3.10 [95% CI, 2.27–3.94, $I^2 = 99.8\%$ ($p = .001$)], and 'sight and sound' was 2.53 [95% CI, 2.03–3.03, $I^2 = 99.3\%$ ($p = .001$)]. Maternal stress level was elevated in the area of relationship with baby (separation from baby, fear and helplessness) and parental role (lack of bonding with baby and not able to feed the baby) (Figure 3).

Four studies used a three-point rating scale to assess maternal stress, and the domains covered under this scale were cognitive, physiological, emotional, parental role alteration, communication with staff and socioeconomic domains. Meta-analysis was carried out in all areas of the stress scale by using a random effect model. The

results showed that the pooled mean in the area of 'cognitive domain' 12.37 [95% CI, 10.89–13.85, $I^2 = 98.9\%$ ($p = .001$)], 'physiological domain' 15.75 [95% CI, 14.25–17.26, $I^2 = 91.0\%$ ($P = .001$)], 'emotional domain' 11.75 [95% CI, 8.82–14.69, $I^2 = 99.1\%$ ($p = .001$)], 'parental role alteration' 9.01 [95% CI, 8.75–9.27, $I^2 = 39.7\%$ ($p = .190$)], 'communication with staff' 11.91 [95% CI, 10.86–12.97, $I^2 = 90.4\%$ ($p = .001$)] and 'socio economic domain' 9.63 [95% CI, 6.45–12.82, $I^2 = 99.5\%$ ($p = .001$)]. A higher score on the scale indicates a severe maternal stress level (Figure 4).

3.3.2 | Paternal (Father's) stress

Two studies reported the stress experienced by the fathers during neonate admission to the NICU (Dongre et al., 2020; Dutta et al., 2016), of which one study reported that the fathers had severe stress compared to the mothers (Ashwani et al., 2017). Fathers of very low birth weight neonates were stressed due to financial costs, alteration in their parental role and other home affairs (Dutta et al., 2016). Overtime, staff behaviour and alteration of parental role helped reduce their stress, but there was increasing stress due to lack of family support, home affairs and finances (Dutta et al., 2016; Gurgani & Jogi, 2018). Meta-analysis showed the pooled mean in the paternal stress level revealed the mean in baby looks and behaviour,

TABLE 2 Characteristics of the outcome.

Author & year	State	Study design	Sampling technique	Sample	Sample size	Data collection tool	Outcome	Remarks
Agrawal & Gaur, 2016	Madhya Pradesh	Cross-sectional study	Simple random sampling	Parents (mother and father) of new-born admitted in NICU	400	PSS: NICU	Parents of neonates admitted to the NICU are under significant stress. Mothers experience more stress than fathers in all the subscales and total scale. Relationships with the baby and parental role (3.23 ± 0.55) are the most stressful for mothers and fathers.	Included in meta-analysis
Ashwani et al., 2017	Telangana	Cross-sectional study	Convenient sampling	Parents (mother and father) of new-born admitted in NICU	100 (12 fathers, 88 mothers)	PSS: NICU	The stress level of parents was found to be significantly higher in relationship with the baby and parental role (2.48 ± 0.48). Term neonates affected the parents more in the sights and sounds domain.	Included in meta-analysis
Chourasia et al., 2013	Pondicherry	Descriptive study	Not mentioned	Mother of new-born admitted in NICU	100	PSS: NICU	"The highest level of maternal stress was found in the areas of alteration of a parental role (4.12 ± 0.62) and looks and behaviour (4.1 ± 0.58). Mothers who directly breastfed their babies had significantly lower stress than mothers who did not.	Included in meta-analysis
Dongre et al., 2020	Maharashtra	Observational study	Not mentioned	Fathers of preterm infants admitted to the NICU	30	PSS: NICU	Fathers of preterm infants admitted to the NICU experience much stress, which can adversely affect their mental health. Findings revealed that staff behaviours and communication were highly stressful (3.13 ± 0.85).	Included in meta-analysis
Ganguly et al., 2020	Odisha	Cross-sectional study	Not mentioned	Parents (mother and father) of new-born admitted in NICU	100 (60 mothers and 40 fathers)	PSS: NICU	Both the parents of high-risk neonates experienced severe stress levels in every subscale. The mean for overall stress experienced was 3.71 ± 0.70 . The sights and sounds " (3.23 ± 0.41) followed by relationship with the baby and parental role is 2.46 ± 0.30 .	Included in meta-analysis

TABLE 2 (Continued)

Author & year	State	Study design	Sampling technique	Sample	Sample size	Data collection tool	Outcome	Remarks
Kumar & Mallick, 2020	Maharashtra	Cross-sectional question-based survey	Not mentioned	Mother of new-born admitted in NICU	73	PSS: NICU	NICU environment was found to be highly stressful for mothers in the domain of parental role alteration (4.14 ± 0.36) and moderately stressful in the domain of sights and sounds (2.60 ± 0.43) and looks and behaviour (3.47 ± 0.31).	Included in meta-analysis
Patil, 2014	Maharashtra	Descriptive cross-sectional study design	Convenient sampling	Mother of new-born admitted in NICU	40	Three-point rating scale	70% of mothers had moderate stress and 30% of mothers was experienced severe stress.	Included in the narrative synthesis
Varma et al., 2019	Gujarat	Cross-sectional survey	. Not mentioned	Mothers of infants admitted for >48 h in a level 3 NICU.	151	PSS: NICU	The sights and sounds (1.98 ± 0.83), followed by parental role alternation (1.76 ± 0.54) were the major sources of maternal stress, which is associated with significant psychological morbidity.	Included in meta-analysis
Das & Krishna, 2020	Assam	Descriptive survey	Convenient sampling	Mothers of neonates admitted to NICU	150	Three-point rating scale	Most of the mothers experienced moderate levels of stress (60%), and the NICU environment had a significant effect in increasing maternal stress levels.	Included in the narrative synthesis
Gurgani & Jogi, 2018	Kashmir	Descriptive design	Purposive sampling	Mothers whose neonates were admitted to NICU	60	Three-point rating scale	Most of the mothers whose neonates were admitted to the NICU experienced moderate levels of stress (85%) as they had less familial support.	Included in meta-analysis
Sidhu, 2016	Punjab	Descriptive survey	Purposive sampling	Mothers whose neonates were admitted to NICU	50	Three-point rating scale.	Most of the mothers whose neonates were admitted to the NICU experienced moderate levels 54%, and mothers reported that parental role alteration and communication with staff domine is more stressful than other domains.	Included in the narrative synthesis
Mulla & Patel, 2021	Dadra & nagar haveli (DNH)	Descriptive study	Judgemental sampling	Mothers who had admitted their neonates to NICU,	50	Paediatric inventory for parents (PIP) scale	Most of the mothers experienced severe stress (86%) whose neonates were admitted to NICU. Monthly family income was found to be a significant extraneous variable.	Included in the narrative synthesis

(Continues)

TABLE 2 (Continued)

Author & year	State	Study design	Sampling technique	Sample	Sample size	Data collection tool	Outcome	Remarks
Niranjan et al., 2015	Karnataka	Cross-sectional study	Not mentioned	Mothers who had admitted their neonates to NICU,	30	PSS: NICU	The highest level of maternal stress was found in the mothers (90%).	Included in the narrative synthesis
Reetha, 2020	Tamil nadu	Descriptive design	Convenient sampling	Mothers who had admitted their neonates to NICU,	60	Stress rating scale	Most of the mothers experienced mild stress (60%) moderate stress levels (28%), and mothers reported that separation from babies causes higher stress levels.	Included in meta-analysis
Rajalakshmi & Kalavathi, 2017	Puducherry	Descriptive design	Convenient sampling	Mothers of preterm infants admitted to NICU	30	Three-point stress rating scale	Higher levels of stress found among mothers of preterm infants than other mothers.	Included in the narrative synthesis
Sharma, 2019	Karnataka	Descriptive design	Purposive sampling	Parents of the neonates admitted in NICU	60	Three-point stress rating scale	Mothers experienced a higher level of stress compared with fathers. 55% of mothers experienced moderate levels of stress. Parental education had a significant association with increased parental stress.	Included in the narrative synthesis
Sheeba & Prabhu, 2019	Tamilnadu	Comparative study	Purposive sampling	Mothers of the neonates admitted to NICU and postnatal ward	60	Three-point stress rating scale	Mothers of high-risk neonates experience moderate level of stress (60%) and higher level of stress (40%). The study findings revealed a highly significant difference in the stress level among NICU and postnatal ward mothers.	Included in the narrative synthesis
Vinod, 2017	Andhra Pradesh	Descriptive cross-sectional design	Convenience sampling	Mothers of neonates in NICU	30	Three-point stress rating scale	Level of parental stress among mothers of neonates admitted to NICU, most of the mothers had mild stress (60%) and 40% mothers had moderate level of stress. There is a necessity for mothers to have coping strategies for their child's disease conditions.	Included in the narrative synthesis
Shanmugam & Ramachandra, 2015	Karnataka	Descriptive cross-sectional design	Simple random sampling	Mothers of neonates in NICU	100	Three-point stress rating scale	Mothers often experience high-stress levels (38%) when the neonate's health status is unstable in NICU.	Included in meta-analysis

TABLE 2 (Continued)

Author & year	State	Study design	Sampling technique	Sample	Sample size	Data collection tool	Outcome	Remarks
Dutta et al., 2016	Chandigarh	Cross-sectional design	Not mentioned	Mothers of neonates in NICU	80 fathers	4-Point likert scale	The total stress score showed a declining trend ($p = .001$). Raw stress scores of staff behaviour and parental role decreased significantly, and finances and home, affairs showed an increasing trend.	Included in the narrative synthesis
Rai & Rani, 2019	Karnataka	Descriptive cross-sectional design	Convenient sampling	Mothers of neonates admitted to NICU for more than 48 h.	135	PSS: NICU	Higher stress contributors were the baby's perceived pain by the mother, followed by the presence of monitors and equipment around the baby.	Included in meta-analysis

relationship with baby and parental role, sight and sound, and staff behaviour and communication. A higher score on the scale indicates an increased stress level. Meta-analysis was carried out in four areas of the stress scale by using a random effect model. The results showed a pooled mean in the area of 'baby looks and behaviour' of 2.21 [95% CI, 0.96–3.45, $I^2 = 99.6\%$ ($P = .001$)], 'relationship with baby and parental role' of 2.97 [95% CI, 2.86–3.09, $I^2 = 21.4\%$ ($p = .259$)], 'sight and sound' of 1.90 [95% CI, 1.87–1.94, $I^2 = 0\%$ ($p = .347$)], and 'staff behaviour and communication' of 2.45 [95% CI, 1.14–3.76, $I^2 = 98.6\%$ ($p = .001$)]. Fathers' stress level was higher in the area of relationship with baby (separation from baby, fear and helplessness) and parental role (lack of bonding with baby and not being able to see the baby whenever they want) (Figure 5).

3.3.3 | Parental stress

Two studies assessed parental stress level using the PSS:NICU scale (Ashwani et al., 2017; Ganguly et al., 2020). The stress levels associated with NICU admission were not significantly impacted by the parents' age or length of stay in hospital. However, there was a correlation between greater levels of stress and gestational age, gender, and parental education. In the domain of sight and noise, fathers were shown to be much more stressed than mothers. Parents' perceptions of sight and noise were more negatively impacted on the term neonates. Parents with less education had issues with staff communication and behavior (Ashwani et al., 2017). Feeling helpless and unable to protect the baby and not feeding my baby myself were the significant stressors expressed by the mothers (Ganguly et al., 2020). Meta-analysis was carried out in four areas of the stress scale by using a random effect model. The results showed a pooled mean in the area of 'baby looks and behaviour' of 2.01 [95% CI, 1.81–2.22, $I^2 = 89.6\%$ ($p = .002$)], 'relationship with baby and parental role' of 2.47 [95% CI, 2.42–2.52, $I^2 = 0\%$ ($p = .726$)], 'sight and sound' of 2.49 [95% CI, 1.04–3.94, $I^2 = 99.9\%$ ($P = .001$)], and 'staff behaviour and communication' of 1.73 [95% CI, 1.23–2.23, $I^2 = 97.3\%$ ($p = .001$)]. Parents experienced a higher level of stress in the area of relationship, sight and sound in the NICU (monitor, equipment sounds, alarms, staff conversations, and bright light around the baby) and parental role (lack of bonding with baby and not able to see the baby whenever they wanted) (Figure 6).

3.4 | Qualitative study results

A total of 38 participants (19 mothers, 15 fathers and 4 grandparents) were interviewed to assess the stress and stressors experienced by the parents and attendants of high-risk neonates in level III NICUs. The subthemes were obtained from the primary study and explained under each relevant theme (Murthy et al., 2021).

Uncertainty due to communication gap: Parents were distressed when faced with uncertainties in the baby's well-being or NICU care costs. Sudden deterioration in the baby's condition

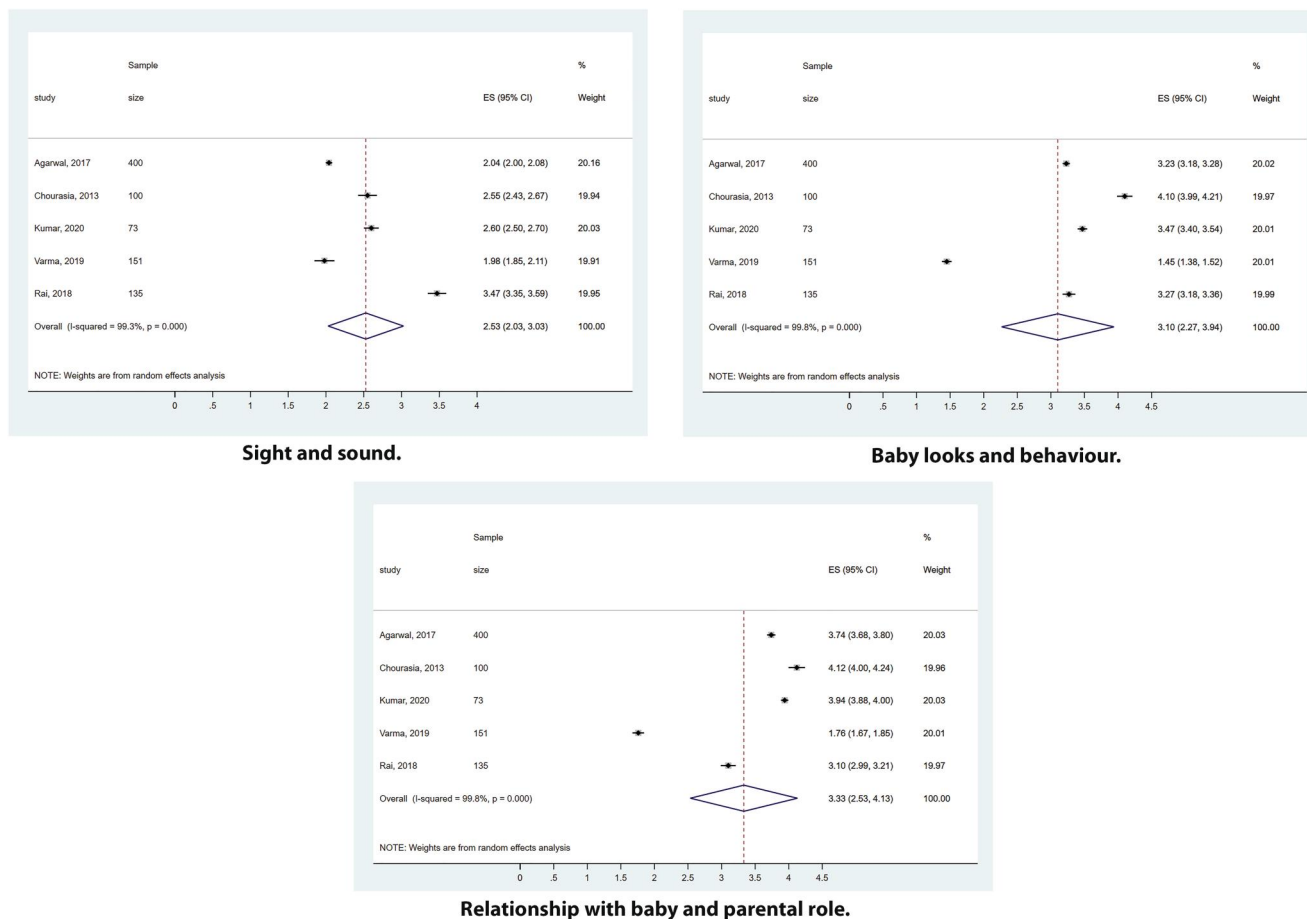


FIGURE 3 Meta-analysis of maternal stress (PSS; NICU).

frightened the parents, which led to feelings of shock, confusion, misunderstanding, guilt, and sadness. Mothers repeatedly blamed themselves for their baby's condition because they did not understand why they were separated from their babies and why certain treatment decisions were made by the staff. Fathers expressed loss of trust in the staff.

Financial constraints: Parents who had to bear all costs due to lack of health insurance and inadequate financial support were extremely stressed. With limited financial resources, fathers and grandparents struggled to source money. Fathers were conflicted about whether to remain at the hospital or go out to earn money or find financial assistance.

Cultural rituals: Some mothers believed cultural practices were responsible for their baby's condition, which necessitated hospitalisation.

Barriers to bonding: Mothers who were in a different hospital from the baby's experienced 'emotional breakdown' because they were unable to care for their neonate. Fathers were frustrated by inflexible work schedules and NICU visiting protocols, which prohibited them from visiting the baby for days.

Others: Inadequate breast milk, inability to alleviate baby's distress, struggling to cope with additional responsibilities with no

support, individual or spouse's well-being were the other causes for concern.

4 | DISCUSSION

To the best of our knowledge, this is the first systematic review and meta-analysis that assessed the prevalence of stress among parents of neonates admitted to the NICU in India. Advancing age of the mother and prolonged NICU stay (Chourasia et al., 2013; Rai & Rani, 2019), religion, and number of children (Rajalakshmi & Kalavathi, 2017) were marginally associated with higher levels of maternal stress. Mothers who directly breastfed their babies had significantly lower stress than mothers who did not (Chourasia et al., 2013). In the present study, a higher mean score of maternal stress was identified in the area of 'relationship with baby and parental role alteration' (Agrawal & Gaur, 2016; Chourasia et al., 2013; Kumar & Mallick, 2020; Rai & Rani, 2019; Varma et al., 2019), physiological domain, emotional domain and cognitive domain (Gurgani & Jogi, 2018; Reetha, 2020; Sidhu, 2016). Existing literature has stated that mothers experience higher levels of stress, depression due to child separation, child condition, equipment

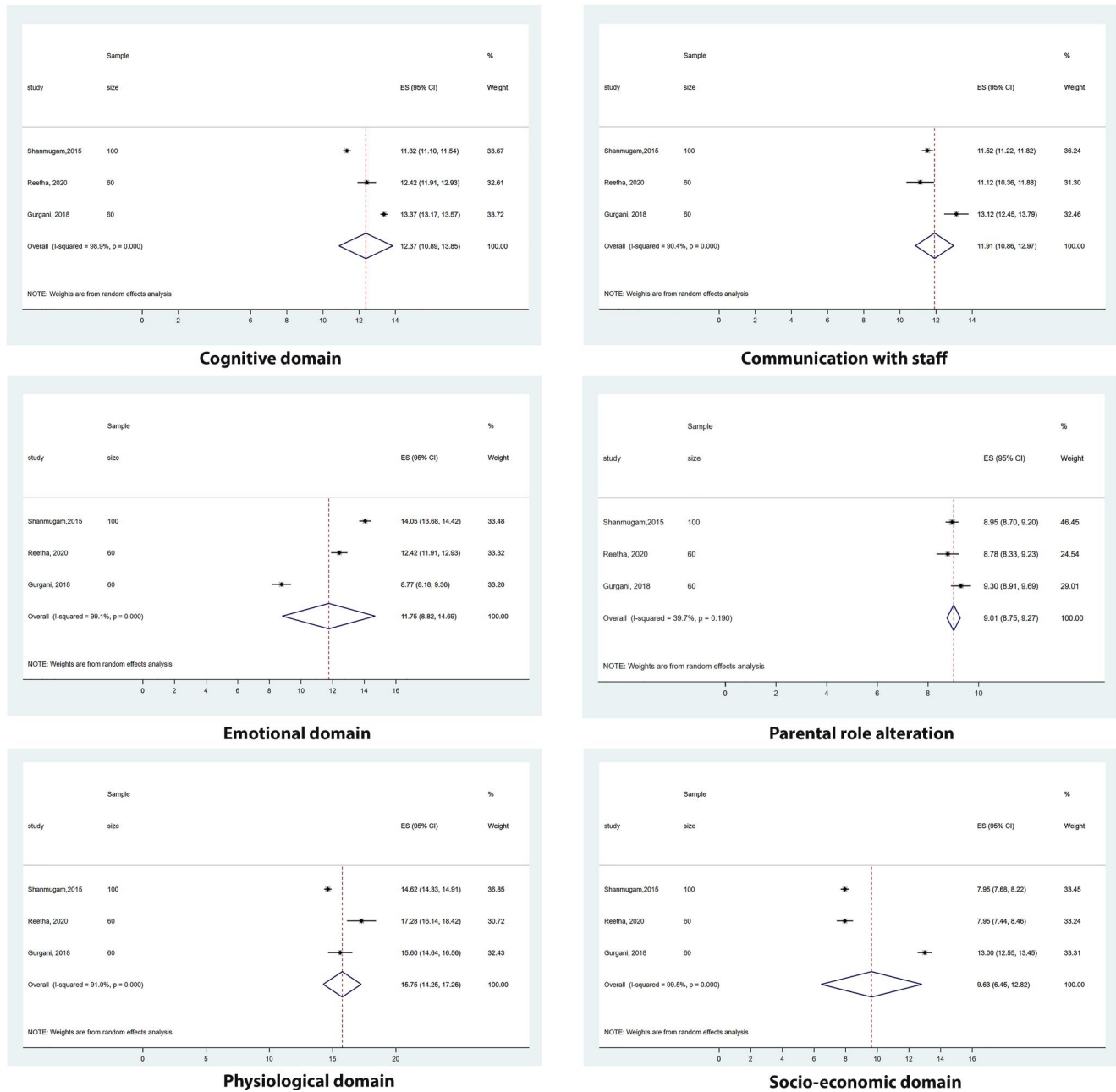


FIGURE 4 Meta-Analysis of Maternal Stress (3-point rating scale).

presence near the child, looks and behaviour and painful procedures performed in the NICU (Benzies et al., 2013; Burke, 2018).

Parental role is a crucial aspect in neonatal care, and parental stress is significantly associated with the separation of babies and their absence in neonatal care, especially for parents of preterm and extremely low birth-weight babies (Ganguly et al., 2020; Ionio et al., 2019). Communication gap and staff behaviour were the common stressors for parents with low educational status (Ashwani et al., 2017). There is a lack of human resources, caregiver availability, and health literacy in LMICs, especially in Iran and South Asia, which will increase neonatal morbidity and maternal psychological stress in all levels of the NICU (Bolan et al., 2021). Parental stressors

at NICU included parents' age, communication barrier with staff, inability to help and comfort the neonates in terms of pain, baby discomfort, baby being on ventilator and lack of healthcare personal support (Govindaswamy et al., 2019; Obeidat et al., 2009). The majority of healthcare settings in LMICs do not allow fathers to visit and care for their babies at frequent intervals (Prouhet et al., 2018). Several studies have reported that fathers often find it difficult to foster an optimal father-child relationship and experience a high level of distress due to financial concerns (Noergaard et al., 2018). The present review findings were supported by Prouhet et al., who reported that fathers of neonates admitted to the NICU experienced severe stress levels related to neonatal medical conditions, staff

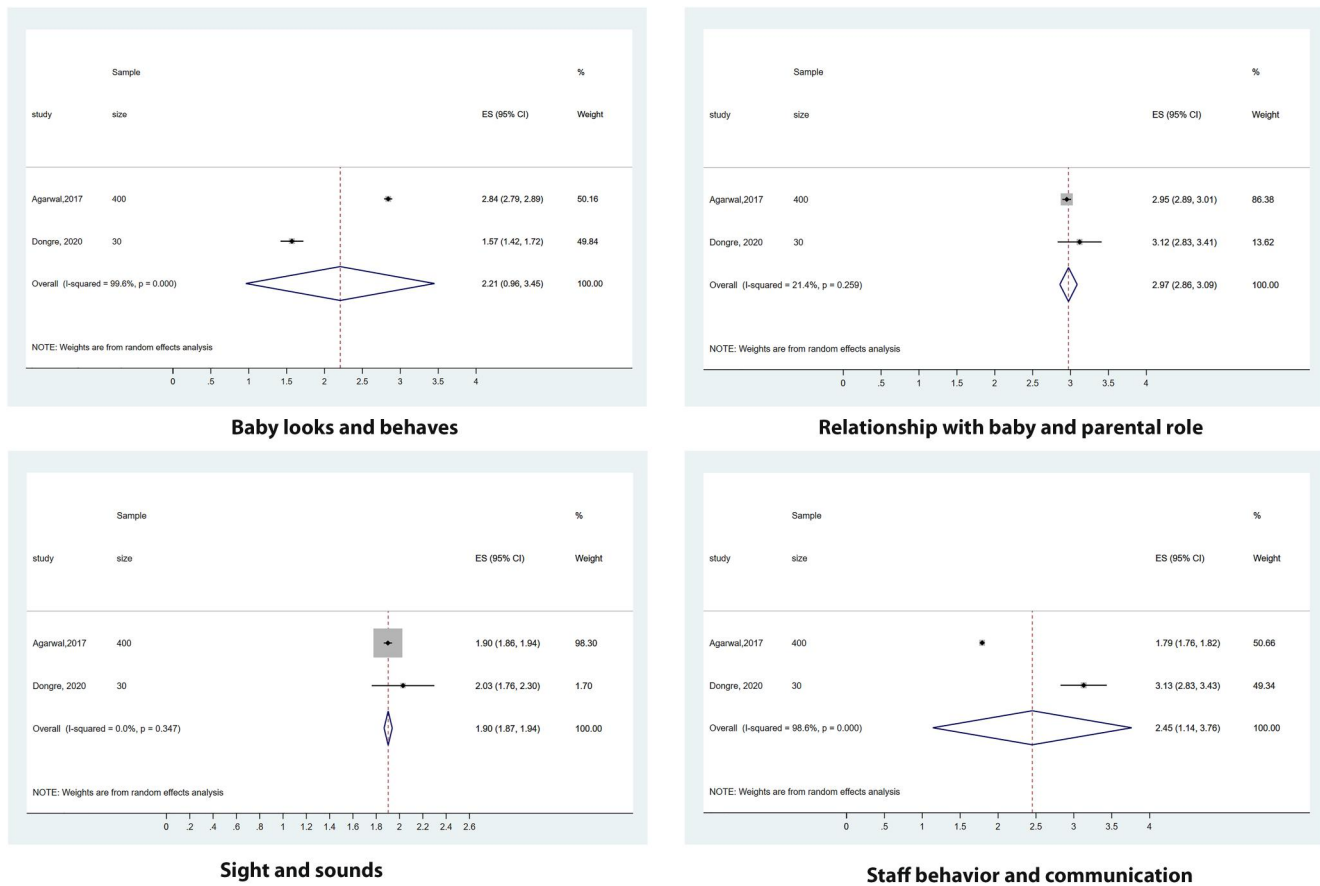


FIGURE 5 Meta-analysis of paternal stress.

communication and financial concerns (Prouhet et al., 2018). In particular, fathers of preterm, very low birth weight neonates are stressed due to prolonged NICU stay, cost of healthcare system, and concern about home affairs (Dutta et al., 2016). There was a decline in stress due to staff's positive behaviour and alteration of parental role over time and a trend towards increasing stress due to financial constraints (Dutta et al., 2016; Hagen et al., 2016; Prouhet et al., 2018).

The qualitative study results revealed that parents and family members experienced severe stress in the NICU. The most common stressors were unexpected situations, the NICU environment and separation from the baby. Similarly, mothers reported that child condition, separation of baby, and helplessness in childcare activities were major stressors in the NICU and caused feelings of guilt as a mother (Lavallée et al., 2021). Similar findings were supported by Maghaireh et al., who highlighted that when a mother delivers a baby who requires NICU admission, it is distressing and frightening for the parents, especially for mothers. Consequently, there will be a negative impact on the infant-parent relationship and parenting style in the future (Arnold et al., 2013; Maghaireh et al., 2016). Some mothers expressed stress over perceived cultural practices as the cause of their infant's illness, which ultimately necessitated hospitalization. Parents and family members were concerned about missing cultural ceremonies of neonates and traditional practices after child birth

(Murthy et al., 2021). A study highlighted that cultural practices varied from one geographical area to another, and various cultural practices were followed by mothers to treat neonates, which negatively affected neonatal health (Osman et al., 2018). Families, especially fathers, struggled to meet the rising hospital costs at short notice (King et al., 2021). This psychological stress and burden extended and continued even after discharge (Lakshmanan et al., 2022).

A systematic review conducted on hospital-based interventions reported that findings will support clinicians and health care systems by outlining implementation goals in light of recommendations to offer regular psychosocial assistance to all NICU parents (Lavallée et al., 2021). Another two systematic reviews recommended that early identification of maternal stress assists researchers by conducting potential investigation of already available modalities as well as the development of early interventions and innovative treatments to minimize parental stress and improve neonatal developmental outcomes (Benzies et al., 2013; Burke, 2018). Despite policy recommendations, progress in implementing FCC or patient navigation in Indian public healthcare has been marginal (Burke, 2018). Neonatal care remains technologically pushed and provider-centered, with very less parental engagement at the NICU (Murthy et al., 2021). Considering that India has the highest global burden of preterm births and a higher prevalence of parental stress during NICU

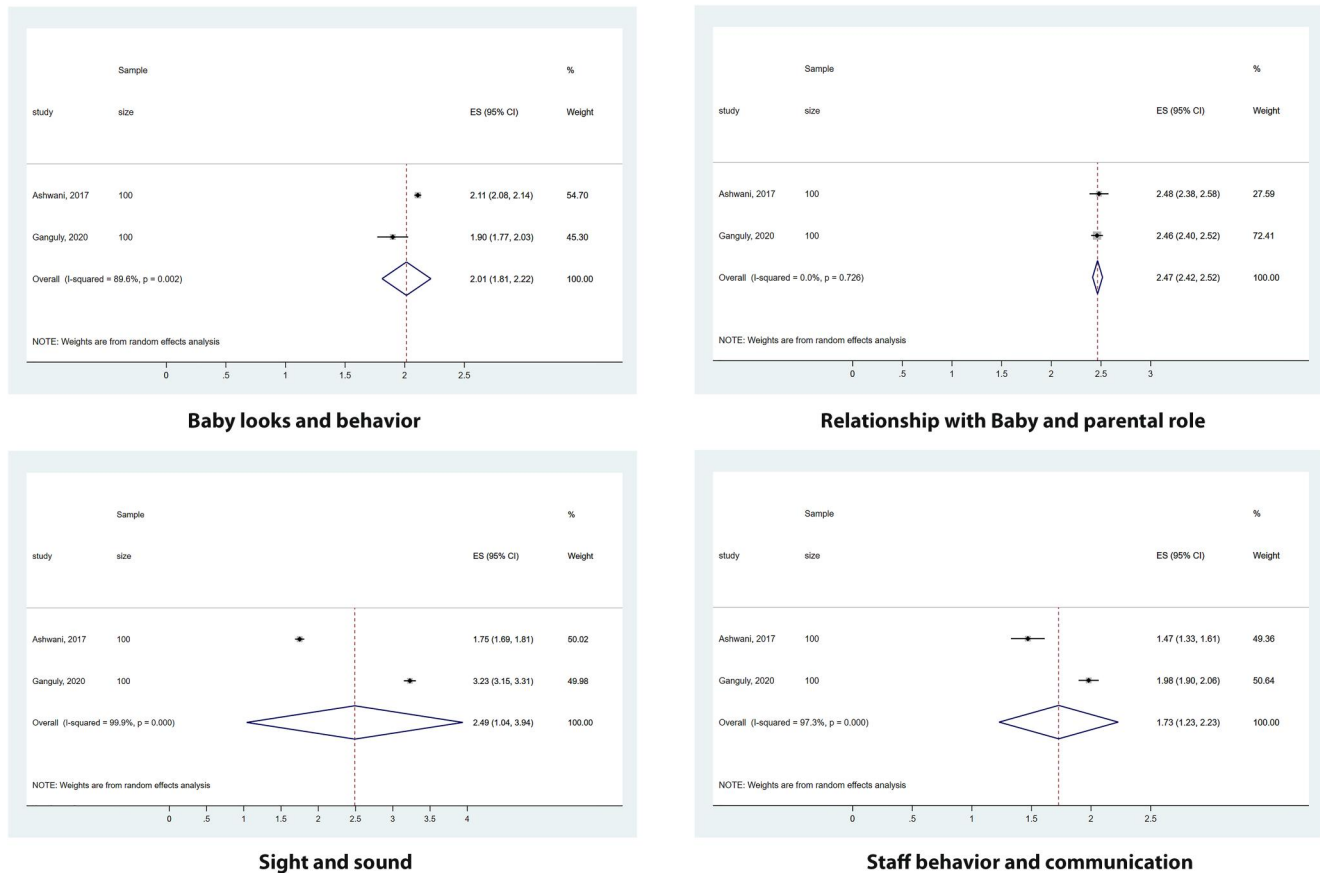


FIGURE 6 Meta-analysis of parental stress.

admission, it is essential to utilize healthcare resources to implement effective interventions that will encourage mothers to provide continuous KMC, exclusive breastfeeding, and kangaroo father care and facilitate the role of parents in routine neonatal care to enhance early parent-child bonding. With these findings, researchers suggest that firm implementation of FCC interventions (Ding et al., 2019), navigation programs (effective communication, supporting parents, empowering mothers about neonatal care, encouraging mothers to be involved in neonatal care at the NICU, maintaining rapport with parents and family members until required follow-up visits are completed (Rice, 2012)) are necessary to support high-risk neonates and their parents and family members throughout NICU admission and even after discharge.

5 | CONCLUSIONS

The systematic review and meta-analysis findings show that neonatal condition, parental role alteration, the NICU environment and communication gap were stressors for parents of neonates admitted to the NICU in India. Unexpected situations, cultural practices, financial burdens, and separation from the baby resulting in a parental role alteration, lack of establishment of early parent-child bonding are significantly contributed to higher parental stress.

Therefore, it is crucial for health care professionals in NICUs to identify specific stressors among parents and incorporate effective interventional strategies in standard neonatal care to improve communication between parents, and healthcare teams and alleviate parental stress especially maternal stress. Appropriate communication and health education enhance the maternal health literacy, ability to actively participate in routine neonatal care, provide continuous KMC, and exclusive breastfeeding to minimise maternal psychological health issues, as well as neonatal morbidity and mortality.

6 | RESEARCH IN CONTEXT

Evidence before this study

- Primary studies have done and reported stress and stressors experienced by parents during neonates NICU admission in Indian context.
- There is lack of qualitative studies in India to find maternal stressors at NICU.
- No systematic reviews have been done in India to assess the prevalence of stress and stressors experienced by the parents of high-risk neonates admitted to NICU.

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Added value of this study

- Quantitative and qualitative studies have demonstrated that parents experienced severe stress levels irrespective of neonatal gestational age, and gender.
- Baby looks and behavior, parental role and communication with staff were considerable stressors for the parents.
- Parental stress is more prevalent and persistent in parents irrespective of level of NICU care.
- Mothers who directly breastfed their babies had significantly lower stress as compared to mothers who did not.
- Parent-child separation contributes to increased stress which is causing significant negative health outcomes for both neonates and their mothers.
- Cultural practices and healthcare financial burden are the most common stressors experienced by the family members, especially fathers.

Implications of all the available evidence

- Health care professionals must identify parental stress to understand the influence of the nature of illness, financial, family, and cultural contexts.
- In our context, families, peers, and religion were essential aspects for reinforcing the available support system.
- The findings highlight the there is significant need for designing a family centered care interventions or nurse navigator program or family-based nursing interventions in every healthcare center in India for support (psychological and emotional) the parents during NICU admission even after discharge.
- Healthcare systems need to incorporate the best interventions in NICU standard care to improve maternal health literacy and neonatal health outcomes.
- Adequate health resources should be in place to ensure early referral and appropriate interventions are offered to the parents of high-risk neonates.
- In addition, consideration should be given to promoting psychological support as a part of routine care for specific groups, for example, parents of premature babies, low birth weight babies, high-risk neonates with prolonged hospital stays.
- Prolonged exposure of stress may cause long term health complications, which need to minimize by continues support to the mothers and family members through navigation programs.

7 | LIMITATIONS

This systematic review included only observational studies that investigated parental stress in neonatal intensive care units in India. Only studies conducted in India were included in the review, which

may limit the generalisability of the evidence globally. While most of the studies used validated tools with demonstrated content validity, only a few studies reported the relevant psychometric performance of the tool specific to the study sample. Variations in tool versions, scoring and reporting results, particularly with the PSS: NICU, make it difficult to compare findings across studies. Even though the studies were found to be included in the review, few studies did not report the required descriptive statistics and hence were not included in the meta-analysis.

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CONFLICT OF INTEREST STATEMENT

The authors declare that they do not have any competing interests.

DATA AVAILABILITY STATEMENT

This review used secondary data which is freely available within publications reviewed. For more information, please contact the authors.

PROTOCOL REGISTRATION

The review is registered with PROSPERO (CRD42021272323) which can be accessed on the research square preprint platform (<https://www.researchsquare.com/article/rs-961644/v1>).

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SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

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