# Effect of an Educational Program on the Stress level Among Mothers of Neonates Hospitalized in Neonatal Intensive Care Units

**Samah Ramadan Ibrahim Elrefaey[1], Ohoud Al Abo Nassir[2], Hend Turki Almutairi[2], Aysha Mohmmed Alsoqae[3], Afaf Hassan Ahmed[4], Dr. Mona Gamal Abd Elnaser Ahmed Elnabauy[5], Shaimaa Mohamed Nageeb[6], Dr. Hanan Nasef Zaki[7]**

*[1]Assistant professor of Psychiatric and Mental Health Nursing Department, Nursing College , Benha University, Egypt. Community and Mental Health Nursing Department, Nursing College, Najran University, KSA. [2]Medical-Surgical Department, Nursing College, Najran University, KSA. [3] Teaching Assistant, Nursing Administration and Education Department. Nursing College, Najran University, KSA. [4]Assistant Professor of Obstetrics and Gynecologic Nursing, Faculty of Nursing, Alexandria University, Egypt. College of Applied Medical Sciences, Yanbu, Department of Nursing, Taibahu University, KSA. [5]Assistant Professor of Psychiatric and Mental Health Nursing, Faculty of Nursing, Zagazig University, Egypt. College of Applied Medical Sciences, Yanbu, Department of Nursing, Taibahu University, KSA. [6]Assistant professor of Psychiatric and Mental Health Nursing College, Hail University, KSA. [7]Assistant Professor of Psychiatric and Mental Health Nursing, Faculty of Nursing, Benha University, Egypt. College of Applied Medical Sciences, Taibah University, Yanbu, KSA.*

**KEYWORDS**
Education program, stress, mothers, neonates.

**ABSTRACT**
Background: Mothers encounter significant psychological distress resulting from the premature birth of their infants, coupled with the need of hospitalization in the Neonatal Intensive Care Unit (NICU), which necessitates prolonged separation from their familial support systems. Aim: to assess the effect of an educational program on the stress level among mothers of neonates hospitalized in neonatal intensive care units. Methods: A quasi-experimental design was undertaken involving 44 mothers of neonates who were admitted to the Neonatal Intensive Care Units (NICUs) at the Children's Hospital and the Maternity & Gynecological Hospital. Researchers used maternal stress scale. Results: Mean score of studied mothers related Sights and sounds domain at preintervention was 24.97 (5.32), while decrease to 15.23 (3.60) postintervention. Also, according to looks and behavior domain mean score was 23.04 (3.90) preintervention, while decrease to 13.61 (2.76) post intervention. Additionally, according to Parental role alteration domain mean score was 26.82 (4.10) preintervention, while decrease to 16.70 (2.34) post intervention. Conclusion: Less than fifty percent of the mothers analyzed exhibited elevated levels of stress prior to the intervention, with approximately one-third demonstrating moderate stress levels. Conversely, following the intervention, less than two-thirds of the participants reported low stress levels, while over one-quarter indicated moderate stress levels. Furthermore, an educational intervention has been demonstrated to reduce maternal stress across various domains, including the auditory and visual realms, the observational and behavioral dimensions, the modifications in parental roles, as well as the overall stress levels experienced by mothers. Recommendations: The formulation of an educational framework aimed at mothers of preterm neonates who have been admitted to the neonatal intensive care unit is essential. It is imperative to furnish parents with psychological empowerment training initiatives designed to facilitate the adoption of proactive coping methodologies to navigate adversities during periods of crisis.

## 1. Introduction

Neonatal Intensive Care Units (NICUs) are specialized healthcare facilities established to deliver sophisticated medical attention to neonates by trained professionals. A newborn is usually brought to the NICU for various reasons such as being born prematurely, maternal pregnancy complications , birth defects, breathing problems, and infections (Karamanou et al., 2022). The neonatal phase, which includes the first 28 days of life, is the most vital period for an infant's survival. During this timeframe, children are confronted with the greatest probability of mortality in their first month of existence (Ganguly et al., 2020).

The hospitalization of a pediatric patient in the Neonatal Intensive Care Unit (NICU) can impose significant psychological strain on the parents, particularly mothers. The repercussions of this experience may extend beyond the period of hospitalization, subsequently impacting familial dynamics and the mental well-being of mothers (Varma et al., 2019). Mothers in the NICU may endure various manifestations of stress- and trauma-related distress, including anxiety, stress, or post-traumatic stress disorder. Extended postnatal distress can disrupt the mother-infant bond and negatively affect children's developmental and social-emotional functioning in the long term (Sabnis et al., 2019).

During this time, the stress is worsened by the unfamiliar hospital environment, loud noises from the intensive care unit equipment, the separation of mother and infant, and the infant's appearance. Mothers may feel a variety of negative emotions like sadness, anxiety, heartache, frustration, rage, and powerlessness (Alexopoulou et al., 2018). Various factors can lead to parents feeling stressed, such as the disease's treatment and procedures, financial pressure, the mother's inability to be with the baby, poor communication with hospital staff, difficulty understanding neonatal care equipment and routines, bright lights and loud noises in the facility, demanding schedules, frequent movement of medical staff, and new parents. The separation of mothers from their newborns after delivery, the difficulty of carrying out parental responsibilities in an intensive care setting, the restriction of maternal caregiving and the delegation of this responsibility to medical staff are additional factors that contribute to stress and anxiety (Yazarloo et al., 2020).

Additionally, long-term psychological issues such as isolation and worry for the baby's future well-being may arise, highlighting the importance of offering support during this crucial time (Mohtashami et al., 2021). Additionally, insufficiently managing stress and anxiety can lead to ineffective parent–infant bonding, negative infant results, and postpartum depression in mothers. Successful stress management techniques can assist mothers in adjusting to their parental responsibilities, leading to better outcomes for infants (Joseph et al., 2019).

Currently, various strategies have been put in place to decrease mental health issues in mothers of premature babies (Zhang et al., 2021). Educational programs aimed at NICU mothers have the potential to enhance their psychological well-being (Day, 2019). A study conducted by (Lebel et al., 2021) revealed that NICU mothers require guidance on understanding their infant's behavior and development, being attuned to their behavioral cues, and providing proper care.

Mothers of newborns in the neonatal intensive care unit need a great deal of information to assist them in dealing with issues related to their child's hospitalization (shomaliahmadabadi et al., 2022). Providing educational information and psychological support has been shown to effectively decrease maternal psychological issues in the NICU, as demonstrated by (Ong et al. in 2019). Nurses have a special chance to assist mothers in this circumstance. The quality of communication between nurses and mothers is a crucial aspect of the nursing profession (van den Hoogen et al., 2021).

Lowering the stress of mothers is a part of neonatal nursing in the realm of family-centered care (Goral & Geçkil, 2022). Recognizing and addressing their emotional disorders is a crucial aspect of nursing care since it enhances mothers' capacity to engage with the nursing staff and, eventually, with the baby (Mahmoodi et al., 2022). It is critical to help moms deal with their infants' NICU stay by measuring their stress levels, provide supportive nursing techniques, and offer training and counselling (Yilmaz & Küçük Alemdar, 2022).

## 2. Methods:

Aim: The current study aimed to assess the effect of an educational program on the stress level among mothers of neonates hospitalized in neonatal intensive care units.

Hypothesis: Education program decrease stress level among mothers of neonates hospitalized in neonatal intensive care units.

Study design:

A quasi-experimental design was used to conduct the current study.

Study settings:

The study was conducted in the NICUs of Children's Hospital and Maternity & Gynecological Hospital in Najran city. Children's Hospital's NICU is focused on medical conditions, with three rooms having , each one has eight incubators , while Maternity & Gynecological Hospital's NICU has four rooms, each with nine incubators.

Study subjects:

A convenience sample consisting of 44 mothers of neonates admitted to the NICU was utilized for this study. The selection criteria were inclusive of all mothers, irrespective of their age, educational background, place of residence, or employment status at the time of the research.

Sample size:

The determination of the sample size was based on research conducted by Khazaii et al. (2018). This involved

estimating an effect size derived from the mean values of the experimental group, which was 63.77 ± 14.48, and the control group, which was 79.23 ± 30.03. The calculations were made with a statistical power of 95%, a confidence level of 95% (1 - Alpha Error), an Alpha of 0.05, and a Beta of 0.1. Each group contributed to the sample size, which was established at 53 premature infants. Taking into account a 10% attrition rate (approximately 5 to 6 premature infants), the final sample size for each group was adjusted to 59 premature infants. The sample size was calculated using a test designed to compare two means.

Tools of data collection:

Tool I: A Pre-designed Questionnaire Sheet:

This document was developed by the researchers following an extensive review of relevant literature and subsequently evaluated by supervisors. It was composed in the Arabic language to collect data pertaining to the following parts:

Part I: Mothers' characteristics as age, marital status, residence, education level, income, and attended training courses, previous neonate admitted to the NICU

Part II: Neonatal characteristics as gestational age, gender, type of delivery, and connected with mechanical ventilator, and ranking of the child.

Part III: Maternal stress scale

The assessment tool, adapted from Kumar & Mallick (2020), was designed to evaluate stress levels among mothers. It comprises three distinct domains of stress evaluation. The first domain, concerning sights and sounds, includes six items such as the presence of monitors and equipment and the constant noise generated by these devices. The second domain, which focuses on looks and behavior, also contains six items, including observations of the baby in pain and the baby appearing unwell. The third domain addresses parental role changes in relation to the baby, featuring seven items such as being separated from the baby and the inability to feed the baby personally. In total, mothers responded to 19 questions, with their answers recorded on a five-point Likert scale ranging from 0 to 5, where 0 indicated no experience of the situation, 1 represented minimal stress, and 5 denoted extreme stress. The scores were aggregated and transformed into a percentage. They were then categorized into three distinct levels: High stress for scores exceeding 70%, Moderate stress for scores ranging from 50% to 70%, and Low stress for scores below 50%.

Validity and Reliability:

A panel of three experts in psychiatric nursing determined the data collection tools to evaluate the alignment of a measure with established theories and the understanding of the concept under investigation (construct), as well as the comprehensiveness of the measurement in addressing all facets of the concept (content). Reliability refers to the stability of results over time, among various observers, and within different sections of the test itself. This was assessed using the Cronbach's alpha test, yielding a score of 0.897, indicating good reliability.

Preparatory Phase:

This stage involved a comprehensive review of literature pertaining to healing environments and clustered nursing care for premature infants. This process was instrumental in the development of the data collection instruments. Additionally, during this phase, the researchers conducted visits to the chosen locations to familiarize themselves with the staff and the study environments. The formulation of the data collection tools was executed under the supervision of experienced mentors, and the insights of experts were taken into account.

Ethical Considerations

The study was approved by the Research Ethical Committee of Najran University , located in Najran city. Prior to the commencement of the research, the researchers explained the aims and objectives to the participating mothers. Verbal consent was obtained from the mothers before their inclusion in the study. The researchers ensured that all collected data would remain confidential and utilized solely for research purposes. They committed to maintaining the anonymity and confidentiality of the mothers' data involved in the study. Furthermore, the researchers assured that no harm would come to the mothers participating in the study. The mothers were also informed of their right to withdraw from the study at any time.

Pilot Study

A pilot study was conducted involving five mothers, constituting 10% of the anticipated sample size, to evaluate the effectiveness of the developed tools and the comprehensibility of the questions pertaining to maternal stress. This pilot study also aimed to assess the duration required for each participant to complete the questionnaire. Based on the findings from the pilot, no modifications or deletions of items were necessary, thus the mothers were retained in the pilot study and included in the overall study sample.

Fieldwork:

The fieldwork commenced in early January 2022 and concluded at the end of March 2022, spanning a total of 13 weeks. During this period, the researcher provided training to mothers of neonates admitted to the NICU via an educational program that consisted of three phases: assessment, intervention, and evaluation.

Assessment of nurses (Pre):

The researcher articulated the aim of the study and detailed the elements of the tools to the participating mothers. A questionnaire was administered to these mothers to evaluate their characteristics and levels of stress. Based on the pretest results, an educational program was created and customized to address the moms' unique needs.

Intervention phase:

The researcher categorized the participating nurses into five distinct groups, with each group receiving training through three one-hour sessions consisting of lectures and seminars, each lasting 30 minutes. Mothers were informed of their assigned group through an invitation letter, which also included details regarding the schedule and location of the training. The theoretical sessions took place in the conference hall of the NICU, conducted by the researcher over a span of 13 consecutive weeks on Saturdays, Wednesdays, and Thursdays. These sessions were scheduled weekly from 10 a.m. to 11 a.m. The Training Program: The training program designed for mothers was formulated by the researcher following a comprehensive review of the literature aimed at reducing the stress levels experienced by mothers.

The training program's content:

The extensive program encompassed the introduction to the Neonatal Intensive Care Unit (NICU) environment, education regarding neonates, facilitation and promotion of tactile interaction with the neonates, the functioning of equipment, and engagement with the medical personnel within the NICU, procedural care techniques (e.g. venipuncture), distinctive attributes of preterm infants (e.g. physical appearance, behavioral patterns, and physiological indicators), predominant medical nomenclature employed in the NICU, alongside the possible emotional reactions exhibited by parents throughout the duration of their infant's hospitalization , and strategies for involvement in infant care (e.g. kangaroo mother care). Familiarization with the NICU and its apparatus such as incubators, respiratory support systems, thermal regulation devices, suction mechanisms, and fluid therapy instruments, along with the observable characteristics and conduct of preterm infants, therapeutic interventions, suctioning procedures, oxygen delivery systems, diagnostic sampling, and phototherapy techniques.

Evaluation phase for mothers (Post):

The researcher provides a comprehensive overview of the training program, solicits inquiries and feedback from the mothers, and facilitates an open discussion. Subsequently, the investigator requests that the mothers complete a posttest questionnaire utilizing the identical study instrument employed during the pre-intervention phase. The researcher relies on a variety of educational methodologies, including group discussions, brainstorming sessions, and reflective thinking, alongside diverse illustrative techniques such as PowerPoint presentations, graphical representations, and video content.

Statistical Analysis

The acquired data underwent a systematic coding process and was subsequently inputted into the Statistical Package for the Social Sciences (SPSS) (SPSS Inc; version 24; IBM Corp., Armonk, NY, USA). Upon completion of the data entry, an exploratory analysis was conducted to identify any discrepancies or errors. Thereafter, the data was subjected to analysis utilizing the same software to generate frequency distributions accompanied by corresponding percentages. Qualitative data were represented quantitatively as numerical values and percentages. Moreover, quantitative data were characterized by either the mean or standard deviation, as deemed applicable. A t-test represents a category of inferential statistics employed to ascertain whether a

significant disparity exists between the means of two distinct groups. Linear regression is a method that models the relationship between a single outcome and one or more predictor variables in a linear way. The results were considered statistically important at $P \leq 0.05$ and very significant at $P < 0.01$.

## 3. Results

**Table (1): Distribution of the studied mothers according to their characteristics (n=44).**

| Items | No. | % |
|---|---|---|
| Age | | |
| 20-<30 | 23 | 52.3 |
| 30-<40 | 17 | 38.6 |
| ≥ 40 | 4 | 9.1 |
| Mean ±SD | 31.1±4.61 | |
| Marital status | | |
| Married | 42 | 95.4 |
| Divorced | 2 | 4.6 |
| Educational level | | |
| Illiterate | 0 | 0 |
| Read and write | 3 | 6.8 |
| Primary education | 4 | 9.1 |
| Preparatory education | 6 | 13.6 |
| Secondary | 20 | 45.5 |
| University education | 11 | 25 |
| Occupation | | |
| Work | 15 | 34.1 |
| Housewife | 29 | 65.9 |
| Residence | | |
| Rural | 18 | 40.9 |
| Urban | 26 | 59.1 |
| Monthly family income | | |
| Sufficient | 14 | 31.8 |
| Insufficient | 30 | 68.2 |
| Attended training courses about caring of neonates | | |
| Yes | 6 | 13.6 |
| No | 38 | 86.4 |
| Previous neonate admitted to the NICU: | | |
| Yes | 8 | 18.2 |
| No | 36 | 81.8 |

Table (1) illustrated that the mean age of studied mothers was 31.1±4.61 years, the most (95.4%) of them were married, and less than half (45.5%) of them possessed a secondary level of education. Also, about two thirds (65.9%) of studied mothers were housewife, (59.1%) of them were from urban areas and more than two thirds of them (68.2%) had insufficient income. In addition, only (13.6%) of them attended training courses about caring of neonates.

**Table (2): Distribution of the studied neonates regarding their characteristics (n=44).**

| Premature characteristics | N | % |
|---|---|---|
| Gestational age: (weeks) | | |
| 32 - <34 | 22 | 50 |
| 34 - <36 | 16 | 36.4 |
| 36 or more | 6 | 13.6 |
| Mean± SD | | |
| | 34.4 ± 2.9 | |
| Gender: | | |
| Male | 19 | 43.2 |
| Female | 25 | 56.8 |
| Rank of the child: | | |
| First | 9 | 20.5 |
| Second | 28 | 63.6 |
| Third | 7 | 15.9 |
| Connected to the mechanical ventilator: | | |
| Yes | 5 | 11.4 |
| No | 39 | 88.6 |
| Type of delivery: | | |
| Vaginal | 28 | 63.6 |
| Cesarean section | 16 | 36.4 |

Table (2) illustrated that the mean gestational age was determined to be 34.4 ± 2.9 weeks , more than half (56.8%) of them were female, and related ranking of the child, one fifth of them (20.5%) of them were the first. Also, 11.4% of them were connected to the mechanical ventilator and more than one third (36.4%) of them delivered through cesarean section

**Table (3): Mean score distribution of the studied mothers according to their stress level (n=44).**

| Domains | Pre Mean (SD) | Post Mean (SD) | T test | P value |
|---|---|---|---|---|
| Sights and sounds | 24.97 (5.32) | 15.23 (3.60) | 8.775 | <0.01** |
| Looks and behavior | 23.04 (3.90) | 13.61 (2.76) | 10.411 | <0.01** |
| Parental role alteration | 26.82 (4.10) | 16.70 (2.34) | 9.703 | <0.01** |
| Total stress | 74.83 (12.11) | 45.54 (6.88) | 13.662 | <0.01** |

Table (3) clarified that mean score of studied mothers related Sights and sounds domain at preintervention was 24.97 (5.32), while decrease to 15.23 (3.60) postintervention. Also, according to looks and behavior domain mean score was 23.04 (3.90) preintervention, while decrease to 13.61 (2.76) post intervention. Additionally, according to Parental role alteration domain mean score was 26.82 (4.10) preintervention, while decrease to 16.70 (2.34) post intervention. Furthermore, there was a highly significant difference observed among the three domains of the stress scale before and after the intervention, with a p-value <0.01**

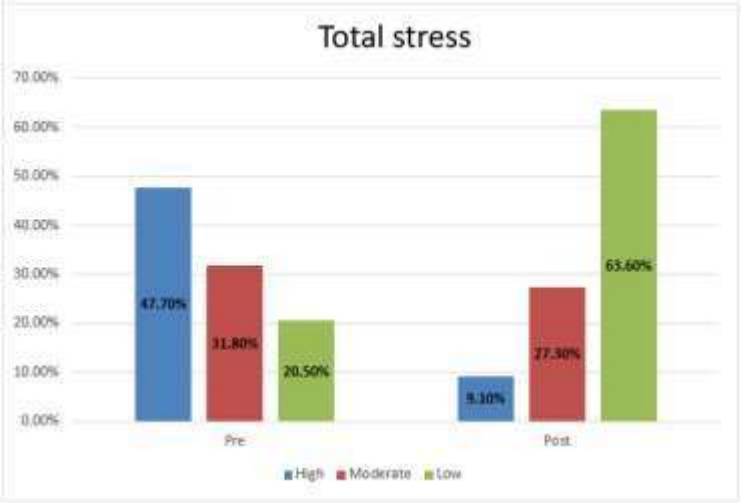


Figure (1): Distribution of the studied mothers according to their total stress level (n=44).

Figure (1) indicated that prior to the intervention, fewer than half of the mothers studied (47.7%) experienced high levels of stress, while approximately one third (31.8%) reported moderate stress. In contrast, following the intervention, nearly two thirds (63.6%) of the mothers exhibited low stress levels, and over one quarter (27.3%) continued to experience moderate stress.

**Table 4. Multiple Linear regression model for mother stress (n=44).**

| | UnstandardizedCoefficients | | StandardizedCoefficients | | |
|---|---|---|---|---|---|
| | B | | B | T | P. value |
| Age of mother | .178 | | .134 | 3.601 | .015* |
| Marital status (divorced) | .211 | | .156 | 3.895 | .012* |
| Training courses (yes) | -.285 | | .216 | 6.011 | .003** |
| Rank of the child (first) | .246 | | .196 | 4.732 | .007** |
| Previous neonate admitted to the NICU (yes) | -.197 | | .113 | 2.953 | .028* |
| Connected to the mechanical ventilator (yes) | .303 | | .226 | 6.245 | .002** |
| | | | | | |
| Model | $R^2$ | | F | | P. value |
| Regression | 0.590 | | 11.921 | | .000** |

a. Dependent Variable: Mother stress

b. Predictors: (constant): age, marital status, training courses, ranking of child, Previous neonate admitted

to the NICU, and Connected to the mechanical ventilator.

Table (4) indicates that a highly significant model was identified through the F test, yielding a value of 11.921 with a p-value of 0.000. This model accounts for 59% of the variation in maternal stress, as evidenced by an $R^2$ value of 0.590. Furthermore, it was noted that an increase in maternal age and the status of being a divorced woman correlated with higher stress scores, with a p-value of <0.05*. Additionally, the presence of multiple variables and having a firstborn child were associated with increased stress scores, with a p-value of <0.01**. Conversely, prior admission of a neonate to the NICU and participation in training courses were found to reduce maternal stress, with p-values of .028* and .003** respectively.

## 4. Discussion

Admitting a newborn to the Neonatal Intensive Care Unit (NICU) can prove to be a challenging experience for parents. This situation often leads to significant stress, adversely affecting their mental well-being and interpersonal relationships, as well as the developmental outcomes for their infants. The NICU environment can be particularly stressful for mothers of premature infants. Maternal stress is associated with various factors, including the premature birth of the baby, the medical conditions affecting the infant, the complexities inherent in the NICU setting, concerns regarding the neonate's vulnerability, and the typical stressors associated with the transition to motherhood (Malouf et al., 2022).

Upon reviewing the current findings, it was observed that less than half of the mothers examined experienced high levels of stress, while approximately one-third reported moderate stress prior to the intervention. In contrast, following the intervention, less than two-thirds of the mothers exhibited low stress levels, and over one-quarter continued to experience moderate stress. Additionally, there was a statistically and clinically significant reduction in stress levels among mothers in the domains of sights and sounds stimuli, look and behavior, parental role alteration, as well as in the overall stress level after the intervention program. These outcomes may be attributed to the effectiveness of the education program, which employed various illustrative methods and was tailored to meet the specific needs of the mothers.

These findings are supported by the research conducted by Heydarpour et al. (2022), which indicated that a supportive-educational program reduced stress and improved mothers' adjustment to the role of mother among moms of premature infants in the neonatal intensive care unit. Furthermore, Yilmaz and Küçük Alemdar (2022) reported that supportive nursing interventions successfully decreased anxiety, saliva cortisol levels, and stress related to the intensive care unit while also boosting mothers' self-esteem as parents. Similarly, Maleki et al. (2022) found that the intervention group experienced considerably less maternal stress than the control group (g: −1.06; 95% confidence interval: −1.64, −0.49; $Z = 3.62$, $p < 0.001$). According to Hadian Shirazi et al. (2022), the intervention group's self-efficacy increased, and mothers' stress levels significantly decreased from before to after the intervention. Karimi et al. (2022) discovered that providing counseling to mothers of premature infants using an empowerment approach founded on the GATHER model effectively reduced stress and increased their self-confidence. Izadi et al. (2022) demonstrated that while posttraumatic stress levels decreased over time in both groups, the reduction was notably more pronounced in the intervention group. Additionally, Johnson Rolfes and Paulsen (2022) highlighted that increased awareness, screening, and treatment of perinatal mood and anxiety disorders among NICU parents could significantly improve outcomes for families and infants. According to Dua'a et al. (2020), Mothers with premature babies in NICU who participated in emotional support training programs saw a significant reduction in the symptoms of acute stress disorder. Moradi et al. (2019) demonstrated how the COPE program helped parents of premature infants hospitalized to the NICU deal with their ongoing grief. Lastly, Heidary et al. (2021) found that the educational module could enhance the effectiveness of care provided by nurses and mothers for premature infants.

Concerning the linear regression model, the current study highlighted how the factors such as increased maternal age and the presence of divorced women, particularly in relation to the first-ranked child and maternal vulnerability (MV), were associated with elevated stress scores among mothers. In contrast, prior admissions to the NICU and participation in training courses were found to alleviate maternal stress. These findings stand in opposition to the conclusions drawn by Ong et al. (2022), which identified maternal occupation as the sole factor influencing the quality of life for mothers with preterm infants in the NICU.

Additionally, Ganguly et al. (2020) reported no significant correlation between overall stress scores and variables such as maternal age, parity, education level, or previous NICU admissions ($P > 0.05$). Notably,

Significantly higher stress level (P = 0.009) were observed in parents of newborn who stayed in the NICU for seven days or less, specifically in the auditory and visual domains . Furthermore, research by Lasheras et al. (2022) indicated that the severity of neonatal health issues exacerbates maternal stress. Karamanou et al. (2022) also discovered that moms in the NICU were more vulnerable than mothers with healthy babies, as seen by higher depression levels and decreased mother-infant bonding. Similarly, Varma et al. (2019) noted that infants on ventilators and those with lower birth weights contributed to increased stress levels among mothers.

## 5. Conclusion:

Less than fifty percent of the studied mothers exhibited high levels of stress prior to the intervention, while approximately one-third experienced moderate stress. In contrast, following the intervention, less than two-thirds reported low stress levels, and over one-quarter indicated moderate stress. Additionally, the educational program effectively reduced the stress levels of mothers across various domains, including the sight and sound domain, the look and behavior domain, the parental role alteration domain, as well as the overall stress level.

## 6. Recommendations:

- The beneficial impact of mindfulness-based stress reduction on mothers experiencing posttraumatic stress disorder.
- The development of a learning resource for mothers of premature babies in the neonatal intensive care unit.
- Offering psychological empowerment training programs for parents to encourage the adoption of proactive coping strategies during challenging times
- The NICU staff's assistance to these women in need and their facilitation of the mother-infant bonding process are crucial.
- Counseling services should be specifically directed at mothers during the hospitalization of their neonates.

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