Effect of Supportive Nursing Intervention on Maternal Stress and Selected Neonatal Outcomes in a Neonatal Intensive Care Unit

Alyaa H. Salama[1], Maha I. Khalifa[2], Shaimaa H. Mohamady[3], Rania E. Elgobashy[4], Faten M. Nouh[5]

[1, 5] *Lecturer of Pediatric Nursing, Faculty of Nursing, Menoufia University, Egypt.*

[2] *Professor of Pediatric Nursing, Faculty of Nursing, Menoufia University, Egypt.*

[3] *Assistant professor of Maternal and Newborn Health Nursing, Faculty of Nursing, Helwan University, Egypt*

[4] *Lecturer of Maternal and Newborn Health Nursing, Faculty of Nursing, Menoufia University, Egypt*

Background Mothers of infants hospitalized in the Neonatal Intensive Care Unit (NICU) may experience a variety of psychological problems such as anxiety, depression, and stress. **Purpose:** To evaluate the effect of supportive nursing intervention on maternal stress and selected neonatal outcomes in a NICU. **Sampling:** A purposive sample of 100 high risk pregnant women and 86 neonates was included. Design: A quasi experimental design was utilized. **Setting:** The study was conducted at Obstetrics and Gynecology departments and neonatal intensive care units in Menoufia University Hospital and Shebin El-Koom Teaching Hospital. **Instruments:** Three instruments were used. Instrument one: structured interview questionnaire sheet. Instrument two: parental stressor scale (PSS): NICU. Instrument three: Astrid Lindgren Children's Hospital pain scale for neonates (ALPS-Neo). **Results:** Mean of maternal stresses was lower in the study group on time 2 and time 3 than on time 1 as follows (61.30±6.44, 64.85±6.17, and 95.94±7.55 consequently). Therefore, there were very highly statistical significant differences at 1‰ level of statistical significance. Furthermore, on posttest neonates exhibited fewer levels of pain, higher weight gain and fewer days of hospitalization than on pretest. **Conclusion:** Implementation of supportive nursing intervention reduced maternal stress, contributed to more increase in neonates' weight and shorter duration of hospitalization on posttest than neonates in the control group. **Recommendations:** It was recommended that continuous in-service education programs should be developed and implemented in all Obstetrics and NICUs to improve quality of care provided for high risk pregnant mothers and their preterm neonates.

Keywords: Maternal Stress, Neonatal Outcomes, Supportive Nursing Intervention

Introduction

Pregnancy and childbirth are two physiologically significant events for women (Yayan et al., 2019). A high-risk pregnancy can lead to a high risk of maternal, fetal, or neonatal morbidity or mortality; either prenatal or postnatal (Queenan et al., 2021). Approximately 10% of all pregnancies are considered high-risk (Szejer, M. ,2022).

When a mother is diagnosed with a high-risk pregnancy, it can be difficult for her to face and cope with this new reality that can lead to emotional and psychological repercussions (Öhman et al., 2020). They experience many emotional problems, involving guilt, fear, shock, sadness, worry, frustration, loneliness and loneliness (Simmons & Goldberg., 2020; Pozzo et al.,2021).

They are also more likely to suffer from psychological stress (Currie and Barber, 2016). Low birth weight and premature birth might be caused by psychological issues during pregnancy (Fisher et al., 2018; Isaacs & Andipatin, 2020).

Premature birth is problematic as a result of the significant infant morbidity and mortality associated with immature organ systems and physiological functioning (Bry & Wigert, 2019). Approximately 15 million infants are born preterm each year worldwide (Liu et al., 2020) and about 50% or more may require care in a neonatal intensive care unit (NICU) for several reasons as respiratory distress syndrome, sepsis, hypoglycemia, jaundice or asphyxia (Phaloprakarn et al., 2020). Premature birth is responsible for 1 million deaths each year and it is one of the common reasons of death among children less than 5 years old (Liu et al.,2020).

Admission of an infant to the NICU is a difficult occasion for families, particularly mothers (Yaman & Altay, 2017; Chertok et al., 2018; Busse et al., 2019). Mothers of preterm infants' experience multiple stressors and negative emotions, including fear, guilt, helplessness, and depression (Laborie, 2020). Maternal stress related with delivery and infant' admission in the NICU has several implications. It has been shown to disrupt attachment and initial bonding, correlate with postpartum depression, anxiety, post-traumatic stress disorder, and affect breast milk production. (Goral, E., & Geçkil,2022).

Stressful situations can negatively affect attachment and increase mothers' risk of depression and anxiety (Korja et al., 2019). The infant's and parents' incapacity to deal with stress might adversely impact the infant's quality of life and future development. Parents therefore need support in dealing with these stressful situations ((Trombini et al., 2018; Korja et al., 2020; Parker. L., 2022). Educational information provision and psychological support-based interventions have been demonstrated to be efficient in decreasing maternal mental health problems in the NICU (Abdeyazdan et al., 2019). A large body of research suggests a need to provide parents (particularly mothers) of preterm infants with interventions that develop attachment processes in the NICU (Morey & Gregory, 2021).

Nurses are in the best position to help parents to cope with the delivery of preterm infants and their admission to the NICU (Çalışır et al., 2018). Providing supportive care is one of the main tasks of nurses, which usually is also one of the main sources of support for the patients and their families during the illness and stress (Chalco et al., 2022).

Significance of the study:

High-risk pregnancy evokes a range of emotional and psychological experiences for the expectant mother, and can adversely affect both the mother and the baby's health (Leichtentritt et al., 2019; Platt et al., 2022). Preterm delivery is among the most common consequences of high risk pregnancy worldwide. Preterm infants face many threats that contribute to neonatal intensive care unit (NICU) admission because the neonatal immune system and other organs are not fully developed (Howe et al., 2017; Çalışır et al., 2018). Therefore, parents of infants in the NICU experience increased stress, feelings of powerlessness (Fotiou et al., 2016; Uludağ, & Ünlüoğlu, 2018). For this reason, in this study a supportive nursing intervention was developed to assess its effect on

maternal stress and selected neonatal outcomes.

Operational definition:

Supportive nursing intervention: A health education program about infant's body, NICU physical requirements of the infant, care of preterm in the NICU, tools utilized in the NICU and advantages of breast milk for NICU baby. It will be assessed using instrument one, part three.

Maternal stress: It is the assessment of visual and auditory stressors, infant's behavior and appearance and parental role alternation. It will be assessed using instrument two.

Neonatal outcomes: - In this study, neonatal outcomes refer to weight at discharge, feeding type/style and length of stay in NICU. It will be assessed using instrument one, part two.

Hypotheses:

1- High-risk pregnant mothers in the study group who receive the supportive nursing intervention are expected to have higher knowledge about premature infants and the NICU than high-risk pregnant mothers in the control group who receive only routine care.

2- High-risk pregnant mothers in the study group who receive the supportive nursing intervention are expected to have lower stress levels than pregnant mothers in the control group.

3- Premature infants in the study group whose mothers receive the supportive nursing intervention are expected to have lower level of pain and stress than premature infants in the control group.

4- Premature infants in the study group whose mothers receive the supportive nursing intervention are expected to have more weight gain than premature infants in the control group.

5- Premature infants in the study group whose mothers receive the supportive nursing intervention are expected to be able to breastfeed more and stay less in the NICU than premature infants in the control group.

Sampling:

A purposive sample of 100 high risk pregnant women who were admitted to the hospital during their pregnancy due to premature rupture of membranes, evidence of premature labor, and/or maternal or fetal health issues were included in the research (Subjects who shared in the research but didn't give birth to a preterm neonate needing NICU admittance were excluded at the third measurement point, 6 in the study group and 8 in the control group). A simple random sample was utilized to allocate them into:
- Control group: only received routine nursing care (50 pregnant mothers)
- Study group: received the supportive nursing intervention (50 pregnant mothers)

Inclusion criteria

- Age between 20 and 40years
- No physical and psychological problems to avoid other causes of pregnant mothers' stress
- Stable vital signs
- Never had another infant admitted to NICU

Sample Size

A purposive sample of 100 mothers was chosen based on this formula:

$$n = \frac{z^2 \times \bar{p}(1-\bar{p})}{\varepsilon^2}$$

n is sample size

p̂ is the population proportion

z for a 95% confidence level is 1.96.

p̂ for the population proportion is

0.068. **ε** for the margin of error is 0.05.

- n $=\dfrac{1.96^2 x 0.068(1-0.068)}{0.05^2}=$ 98 *mothers*
- Therefore, a sample size of 100 mothers would be required for the research.

Sampling of neonates

- A purposive sample of 86 premature infants who admitted to the NICU were included in the study. Using a basic random sampling, they were assigned to:
- ✓ Control group: received routine nursing care (n=44)
- ✓ Study group: received the supportive nursing intervention (n=42)

Inclusion criteria

- Gestational age of <37 weeks
- Birth weight of 1,500 g or more

Methods

Design:

A quasi-experimental design was utilized for this research.

Setting:

This research was applied at Obstetrics and Gynecology departments and NICUs in Menoufia University Hospital and Shebin El-Kom Teaching Hospital.

Instruments:

Three instruments were utilized for data collection.

Instrument one: Structured interview questionnaire sheet. It was designed by the researcher after

Where

z is the z score

ε is the margin of error
reviewing related literature (De Bernardo et al., 2017; Abdeyazdan et al., 2018; Obeidat et al., 2019; Morey, J. A., & Gregory, 2021 & Oyekunle et al., 2021; Waddington et al.,2021; Yilmaz et al., 2022). This instrument was divided into three parts: -

- **Part one:** Maternal descriptive data. It contained 7 questions about mother's age, educational level, occupation, economic situation, planned pregnancy, gravida, reason for antenatal admission.
- **Part two:** Neonatal descriptive data. It involved 8 questions about infant's gender, type of birth, number of gestations, gestational age /weeks, birth weight /gr, Apgar score (5 minutes), duration of stay in NICU and feeding style.
- **Part three:** Knowledge of pregnant women about preterm newborns and NICUs structured questionnaire. The questionnaire was developed by the researcher to evaluate mothers' knowledge about preterm newborns and NICUs. It included 5 questions about infant's body, NICU physical requirements of the infant, who will be taking care of preterm in the NICU, tools utilized in the NICU and significance of breast milk for NICU baby. Items were graded using 5-points Likert scale from 1 (least knowledge) to 5 (most knowledge). Total score ranged from 5 to 25 score.

Instrument two: Parental Stressor Scale (PSS): NICU. It was designed by Miles et al. (1993) to assess the stress experienced by parents of infants hospitalized at that unit. It was used for assessing the perceptions of parents about stressors due to the physical and psychosocial environment in the

NICU. It consisted of 27 questions, distributed in three subscales, which are "sights and sounds", "infant's behavior and appearance and "parental role alternation". The stress scale was rated by mothers as 1 (not stressful) to 5 (very stressful) (excessively stressful). Six questions comprise the sounds and sights subscale, and scores ranged from 6 to 30. The newborn appearance and behavior subscale consists of 30 questions, and scores ranged from 13 to 65. The parental role subscale comprised of seven elements with a range of scores between 7 and 35. The range of total scores was 27 to 135. The more the mother's scores, the greater her stress level.

Instrument three: Astrid Lindgren Children's Hospital Pain Scale for Neonates (ALPS-Neo). It is a five-item unidimensional scale created by Lundqvist et al. (2014) to evaluate pain and stress in preterm and term babies treated in the NICU. It consists of five items on a 3-point Likert scale: face expression, breathing pattern, tone of extremities, hand/foot activity, and degree of activity. Each item is scored between 0 and 2. The overall score varied between 0 and 10. Scores 0-2 showed the absence of pain and stress, scores 3-5 indicated moderate pain and stress, while scores >5 indicated severe pain and stress.

Validity:

Instruments of data collection were reviewed by a panel of expertise composed of three Professors in maternal and newborn health nursing and two professors in pediatric nursing. Modifications were done in the light of valuable their comments such as modifications of some words in order to provide the most appropriate meaning for the phrase which was not clear. Questionnaires were modified according to clarity of sentences, consistency, and appropriateness of content, the sequence of items, accuracy, and relevance.

Reliability

Reliability of the three instruments was tested using Cronbach Coefficiency Alpha (a). The estimated reliability of instruments one, two, and three was 0.85, 0.89, and 0.91 consequently.

Pilot study:

It was conducted on 10 high-risk pregnant women and their preterm neonates (10% of the sample) to assess the applicability and evaluation of the instruments' practicability and estimation of the time necessary to finish them. No essential adjustments were made. The pilot study was thus included in the entire sample.

Ethical Consideration:

An official approval was obtained from the Ethical Research Committee in the Faculty of Nursing, Menoufia University. A written consent was obtained from high-risk pregnant women regarding their acceptance to participate in the study. Then, they received education about objectives, advantages, and voluntary nature of the research. Participants were informed that they may withdraw from the research at any time without penalty and the study would not cause any physical, social or psychological risk on the participant.

Procedure:

▪ Prior to data collection, an official letter was sent from the Dean of the Faculty of Nursing to the directors of selected settings explaining the purpose of study and methods of data collection.
▪ The researcher introduced herself to the high-risk pregnant women in the study and control groups and

explained the purpose of the study and methods of data collection. Data collection lasted for 6 months extending from the beginning of Augest, 2022 to the end of January, 2023.

- Maternal knowledge about premature infants and maternal stress were assessed 3 times.

o Time 1: Prior the educational program and before delivery.

o Time 2: Immediately following the educational program and but delivery.

o Time 3: Within 72 hours of delivery and NICU hospitalization.

- A pre intervention assessment of maternal knowledge in the study and control groups was done by the researcher by using instrument one (Time 1 assessment). Another pre intervention assessment of maternal stress in the study and control groups was done by the researcher by using instrument two (Time 1 assessment).

- Based on the results obtained from the pretest assessment of mothers' s knowledge, stress and beliefs, health education sessions were planned.

- The researchers provided the health education sessions to all high risk pregnant mothers in the study group. Each mother received three health education sessions. Each session included 2 - 5 mothers and lasted for 45-60 minutes. Laptop PowerPoint presentations, explanatory videos, group discussions and feedbacks were utilized for health education.

The first session was about general knowledge related to premature infants and the NICU. It included information about preterm infant's characteristics (e.g. behavior, appearance, and physical signs), differences between neonates born prematurely and at term, NCU

environment, NCU staff, and importance of breast milk for NICU baby etc.

In the second session, the researcher allowed mothers to communicate their happiness, sorrow, and concerns. Then, they received instructions on positive thinking, healthy living, self-awareness, dealing with stress, and relaxing methods. Mothers were asked to practice deep breathing as a mean for relaxation (diaphragmatic respiration).

The third session included explanation of methods that could allow mothers to participate in the care of their infants, improve emotional bonds between them and reduce infant's stress (e.g., kangaroo mother care), breastfeeding benefits for preterm infants, pump breast milk and practice infection control (i.e., hand washing necessity, mobile phones usage, healthful guests).

- After the educational sessions, the researcher prepared a tour for mothers in the NICU. During this tour, the researcher introduced the NICU team, showed them the NICU physical architecture, NICU equipment and newborn caring (ventilators, isolettes, IV pumps, etc.), and allowed them to come to the bedside.

- Following the intervention, participants in the study group fulfilled the knowledge questionnaire, and PSS: NICU for the second time (Time 2 assessment).

- Upon birth of the newborn and NICU admission, the neonatal infant' stress level was assessed by using instrument three. The neonatal infant's weight and type of feeding were also evaluated by the researcher in the study and control groups. The researcher also

encouraged mothers to breastfeed their infants or use expressed breast milk according infants' condition. Also mentioned are preparations for discharge and infant care at home.

- Evaluation of maternal knowledge and stress were conducted within 72 hours of infant's NICU admission using knowledge questionnaire and PSS: NICU respectively for the third time (Time 3 assessment) for the study and control groups.

- Before discharge, the neonatal infant' stress level was assessed by using instrument three. The neonatal infant's weight, type of feeding as well as duration of hospitalization were evaluated by the researcher in the study and control groups.

Statistical analysis

- Data was entered and analyzed by SPSS (Statistical Package for Social Science) statistical package version 22. Quantitative data were presented as mean and standard deviation (SD) and compared utilizing student ttest and ANOVA (F) test. Qualitative data were presented in as number and percentage and compared utilizing chi-square (χ2) test. A statistical significant difference was considered if P<.05. A highly statistical significant difference and very highly statistical significant differences were considered if P<1% and <1‰ consequently.

Results:

Table 1 shows characteristics of high risk pregnant women in the study and control groups. More than half of studied mothers in the study and control groups were between 20-29 years (54.0% &56.0% respectively). Regarding educational level, 50.0% in the study group and 52.0% in the control group had high education. Concerning occupation, 66.0% &

58.0% of studied mothers in the two groups were housewives. More than one third of studied mothers in the study and control groups (36.0% &32.0%) admitted to the hospital as a result of maternal complications. No statistical significant differences were found between women in the study and control groups.

Table 2 shows characteristics of neonates in the study and control groups. 64.3% and 59.1% of studied neonates in the study and control groups were males. More than half of neonates (73.8% in the study group and 65.9% in the control group) were delivered by cesarean section. In relation to gestational age of studied neonates, the mean and standard deviation were 33.23 ± 1.52 & 33.20 ± 1.57 in the study group and control groups respectively. There was no statistical significant difference between neonates in the two groups (P>.05).

Table 3 reflects mean and standard deviation of maternal knowledge about premature infants and the NICU in study and control groups at times 1,2,3. The findings revealed that mothers in the study group had higher total mean score of knowledge at time 2 and 3 (19.66±3.21 &19.48±2.83) than at time 1(8.44±1.61). Therefore, there were very highly statistical significant differences between knowledge of women in the study before and after intervention. On the other hand, no statistical significant differences were found between maternal knowledge in the control group at times 1, 2 and 3.

Table 4 clarifies mean and standard deviation of maternal stress in study and control groups at times 1,2,3. There was a significant reduction in maternal stress in the study group at time 2 and 3 than time 1 regarding sights and sounds, infant appearance and parental role alternation. Also, there was a significant reduction in

maternal stress score in the study group at time 2 and 3 (61.30±6.44 & 64.85±6.17) respectively than time 1 (95.94±7.55). Therefore, there was a significant variance among maternal stress at time 1,2 and. While in the control group, maternal stress has been increased at time 2 and 3 than time 1 regarding sights and sounds, infant appearance and parental role alternation. Also, there was a significant increase in maternal stress score in the control group at time 2 and 3 (106.06±4.60 & 108.36±4.81) respectively than time 1 (91.96±7.68). Therefore, there was a significant variance among maternal stress at time 1,2 and 3.

Table 5 shows mean and standard deviations of pain and stress among neonates in the study and control groups on pre and post intervention. There was very highly statistical significant reduction in the levels of pain and stress among premature infants in the study group on pre and post intervention (P<.001). On the other hand, there were no statistical significant differences between levels of pain and stress among neonates in the control group on pre and post intervention (P>.05).

Figure 1 distribution of neonates according to levels of pain in the study and control groups on pre and post interventions. There was a significant reduction in pain and stress in premature infants in the study cases post intervention than pre intervention.

Table 6 clarifies mean weights of neonates in the study and control groups on pre and post intervention. In the study group, the mean weight was (1934.52 ± 296.6) on pre intervention compared to (2010.71 ± 260.7) on post intervention. Therefore, there was statistical significant difference between them on pre and post intervention (P< .05). Whereas, mean

weight of newborns in the control group was 1918.29 ± 303.2 on pre intervention compared to 1868.29 ± 307.4 on post intervention. Thereby, no statistical significant difference was found between weights of newborns in the control on pre and post intervention (P>.05).

Figure 2 illustrates distribution of neonates according to their feeding style in study and control groups on pre and post intervention. Neonates in the study group demonstrated significant improvement in their ability to breastfeed on post intervention (45.2%) compared to 7.1% on pre intervention.

Table 7 shows mean and standard deviation of the duration of hospitalization of neonates in NICU in the study and control groups. The duration of hospitalization of neonates in the study group (14.64 ± 7.16) was less than duration of hospitalization of neonates in the control group (20.54 ± 11.14). Therefore, there was a statistical significant difference between neonates in the study and control groups (P<.05).

Table 8 shows Pearson correlation between total maternal knowledge and total maternal stress in the study and control groups. There was very highly statistical significant negative correlation between maternal knowledge and maternal stress in the study group while there was no statistical significant correlation between maternal knowledge and maternal stress in the control group.

Figure 3 shows Pearson correlation between levels of pain, stress and duration of hospitalization among neonates in the study group. There was very highly statistical significant positive correlation among neonatal pain, stress and duration of stay in NICU.

Table (1) - Characteristics of high risk pregnant women in the study and control groups.

Maternal data	Study n=50		Control n=50		X²	p-value
	No.	%	No.	%		
Age						
15-19	10	20.0%	13	26.0%	1.13NS	.566
20-29	27	54.0%	28	56.0%		
30 and older	13	26.0%	9	18.0%		
Educational level						
Primary education	5	10.0%	9	18.0%	1.87NS	.391
secondary education	20	40.0%	15	30.0%		
High education	25	50.0%	26	52.0%		
Occupation					.67 NS	.410
Housewife	33	66.0%	29	58.0%		
Working	17	34.0%	21	42.0%		
Planned pregnancy					.48 NS	.488
No	14	28.0%	11	22.0%		
Yes	36	72.0%	39	78.0%		
Gravida					.38 NS	.534
Primiparious	20	40.0%	17	34.0%		
Multiparious	30	60.0%	33	66.0%		
Reason for antenatal admission					.85 NS	.931
Premature labor	14	28.0%	16	32.0%		
Premature rupture of membrane	12	24.0%	10	20.0%		
Cervical changes	5	10.0%	6	12.0%		
Maternal complications	18	36.0%	16	32.0%		
Fetal complications	1	2.0%	2	4.0%		

NB: [NS]: Not Significant (p>0.05)

Table (2): Characteristics of neonates in the study and control groups.

Neonatal data	Study group (n=42)		Control group (n=44)		Statistical tests	p-value
	No.	%	No.	%		
Gender					X^2= .24 [NS]	.620
Male	27	64.3%	26	59.1%		
Female	15	35.7%	18	40.9%		
Type of birth					X2= .63 NS	.425
Vaginal delivery	11	26.2%	15	34.1%		
Cesarean section	31	73.8%	29	65.9%		
Number of gestations					X2= .26 NS	.607
Singleton gestation	39	92.9%	42	95.5%		
Multiple gestation	3	7.1%	2	4.5%		
Gestational age (weeks) (X ± SD)	33.23 ± 1.52		33.20 ± 1.57		t- test = .100 NS	.921
Apgar score at 5 minutes (X ± SD)	5.92 ± 1.42		5.75 ± 1.33		t- test = .602 NS	.920

NB: [NS]: Not Significant (p>0.05)

Table (3) - Maternal knowledge about premature infants and the NICU in the study and control groups at times 1,2,3.

Maternal knowledge	Study group			ANOVA-test (P- value)	Control group			ANOA-test (P-value)
	Time 1 n=50	Time 2 n= 50	Time 3 n= 42		Time 1 n=50	Time 2 n=50	Time 3 n=44	
The baby' body	1.52 ±.814	4.04 ± .668	4.09 ± .69	197.10HS .000	1.29 ±.59	1.54 ±.78	1.66 ±.89	2.65NS .074
The baby physical needs in the NICU	1.34 ±.592	4.02±.78	3.98 ±.684	244.46 HS .000	1.36 ±.61	1.48 ±.73	1.50 ±.67	.539 NS .585
Who will be taking care of baby in the NICU	1.92±.778	3.66±.871	3.66 ±.84	71.08 HS .000	1.31 ±.51	1.68 ±.84	1.68 ±.84	2.468 NS .054
Equipment used in the NICU	1.38 ±.666	4.00±.76	3.96 ±.72	212.01 HS .000	1.29 ±.63	1.54 ±.78	1.50 ±.73	1.504 NS .226
Importance of breast milk for NICU baby	2.28 ± 1.06	3.88±.91	3.84 ±.93	42.14 HS .000	2.09 ±1.17	2.20 ±1.10	2.26 ±1.08	.271 NS .763
Total knowledge (X ± SD)	8.44 ±1.61	19.66 ±3.21	19.48 ±2.83	294.58 HS .000	7.36 ±1.72	8.44 ±2.21	8.60 ±2.44	2.416 NS .054

NB: [HS]: High significance (p<.001)   [NS]: Not Significant (p>0.05)

NICU = Neonatal Intensive Care Unit.

Table (4) - Maternal stress in study and control groups at times 1,2,3.

| Maternal stress	Study group			ANOVA-test (P-value)	Control group			ANOVA-test (P-value)
	Time 1 n=50	Time 2 n= 50	Time 3 n= 42		Time 1 n=50	Time 2 n=50	Time 3 n=44	
Sights and sounds	20.28±2.96	12.28±2.98	12.90±3.19	244.2HS .000	19.24±3.19	24.36±2.20	24.63±2.12	68.10 HS .000
Infant' appearance	38.00±2.74	26.60±3.74	26.73±4.132	384.9HS .000	38.24±4.44	43.56±3.44	45.84±3.532	32.85 HS .000
Parental role alternation	37.66±4.31	22.42±3.49	25.21±2.97	282.1HS .000	34.48±3.88	38.14±3.16	37.88±3.23	17.23 HS .000
Total maternal stress	95.94±7.55	61.30±6.44	64.85±6.17	695.2HS .000	91.96±7.68	106.06±4.60	108.36±4.81	94.61 HS .000

NB: [HS]: High significance (p<.001)   **NICU** = Neonatal Intensive Care Unit.

Table (5): - Mean and standard deviations of pain and stress among neonates in the study and control groups on pre and post interventions.

Mean ± SD	Study group n=42		Paired t- test (P-value)	Control group n=44		Paired t-test (P-value)
	Pre intervention	Post intervention		Pre intervention	Post intervention	
Facial expression	1.35 ± .69	.11 ± .37	10.44 .000	1.12 ± .64	1.22 ± .67	-.484- .630
Breathing pattern	1.23 ± .65	.11 ± .32	7.93 .000	1.15 ± .64	1.22 ± .67	-.484- .630
Tone of extremities	1.47 ± .50	.33 ±.57	9.71 .000	1.29 ± .70	1.29 ± .69	.000 1.000
Hand foot activity	.97 ± .68	.19 ±.50	6.00 .000	1.25 ± .61	1.31 ± .63	-.510- .611
Level of activity	1.04 ± .53	.07 ±.26	1.056 .000	1.15 ± .64	1.2 2± .67	-.484- .630

Figure (1): - Distribution of neonates according to levels of pain in the study and control groups on pre and post intervention.
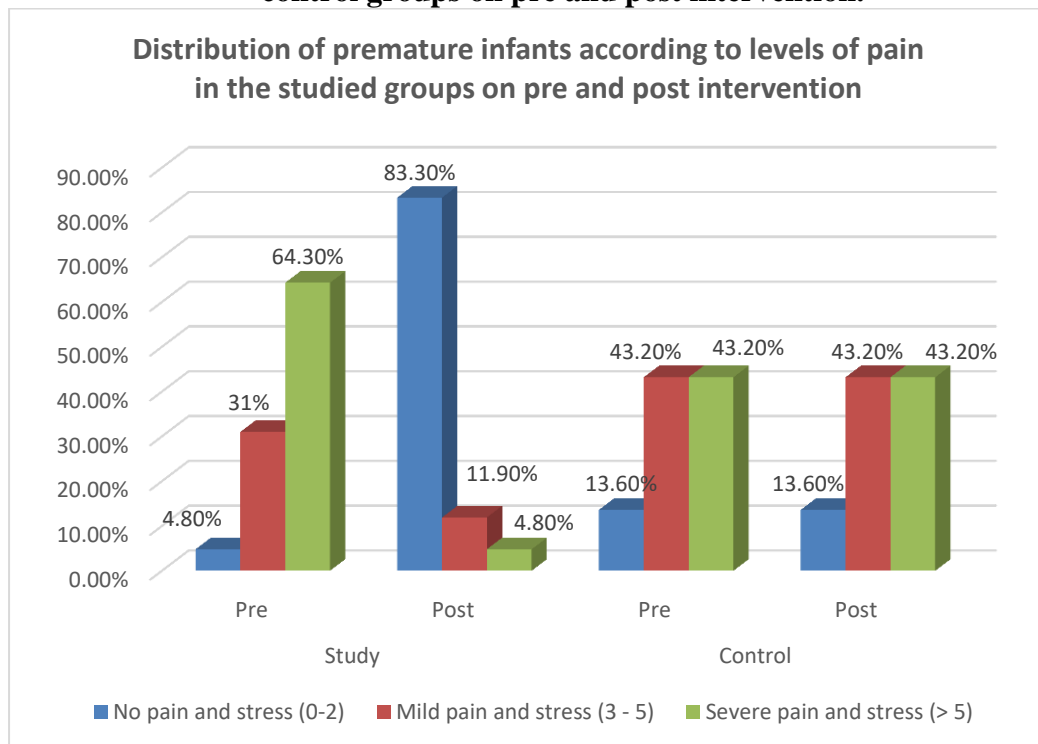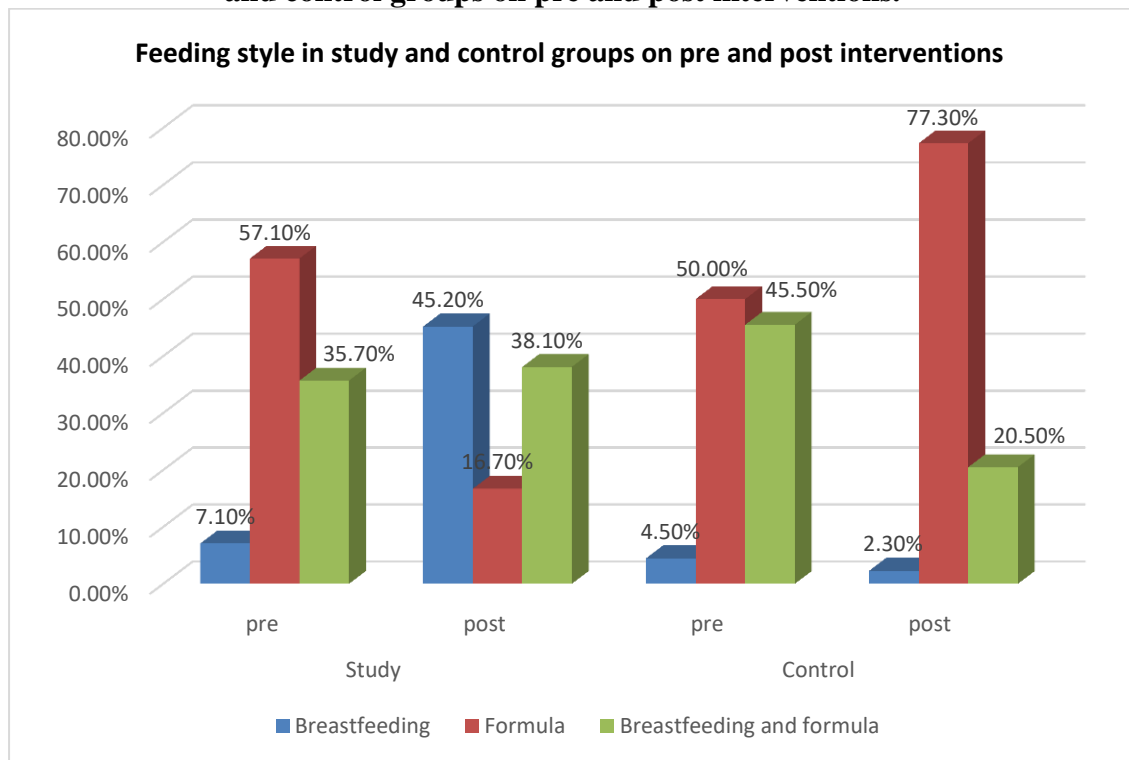

Table (6): - Mean weights of neonates in the study and control groups on pre and post interventions.

Infant' weight	Study group	Control group	Independent t- test	p-value
Pre intervention	1934.52 ± 296.6	1918.29 ± 303.2	.251 NS	.803
post intervention	2010.71 ± 260.7	1868.29 ± 307.4	3.557 S	.008
Paired t- test	-2.532-S	.768 NS		
p-value	.020	.445		

NB: ^{HS}: High significance (p<.001)   ^{NS}: Not Significant (p>0.05)

Figure (2): - Distribution of neonates according to their feeding style in the study and control groups on pre and post interventions.

Table (7): Duration of hospitalization of neonates in the study and control groups.

| Item	Study group	Control group	t- test	p-value
Duration of stay in NICU (Mean ± SD)	14.64 ± 7.16	20.54 ± 11.14	-2.906- S	.005

NB: S: Significant (p<0.05)

Table (8): Pearson correlation between total maternal knowledge and total maternal stress in the study and control groups.

	Total maternal knowledge			
	Study group		**Control group**	
	R	**p- value**	**R**	**p- value**
Total maternal stress	-.819-	.000	-.051	.542

*Correlation is significant at the 0.01 level (2- tailed)

Figure (3): - Pearson correlation between levels of pain, stress and duration of hospitalization among neonates in the study group.
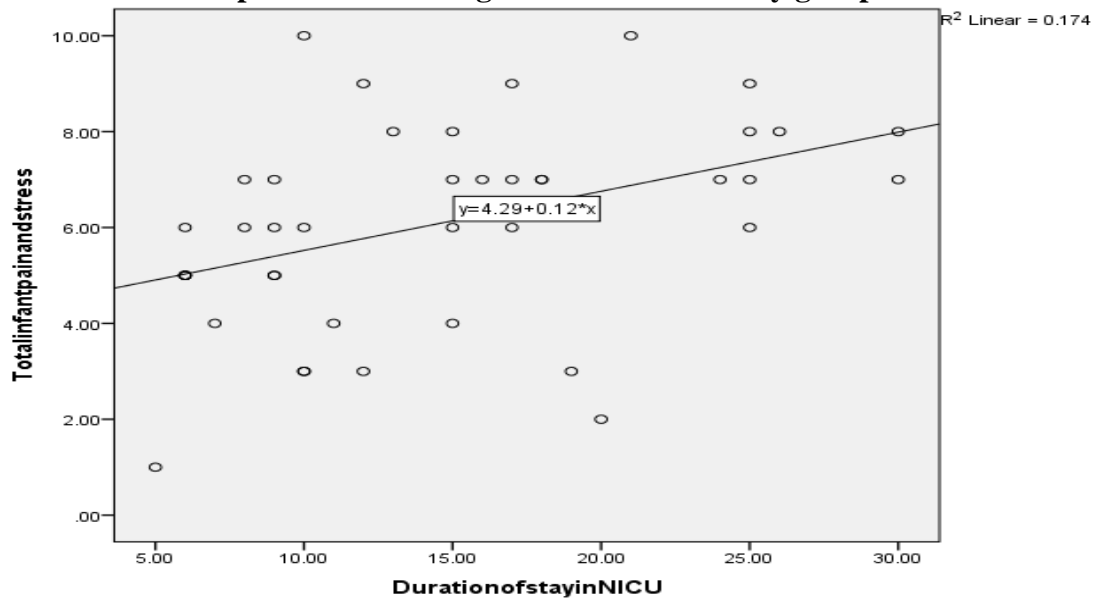
Discussion

Mothers face many stresses associated with preterm delivery, medical condition of the baby, complexity of the NICU environment perceived infant' perceived fragility, in addition to the difficulties associated with the ordinary transition to motherhood (Holditch-Davis & Miles, 2020). This research was conducted to investigate the effect of supportive nursing interventions on mother's stress and neonate outcomes in the neonatal intensive care unit.

In relation to hypothesis one that high-risk pregnant mothers in the study group who receive the supportive nursing intervention are expected to have higher knowledge about premature infants and the NICU than high-risk pregnant mothers in the control group who receive only routine care. The present study illustrated that mothers in the study group had higher mean score of knowledge about premature infants and the NICU than the control group on post intervention than on pre intervention. This could be attributed to the effect of educational

program provided to them by the researchers.

This result was in accordance with Ahn, Y. M., & Kim, 2017 who conducted a study about "Parental perception of neonates, parental stress and education for NICU parents" and Morey & Gregory, 2021 who conducted a study about "Nurse-led education mitigates maternal stress and enhances knowledge in the NICU". They found parents and maternal health education enhanced both parental as well as maternal perception of care of neonates and decreased parental stress on post intervention than on pre intervention.

In relation to hypothesis two that high-risk pregnant mothers in the study group who receive the supportive nursing intervention are expected to have lower stress levels than pregnant mothers in the control group. This result was consistent with Chourasia et al., 2018 who conducted a study about "NICU admissions and maternal stress levels" and Turan et al., 2018 who conducted a study about "Effect of

nursing interventions on stressors of parents of premature infants in neonatal intensive care unit". It was found that NICU mothers were under significant stress. Stressors could be attributed to the effects of prematurity, longer NICU stay and inability to directly breastfeed the baby.

In the same research, there was a significant decline in the mean score of maternal stress in the study group on post intervention than on pre intervention. This could be due to the effect of teaching strategies (videos, group discussion, feedback, emotional support, relaxation techniques, tour to NICU) as well as emotional support that was provided by the researchers. These findings were also in line with Oyekunle et al., 2021, Morey & Gregory, 2021, Mousavi et al., 2021 and Goral, E., & Geçkil,2022. They described that maternal participation in the intervention significantly decreased levels of maternal and neonatal stress.

In relation to hypothesis three that premature infants in the study group whose mothers receive the supportive nursing intervention are expected to have lower level of pain and stress than premature infants in the control group. The current study revealed that there was a significant reduction in the levels of pain and stress among neonates on post intervention. This might be attributable to the researchers' supportive nursing intervention, which helped mothers to be in close contact with their infants. Improved infant-mother interaction could have appositive effect on reducing pain and stress in premature infants. This finding was in line with Johnston et al., 2017, Johnston et al., 2018, Akcan et al., 2019 and Souza-Vogler & Lima, 2021 and Cristóbal Cañadas et al., 2022. They notified that supportive care helped to reduce levels of neonatal pain and stress.

In relation to hypothesis four that premature infants in the study group whose mothers receive the supportive nursing intervention are expected to have more weight gain than premature infants in the control group. This research illustrated that there was a significant increase in infant's weight in the study group on post intervention than on pre intervention. This result was consistent with Mianaei et al., 2021 who conducted a study about "Effectiveness of "Parent Empowerment" program on anxiety and stress in mothers who have preterm infants hospitalized in NICUs" and Salehi et al., 2022 who conducted a study about "The effect of education and implementation of evidence-based nursing guidelines on infants' weight gaining in NICU". They mentioned that training mothers on how to care for preterm children may be a valuable and successful strategy for promoting weight gain among premature and low-birth-weight neonates.

In relation to hypothesis five that premature infants in the study group whose mothers receive the supportive nursing intervention are expected to be able to breastfeed more and stay less in the NICU than premature infants in the control group. The findings of the present study revealed that preterm infants in the study group showed significant improvement in their ability to breastfeed on post intervention compared to pre intervention. This could be due to the supportive nursing intervention provided by the researchers which helped mothers to become less stressed. Maternal stress reduction positively affected breast milk production. Also, maternal stress reduction could be transmitted to neonates which in return reduced infants' stress and improved their breastfeeding abilities.

This result was consistent with Hake-Brooks, S., & Anderson, 2018 who

conducted a study about "Kangaroo care and breastfeeding of mother-preterm infant dyads 0–18 months: A randomized, controlled trial", Tharashree et al., 2018 who conducted a study about "The effect of kangaroo mother care (KMC) on breast feeding at the time of NICU discharge" and Grayson, 2018 who conducted a study about "Kangaroo mother care to reduce morbidity and mortality in low birth weight infants". They reported that kangaroo mother care was more successful in increasing exclusive breastfeeding than traditional methods of care. Even in NICU settings, it was a secure, efficient, and workable technique of caring for premature neonates.

According to the results of the current study, the average period of hospitalization for preterm newborns in the NICU was lower in the study group than in the control group. This finding was in line with Melnyk et al., 2016 who conducted a study about "Reducing premature infants' length of stay and improving parents' mental health outcomes with the creating opportunities for parent empowerment (COPE) neonatal intensive care unit program: a randomized, controlled trial". They reported that infants in the creating opportunities for parent empowerment program had shorter hospital stays overall and shorter stays in the NICU than did comparison infants.

Moreover, findings of the present study were consistent with Mianaei et al., 2021 who conducted a study about "Effectiveness of "Parent Empowerment" program on anxiety and stress in mothers who have preterm infants hospitalized in NICUs". They mentioned that educating mothers on how to look after preterm babies could be helpful and efficient in shortening the duration of infants' hospitalization.

In this study, we demonstrated that when supportive nursing intervention was given to mothers of infants hospitalized in the NICU, maternal understanding was improved and maternal and neonatal stress were significantly reduced. Additionally, infant' weight and breast-feeding efficiency were considerably improved. The amount of time spent in the NICU also reduced dramatically.

Conclusion

The study concluded that implementation of the supportive nursing intervention improved mothers' knowledge regarding premature infants and the NICU and reduced maternal stress level. Also, it helped premature neonates experience less stress, gained more weight, were able to breastfeed with shorter duration of hospitalization on posttest than neonates in the control group.

Recommendations

The following recommendations can be made in light of the study's findings:

1- Ongoing in-service education programs must be designed and implemented in all Obstetrics and Gynecology departments and neonatal intensive care units to improve quality of care provided for high risk pregnant mothers and their preterm neonates.

2- Authorities and administrators of hospitals and educational institutions of the healthcare services advised to prioritize education and implementation of evidence-based teaching in their work plans.

3- Replicability of the study on larger sample of high risk pregnant mothers and their preterm neonates to ensure the generalizability of results.

References

Abdeyazdan, Z., Shahkolahi, Z., Mehrabi, T., & Hajiheidari, M. (2018). A family support intervention to reduce stress among parents of preterm infants in neonatal intensive care unit. Iranian journal of nursing and midwifery research, 19(4), 349.

Ahn, Y. M., & Kim, N. H. (2017). Parental perception of neonates, parental stress and education for NICU parents. Asian Nursing Research, 1(3), 199-210.

Akcan, E., Yigit, R., & Atici, A. (2019). The effect of kangaroo care on pain in premature infants during invasive procedures. The Turkish journal of pediatrics, 51(1), 14.

Bry, A., & Wigert, H. (2019). Psychosocial support for parents of extremely preterm infants in neonatal intensive care: a qualitative interview study. BMC psychology, 7, 1-12.

Busse, M., Stromgren, K., Thorngate, L., & Thomas, K. A. (2019). Parents' responses to stress in the neonatal intensive care unit. Critical care nurse, 33(4), 52-59.

Çalışır, H., Şeker, S., Güler, F., Taşçıoğlu, G., & Türkmen, M. (2018). Requirements and anxiety levels of parents babies hospitalized on neonatal intensive care unit. CU Journal of School of Nursing, 12(1), 31-44.

Chalco, K., Wu, D. Y., Mestanza, L., Munoz, M., Llaro, K., Guerra, D., & Sapag, R. (2022). Nurses as providers of emotional support to patients with MDR-TB. International nursing review, 53(4), 253-260.

Chertok, I. R. A., McCrone, S., Parker, D., Leslie, N., & Catlin, A. (2018). Review of interventions to reduce stress among mothers of infants in the NICU. Advances in Neonatal Care, 14(1), 30-37.

Chourasia, N., Surianarayanan, P., Adhisivam, B., & Vishnu Bhat, B. (2018). NICU admissions and maternal stress levels. The Indian Journal of Pediatrics, 80(5), 380-384.

Cristóbal Cañadas, D., Bonillo Perales, A., Galera Martínez, R., Casado-Belmonte, M. D. P., & Parrón Carreño, T. (2022). Effects of Kangaroo mother care in the NICU on the physiological stress parameters of premature infants: a meta-analysis of RCTs. International journal of environmental research and public health, 19(1), 583.

Currie, J. C. H., & Barber, C. C. (2016). Pregnancy gone wrong: Women's experiences of care in relation to coping with a medical complication in pregnancy.

De Bernardo, G., Svelto, M., Giordano, M., Sordino, D., & Riccitelli, M. (2017). Supporting parents in taking care of their infants admitted to a neonatal intensive care unit: a prospective cohort pilot study. Italian Journal of Pediatrics, 43(1), 1-11.

Fisher, C., Hauck, Y., & Fenwick, J. (2018). How social context impacts on women's fears of childbirth: a Western Australian example. Social science & medicine, 63(1), 64-75.

Fotiou, C., Vlastarakos, P. V., Bakoula, C., Papagaroufalis, K., Bakoyannis, G., Darviri, C., & Chrousos, G. (2016). Parental stress management using relaxation techniques in a neonatal intensive care unit: A randomised controlled trial. Intensive and Critical Care Nursing, 32, 20-28.

Goral, E., & Geçkil, E. (2022). The effect of a comprehensive support program on the stress level of

mothers in a neonatal intensive care unit. Nursing Practice Today, 9(1), 54-61.

Grayson, C. E. (2018). "Kangaroo Mother Care to Reduce Morbidity and Mortality in Low Birthweight Infants" (2016), by Agustin Conde-Agudelo and José Díaz-Rossello. Embryo Project Encyclopedia.

Hake-Brooks, S., & Anderson, G. C. (2018). Kangaroo care and breastfeeding of mother–preterm infant dyads 0–18 months: A randomized, controlled trial. Neonatal Network, 27(3), 151-159.

Holditch-Davis, D., & Miles, M. S. (2020). Mothers' stories about their experiences in the neonatal intensive care unit. Neonatal network, 19(3), 13-21.

Howe, T. H., Sheu, C. F., Wang, T. N., & Hsu, Y. W. (2017). Parenting stress in families with very low birth weight preterm infants in early infancy. Research in developmental disabilities, 35(7), 1748-1756.

Isaacs, N. Z., & Andipatin, M. G. (2020). A systematic review regarding women's emotional and psychological experiences of high-risk pregnancies. BMC psychology, 8, 1-11.

Johnston, C. C., Filion, F., Campbell-Yeo, M., Goulet, C., Bell, L., McNaughton, K., & Walker, C. D. (2018). Kangaroo mother care diminishes pain from heel lance in very preterm neonates: a crossover trial. BMC pediatrics, 8(1), 1-9.

Johnston, C. C., Stevens, B., Pinelli, J., Gibbins, S., Filion, F., Jack, A., & Veilleux, A. (2017). Kangaroo care is effective in diminishing pain response in preterm neonates. Archives of pediatrics & adolescent medicine, 157(11), 1084-1088.

Korja, R., Ahlqvist-Björkroth, S., Savonlahti, E., Stolt, S., Haataja, L., Lapinleimu, H., & PIPARI Study Group. (2020). Relations between maternal attachment representations and the quality of mother–infant interaction in preterm and full-term infants. Infant Behavior and Development, 33(3), 330-336.

Korja, R., Savonlahti, E., Haataja, L., Lapinleimu, H., Manninen, H., Piha, J., & PIPARI Study Group. (2019). Attachment representations in mothers of preterm infants. Infant behavior and development, 32(3), 305-311.

Laborie, S., Denis, A., Horsch, A., Occelli, P., Margier, J., Harari, M. M., & Fumeaux, C. J. F. (2020). Breastfeeding peer counselling for mothers of preterm neonates: protocol of a stepped-wedge cluster randomised controlled trial. BMJ open, 10(1), e032910.

Leichtentritt, R. D., Blumenthal, N., Elyassi, A., & Rotmensch, S. (2019). High-risk pregnancy and hospitalization: the women's voices. Health & Social Work, 30(1), 39-47.

Liu, L., Oza, S., Hogan, D., Chu, Y., Perin, J., Zhu, J., & Black, R. E. (2020). Global, regional, and national causes of under-5 mortality: an updated systematic analysis with implications for the Sustainable Development Goals. The Lancet, 388(10063), 3027-3035.

Lundqvist, P., Kleberg, A., Edberg, A. K., Larsson, B. A., Hellström-Westas, L., & Norman, E. (2014). Development and psychometric properties of the S wedish ALPS-N eo pain and stress assessment scale for newborn infants. Acta Paediatrica, 103(8), 833-839.

Melnyk, B. M., Feinstein, N. F., Alpert-Gillis, L., Fairbanks, E.,

Crean, H. F., Sinkin, R. A., ... & Gross, S. J. (2016). Reducing premature infants' length of stay and improving parents' mental health outcomes with the Creating Opportunities for Parent Empowerment (COPE) neonatal intensive care unit program: a randomized, controlled trial. Pediatrics, 118(5), e1414-e1427.

Mianaei, S. J., Karahroudy, F. A., Rasuli, M., & Zayeri, F. (2021). Effectiveness of" Parent Empowerment" program on anxiety and stress in mothers who have preterm infants hospitalized in NICUs. Payesh (Health Monitor), 11(2), 253-258.

Miles, M. S., Funk, S. G., & Carlson, J. (1993). Parental Stressor Scale: neonatal intensive care unit. Nursing research, 42(3), 148-152.

Morey, J. A., & Gregory, K. (2021). Nurse-led education mitigates maternal stress and enhances knowledge in the NICU. MCN: The American Journal of Maternal/Child Nursing, 37(3), 182-191.

Mousavi, S. S., Keramat, A., Chaman, R., Mohagheghi, P., Mousavi, S. A., & Khosravi, A. (2021). Impact of maternity support program on the stress of mothers in the first encounter with the preterm infants. International Journal of Preventive Medicine, 12.

Obeidat, H. M., Bond, E. A., & Callister, L. C. (2019). The parental experience of having an infant in the newborn intensive care unit. The Journal of perinatal education, 18(3), 23-29.

Öhman, S. G., Saltvedt, S., Grunewald, C., & Waldenström, U. (2020). Does fetal screening affect women's worries about the health of their baby?: A randomized controlled trial of ultrasound screening for Down's syndrome versus routine ultrasound screening. Acta obstetricia et gynecologica Scandinavica, 83(7), 634-640.

Oyekunle, O. O., Bella-Awusah, T., Ayede, A. I., Omigbodun, O. O., & Ani, C. C. (2021). Effect of a Brief Supportive and Educational Intervention on the Psychological Well-Being of Mothers with Babies in Neonatal Wards of a Tertiary Hospital in Ibadan, Nigeria. Journal of Tropical Pediatrics, 67(2), fmab038.

Parker, L. (2022). Mothers' experience of receiving counselling/psychotherapy on a neonatal intensive care unit (NICU). Journal of Neonatal Nursing, 17(5), 182-189.

Phaloprakarn, C., Manusirivithaya, S., & Boonyarittipong, P. (2020). Risk score comprising maternal and obstetric factors to identify late preterm infants at risk for neonatal intensive care unit admission. Journal of Obstetrics and Gynaecology Research, 41(5), 680-688.

Platt, E. S., Campbell, B., Tetreau, A., & Pinette, M. G. (2022). 100 questions & answers about your high-risk pregnancy. Jones & Bartlett Learning.

Pozzo, M. L., Brusati, V., & Cetin, I. (2021). Clinical relationship and psychological experience of hospitalization in "high-risk" pregnancy. European Journal of Obstetrics & Gynecology and Reproductive Biology, 149(2), 136-142.

Queenan, J. T., Spong, C. Y., & Lockwood, C. J. (2021). Overview of High-Risk Pregnancy. Queenan's Management of High-Risk

Pregnancy: An Evidence-Based Approach, 1-3.

Roomaney, R., Andipatin, M. G., & Naidoo, A. (2021). The psychological experience of women who survived HELLP syndrome in Cape Town, South Africa. Health SA Gesondheid, 19(1), 1-9.

Salehi, Z., Nouri, J. M., Khademolhoseyni, S. M., & Ebadi, A. (2022). The effect of education and implementation of evidence-based nursing guidelines on infants' weight gaining in NICU. Global Journal of Health Science, 7(2), 148.

Simmons, H. A., & Goldberg, L. S. (2020). 'High-risk'pregnancy after perinatal loss: understanding the label. Midwifery, 27(4), 452-457.

Souza-Vogler, S. R. D., & Lima, G. M. D. S. (2021). The effect of kangaroo care on modulate chronic stress response in preterm infants and mothers. Stress, 24(6), 742-752.

Tedesco, R. P., Galvão, R. B., Guida, J. P., Passini-Júnior, R., Lajos, G. J., Nomura, M. L., & Cecatti, J. G. (2020). The role of maternal infection in preterm birth: evidence from the Brazilian Multicentre Study on Preterm Birth (EMIP). Clinics, 75.

Tharashree, C. D., Shravani, M. R., & Srinivasa, S. (2018). The effect of kangaroo mother care (KMC) on breast feeding at the time of NICU discharge. Int J Contemp Pediatr, 5(3), 1068-71.

Trombini, E., Surcinelli, P., Piccioni, A., Alessandroni, R., & Faldella, G. (2018). Environmental factors associated with stress in mothers of preterm newborns. Acta paediatrica, 97(7), 894-898.

Turan, T., Başbakkal, Z., & Özbek, Ş. (2018). Effect of nursing interventions on stressors of parents of premature infants in neonatal intensive care unit. Journal of clinical nursing, 17(21), 2856-2866.

Uludağ, A., & Ünlüoğlu, İ. (2018). Determinants of anxiety among mothers of infants in the newborn intensive care unit: role of family physicians on coping with the stressors. Konuralp Medical Journal, 4(3), 19-26.

Waddington, C., van Veenendaal, N. R., O'Brien, K., Patel, N., & International Steering Committee for Family Integrated Care. (2021). Family integrated care: Supporting parents as primary caregivers in the neonatal intensive care unit. Pediatric Investigation, 5(02), 148-154.

Yaman, S., & Altay, N. (2017). Posttraumatic stress and experiences of parents with a newborn in the neonatal intensive care unit. Journal of Reproductive and Infant Psychology, 33(2), 140-152.

Yayan, E. H., Özdemir, M., Düken, M. E., & Suna Dag, Y. (2019). Determination of stress levels of parents in newborn intensive care unit of baby. Gümüşhane University Journal of Health Sciences, 8(1), 82-9.

Yilmaz, G., & Küçük Alemdar, D. (2022). The Effect of Supportive Nursing Interventions on Reducing Stress Levels of Mothers of Infants in the Neonatal Intensive Care Unit: A Randomized Controlled Trial. Clinical Nursing Research, 31(5), 941-951.