

The Effect of Positive Touch Education on Stress and Anxiety Levels among Mothers of Premature Infants in the NICU: A Scoping Review

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Abstract: Admissions to the neonatal intensive care unit (NICU) are frequent and have been connected to mother stress and anxiety. There are many ways in which maternal stress and anxiety affect maternal and child outcomes. Infant massage, kangaroo care, and gentle touch are all examples of positive touch. Positive touch may be a useful technique to lessen mother stress and anxiety. In this study, we conducted a scoping review to look into the evidence on the effect of positive touch on maternal stress and anxiety. We searched PubMed, Scopus, Web of Science, and Cochrane databases from inception to October 8, 2023, for randomized controlled trials (RCTs) that assessed the effect of positive touch modalities, either combined or separately, on maternal stress and anxiety levels and compared them to a control group. We evaluated the quality of the studies using version 2 of the Cochrane risk-of-bias tool. We followed the PRISMA guidelines for reporting systematic reviews and meta-analyses extension for scoping reviews. A total of 15 RCTs were included. Compared to the control group, infant massage consistently significantly reduced parental stress and anxiety across all the studies. Kangaroo care significantly lowered mother stress and anxiety in the majority of the included trials, whereas other studies found the opposite. Gentle touch was the least studied in the literature and was found to have a positive effect on reducing maternal stress in only one study. All three methods combined showed significant reduction in the maternal stress and anxiety compared to the control group. In conclusion, positive touch is an effective intervention for reducing stress and anxiety levels in mothers of premature infants in the NICU. Future large, high-quality RCTs are required to confirm the findings.

Keywords: neonatal intensive care unit (NICU), anxiety affect maternal, randomized controlled trials (RCTs).

1. INTRODUCTION

A major problem in the world of medicine is maternal stress and anxiety associated to neonatal intensive care unit (NICU) admission. The NICU provides care for 64–80 neonates per 1,000 live births annually [1]. In 2014, the global preterm birth rate was estimated at 14.84 million live preterm births, with Asia and Sub-Saharan Africa accounting for 81.1% [2].

Admission of an infant to the NICU has a detrimental influence on the mother. Mothers of prematurely born babies experienced more severe anxiety symptoms, and 23.1% of mothers with premature infants admitted to the NICU suffer

from maternal stress [3]. Between 2018 and 2020, 31.15% of women with newborns admitted to NICUs in England reported at least one postnatal mental health concern. Within six months of giving birth, 23.7%, 16.0%, and 14.6% of mothers with neonatal hospitalizations, respectively, reported depression, anxiety, and post-traumatic stress disorder [4].

Maternal stress and anxiety affect maternal and child outcomes in a variety of ways. Bonacquisti et al. 2020 [5] investigated the effect of maternal anxiety and stress in the NICU on maternal-infant attachment and discovered that a significant proportion of 127 mothers scored above the clinical cut-off values for each of the anxiety and stress symptom scales, with a significant negative association between maternal-infant attachment and both anxiety and stress. According to Varela et al. 2023 [6], NICU mothers have lower bonding ratings with their infants and higher levels of anxiety than non-NICU mothers, with a strong association between anxiety and bonding scores in both groups.

Furthermore, a prospective longitudinal study on 155 mothers investigated the impact of maternal stress in the NICU on parenting behavior when the children reached the age of 5 [7]. The correlations revealed that significant stress from NICU admissions was associated with less maternal sensitivity, greater negativity, and more maternal intrusiveness with their child. The findings suggest that the experience mothers have while in the hospital with their newborns has a longer-term impact on their mental health and influences their parenting style.

Positive touch refers to various types of infant touch-interaction such as handling, holding, kangaroo care, and massage [8]. Positive touch showed several benefits and the ability to improve mothers' and preterm infants' outcomes in the NICU. Kangaroo care has been shown to reduce psychological symptoms and distress in mothers of preterm infants admitted to the NICU, as well as improve their sleep quality [9]. Preterm infants who received kangaroo care had a significantly lower mean respiratory rate than infants who received standard incubator care [10]. Gentle touch was found to be an effective non-pharmacological pain management method, to increase mother-baby attachment, to contribute to sleep-calm states, vital sign stability, infant weight gain, and to shorten the length of hospital stay [11]. Infant massage helps premature neonates reach developmental milestones. The frequency of maternal massage was linked to socially desirable emotional development in premature infants, as measured by better cognition, language cues, and gross motor skills [12].

Individual education programs such as kangaroo care, infant massage, and gentle touch have been shown to reduce maternal stress and anxiety in the NICU. Kangaroo care education reduced the mean stress score in the Samsudin et al. 2023 study [13]; additionally, the Khazaii et al. 2018 study [14] examined the effect of preterm infant care education that included gentle touch and concluded a reduction in maternal stress scores; and finally, infant massage resulted in a significant lower maternal anxiety in mothers of premature infants in the NICU [15]. However, only a few studies have looked into the effects of combined positive touch methods education on maternal stress and anxiety levels. In this study, we conducted a scoping review to look into the effect of the three approaches, separately or combined, on stress and anxiety levels in mothers of premature infants in the NICU.

2. METHODS

The authors adhered to the PRISMA guidelines for reporting systematic reviews and meta-analyses extension for scoping reviews.

Eligibility criteria

Studies were included if they met the PICOS criteria: population, intervention, control, outcomes, and study design. Studies were included if they met the PICOS criteria: population, intervention, control, outcomes, and study design. The mothers of preterm infants admitted to the NICU were the population of interest. Interventions were kangaroo care, infant massage, gentle human touch, or positive touch that combined all three methods. The regular treatment or no treatment served as the comparative. To be considered, studies must have assessed and reported on the outcomes of interest. We included only randomized clinical trials.

Non-English studies, books, and abstracts were excluded. We also omitted studies in which the population of interest was exclusively full-term infants or fathers.

Information source

A thorough search of the PubMed, Web of Science, Cochrane, and Scopus databases through October 8, 2023, was conducted to retrieve the relevant studies. We also looked for relevant studies in the reference lists of the eligible papers.

Search strategy

We conducted database searches using a combination of the following keywords: "Positive Touch", "Kangaroo care", "infant massage", "gentle touch", "Intensive Care", "Preterm Infants", "mothers", "stress", and "anxiety". We applied no filters. **Table 1** shows the full search strategy used for each database.

Table 1. Full search strategy used for each database.

Database	Search Terms	Search Field	Search Results
PubMed	("Positive Touch" OR "Kangaroo care" OR "infant massage" OR "gentle human touch" OR "gentle touch" OR "skin-to-skin contact" OR "Support Program" OR "education program") AND ("Intensive Care" OR "Preterm Infants") AND (mother OR mothers OR paternal) AND (stress OR "Parental Stressor Scale" OR anxiety)	All Fields	90
Cochrane	("Positive Touch" OR "Kangaroo care" OR "infant massage" OR "gentle human touch" OR "gentle touch" OR "skin-to-skin contact" OR "Support Program" OR "education program") AND ("Intensive Care" OR "Preterm Infants") AND (mother OR mothers OR paternal) AND (stress OR "Parental Stressor Scale" OR anxiety)	All Fields	80
Web of Science	("Positive Touch" OR "Kangaroo care" OR "infant massage" OR "gentle human touch" OR "gentle touch" OR "skin-to-skin contact" OR "Support Program" OR "education program") AND ("Intensive Care" OR "Preterm Infants") AND (mother OR mothers OR paternal) AND (stress OR "Parental Stressor Scale" OR anxiety)	All Fields	194
SCOPUS	TITLE-ABS-KEY (("Positive Touch" OR "Kangaroo care" OR "infant massage" OR "gentle human touch" OR "gentle touch" OR "skin-to-skin contact" OR "Support Program" OR "education program") AND ("Intensive Care" OR "Preterm Infants") AND (mother OR mothers OR paternal) AND (stress OR "Parental Stressor Scale" OR anxiety))	Title, Abstract, Keywords	191

Selection process

All of the records were combined using Endnote. All of the records were combined using Endnote. The data was converted to an Excel spreadsheet, which was subsequently submitted in two steps to identify studies that were eligible. Initially, the title and abstract screening step is completed, and records that pass this stage proceed to the full-text screening stage. Two authors independently examined each article's eligibility in each phase. Any disagreements were settled by discussion. Any disagreements were settled by discussion.

Data collection

The lead author created formatted Excel sheets into which the review writers extracted the data. Two writers retrieved data from each study separately and then discussed it.

Data items

The outcomes of interest were the stress and anxiety of mothers of preterm infants admitted to the NICU. Other extracted data included study ID, country, sample size, settings, control group, outcomes measured, and findings of the included studies.

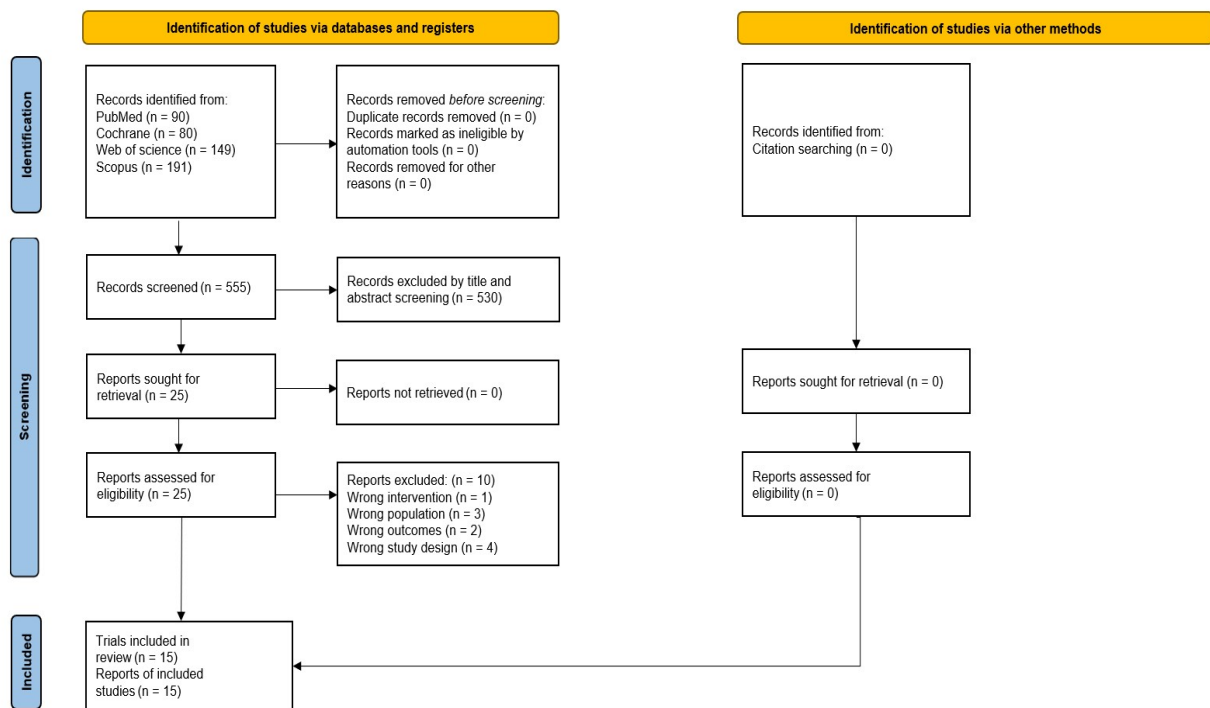
Quality assessment

The Cochrane Risk of Bias Tools for RCTs were used to assess the quality of the included studies. Two authors independently assessed the quality of each paper, which was then debated. Any disagreements were settled by a third senior author. The tool is divided into the following domains: random sequence generation (selection bias), allocation sequence concealment (selection bias), blinding of participants and personnel (performance bias), blinding of outcome assessors (detection bias), incomplete outcome data (attrition bias), selective outcome reporting (reporting bias), and other bias; author judgments are classified as low, unclear, or high risk of bias for each domain.

3. RESULTS

Literature results

A database search yielded 555 records; after removing duplicates and title and abstract screening, 25 records proceeded to full-text screening. After excluding six records, we were left with 15 RCTs that satisfied our eligibility criteria and were included in our study [13–27]. The PRISMA flow diagram is shown in **Figure 1**.



From: Page MJ, McKenzie JE, Bossuyt PM, Boutron I, Hoffmann TC, Mulrow CD, et al. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. *BMJ* 2021;372:n71. doi: 10.1136/bmj.n71. For more information, visit: <http://www.prisma-statement.org/>

Figure 1. PRISMA flow diagram shows the detailed search process

Study characteristics

Of the 15 included studies, three employed positive touch [17,26,27], which includes the three approaches combined; three used infant massage [15,21,25]; five used kangaroo care [13,18–20,22]; and two used gentle touch [14]. One study allowed the mothers to use any of the three methods [16]. Two studies assessed infant massage and kangaroo care in two separate arms [23,24]. Most of the included studies were conducted in Iran [14,17,21,24,25,27], followed by USA [15,16,23]. The sample size ranged between 37 to 240 in the included studies. Except for two studies [23,24] in which a third arm got active treatment, kangaroo care, all studies included two arms with the control group receiving standard care and support. **Table 2** shows the detailed characteristics of the included studies

Table 2. Study characteristics and findings

Study ID	Country	Sample size (I/C)	Settings	Control group	Outcomes measured	Findings
Positive touch (All three methods combined)						
Zaferani et al. 2021 [17]	Iran	80 (40/40)	Mothers whose premature infants were hospitalized in the NICU of two hospitals in northern Iran in 2018.	The usual care and support	POMS questionnaire	There were significant differences in all of the sub-components of POMS, including anxiety, before and after the intervention and compared to the control group
Mousavi et al. 2021 [27]	Iran	143 (75/68)	This experimental study began in NICUs of two hospitals of Iran; from Feb 14, 2016, to May 14, 2016.	The usual care and support	PSS: NICU	All stress scores including 1- total 1.18 (95% CI 0.93–1.44), 2- stress over the NICU environment 1.47 (95% CI 1.19–1.75), 3- stress over the infant's appearance, behavior, and special treatments on him/her 1.06 (95% CI 0.73–1.14), and 4- stress over the change in parental role 1.21 (95% CI 0.93–1.49), in the experimental group were significantly lower than the stress scores of the control group.
Matricardi et al. 2013 [26]	Italy	42 (21/21)	Between February 2010 and September 2011 at Fatebenefratelli – San Giovanni Calibita Hospital (Rome).	The usual care and support	PSS: NICU	intervention group parents showed significantly lower levels of stress related to infants' appearance/behaviour and to parental role alteration (PRA) than those of the standard support group (p = 0.000). Overall, mothers reported more stress compared with fathers (p ≤ 0.05). The intervention was effective in reducing the stress-role alteration in mothers (p < 0.05), but not in fathers.
Infant massage						
Afand et al. 2017 [21]	Iran	75 (38/37)	This quasi-experimental study was conducted on mothers whose preterm infants admitted to NICU in Akbar abadi teaching centre in Tehran, from 24 June 2013 to 12 October 2013	The usual care and support	STAI	The mean scores of maternal state anxiety (MSA) in mothers of the massage group were significantly lower than control group, but not in the severity of MSA. In before and after comparison, the mean score of MSA in two groups was significantly decreased
Feijo et al. 2006 [15]	USA	40 (20/20)	Mothers of preterm infants in neonatal intermediate care nursery (NICU) at a University Hospital	The usual care and support + Only observing the massage	STAI, POMS questionnaire	Both groups of mothers had lower depressed mood scores following the session. However, only the group who massaged their infants had lower anxiety scores after the session.
Holditch-Davis et al. 2014 [23]	USA	240 (73/67/67)	Four NICUs (two in North Carolina, two in Illinois).	Kangaroo Care group and No intervention group	STAI, Perinatal PTSD Questionnaire (PPQ)	Mothers who participated in Infant massage or Kangaroo care had less parenting stress than those who did not. Higher anxiety was related to lower intervention satisfaction at discharge and lower ratings of nurse helpfulness at discharge and 2 months.
Lotfalipour et al. 2019 [25]	Iran	52 (26/26)	Mothers of preterm infants (born at 30-37 weeks of gestation) hospitalized in the neonatal intensive care unit of Afzalipour Hospital of Kerman University of Medical Sciences, Iran.	The usual care and support	POMS questionnaire	Massage of a preterm infant by the mother reduced maternal anxiety and depression and improved the mother's mood more than the control group. Mood scores of mothers with preterm infants were not significantly different between the control and intervention groups before massage (P = .833), but was significantly different after the intervention (P ≤ .005). The mean score of mother's mood in the intervention group was 152.42 ± 4.56 before the massage and 118.92 ± 3.45 after the massage (P b .001). In addition, the mean of mother's mood score in the control group was 153.76 ± 5.5 first, which reduced to 141.73 ± 6.1
Karimi et al. 2022 [24]	Iran	90 (30/30/30)	The Bahar Hospital with a tertiary level neonatal intensive care unit (NICU) in the northeast of IRAN over eight months in 2019, from December 2018 to July 2019.	Kangaroo Care group and the usual care and support group	Depression, Anxiety and Stress Scale (DASS-21)	KMC and massage were effective in reducing stress and anxiety in mothers compared to the baseline and the control group
Kangaroo Care						
Cho et al. 2016 [22]	Korea	40 (20/20)	Between May and October 2011.	The usual care and support	PSS: NICU	Maternal stress significantly differed (F = 47.320, p b .001), with kangaroo care being effective in reducing maternal stress
Coşkun et al. 2020 [18]	Turkey	80 (42/38)	Firat University and the Elazığ Education and Research Hospital NICU from December 2017 to October 2018	The usual care and support	PSS: NICU	The mothers who applied kangaroo care had lower PSS: NICU subdimension and total scale average scores than the mothers in the standard care group.
Mörelius et al. 2015 [19]	Sweden	37 (18/19)	In one level-III NICU at Linköping University Hospital and one level-II NICU at Södersjukhuset, Sachs' Children's Hospital in Stockholm. Recruitment to the study took place between April 2008 and April 2012.	The usual care and support	SPSQ, EPDS	There were no significant differences in total SPSQ, or in the sub-scales incompetence, role restriction, social isolation, and health problems, between kangaroo care and control at one or four months
Samsudin et al. 2023 [13]	Malaysia	96 (48/48)	At the NICU in a tertiary referral teaching hospital from February 2018 to July 2018, while for the experimental group, from October 2018 to April 2019.	The usual care and support	Self-administered Kangaroo Care Questionnaires	At 3 months post-intervention, the experimental group reported a significant reduction in stress, a positive perception and good knowledge towards kangaroo care implementation. The mothers' perceived barriers towards kangaroo care significantly decreased after 3 months in the experimental group.
souza-vogler et al. 2021 [20]	Brazil	59 (30/29)	NICU, included levels I-IV and kangaroo care unit, within one week of infant birth in hospitals in Brazil	The usual care and support	Salivary cortisol	Kangaroo care did not help reduce Cortisol and DHEA levels of mothers
Gentle touch						
Khazaei et al. 2018 [14]	Iran	62 (31/31)	In 2017, hospitalized in the NICU of Valie Asr teaching Hospital, Birjand, Iran	The usual care and support	PSS: NICU	The pretest - posttest mean differences of maternal stress and all its domains in the experimental group were significantly greater than those of the control group (P < 0.05).
Infant massage, kangaroo care, or gentle touch						
Pineda et al. 2021 [16]	USA	52 (24/28)	From consecutive admissions at St. Louis Children's Hospital NICU, an 83-bed (that expanded to 132-bed during the course of the study) level IV NICU from August 2017 to June 2018.	The usual care and support	PSS: NICU, STAI	No significant effect was observed between the two groups in terms of stress and anxiety at discharge (full term) or after one year

Quality assessment

The revised Cochrane risk of bias tool was used to assess the quality of the included studies. Four trials [16,18,19,24] had a low risk of bias in all domains, while eleven trials [13–15,17,20–23,25–27] exhibited a high overall risk of bias. Blinding lacked in most of the studies and the randomization process was of high risk in seven trials. **Figure 2** shows the summary of the quality assessment of the included studies.

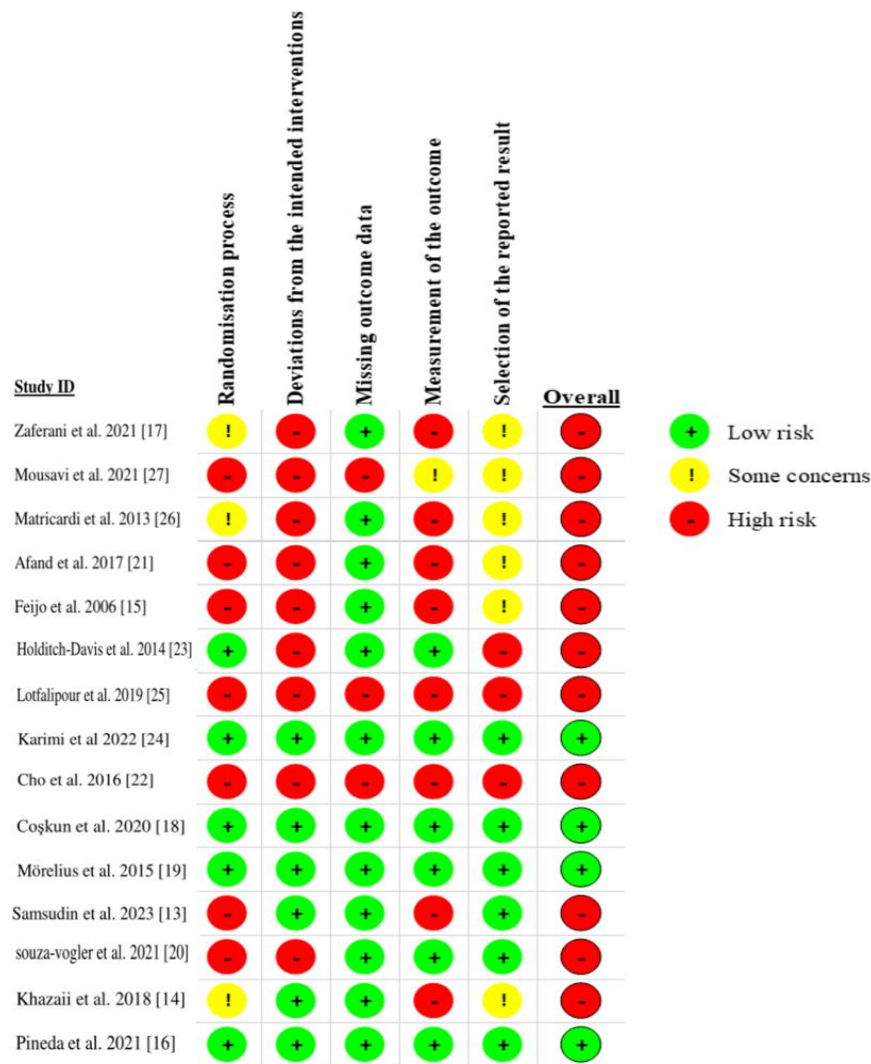


Figure 2. Summary of the risk of bias of the included studies

Effect of Positive touch on stress and anxiety levels in mothers of premature infants in the NICU

Three RCTs [17,26,27] assessed the positive touch which includes the three methods combined. Zaferani et al. 2021[17] revealed significant difference in the anxiety subcomponent of profile of mood states (POMS) before and after the intervention and compared to the control group. Mousavi et al. 2021[27] and Matricardi et al. 2013 [26] revealed a significant decrease in the experimental group than the control group in the total score of stress and for all 3 components of the parental stressor scale (PSS-NICU): stress over the NICU environment, stress over the infant’s appearance, behavior, and special treatments on him/her, and stress over the change in parental role.

Effect of infant massage on stress and anxiety levels in mothers of premature infants in the NICU

Four studies assessed effect of infant massage on anxiety. Afand et al. 2017 [21] and Karimi et al 2022 [24] revealed that mean scores of maternal state anxiety in mothers of the massage group were significantly lower than control group and compared to the baseline. Feijo et al. 2006 [15] showed that only the group who massaged their infants had lower anxiety scores compared to the baseline. Lotfalipour et al. 2019 [25] revealed that massage of a preterm infant by the mother reduced maternal anxiety compared to the control group.

Two studies assessed effect of infant massage on stress. Holditch-Davis et al. 2014 [23] showed that mothers who participated in infant massage had less parenting stress than those who did not. Karimi et al 2022 [24] massage was effective in reducing stress in mothers compared to the baseline and the control group.

Effect of kangaroo care on stress and anxiety levels in mothers of premature infants in the NICU

Seven studies assessed kangaroo care effect on stress. Cho et al. 2016 [22] and Coşkun et al. 2020 [18] showed that kangaroo care was effective in reducing maternal stress as measured by PSS: NICU compared to the control group. Karimi et al 2022 [24] reported that kangaroo care were effective in reducing stress in mothers compared to the baseline and the control group. Samsudin et al. 2023 [13] reported that after three months of kangaroo care, the experimental group reported a significant reduction in stress as assessed by PSS: NICU. Holditch-Davis et al. 2014 [23] found that mothers who participated in kangaroo care had less parenting stress than those who did not.

However, Mörelius et al. 2015 [19] used Swedish parenthood stress questionnaire and found no in total SPSQ, or in the sub-scales incompetence, role restriction, social isolation, and health problems. Souza-Vogler et al. 2021 [20] found that kangaroo care did not help reduce cortisol and DHEA levels of mothers.

Only Karimi et al 2022 [24] assessed kangaroo care effect on anxiety and found that kangaroo care was effective in reducing anxiety in mothers compared to the baseline and the control group.

Effect of gentle touch on stress and anxiety levels in mothers of premature infants in the NICU

Only two studies assessed the effect of gentle touch on stress and anxiety. While Khazai et al. 2018 [14] found that the maternal stress and all its domains in the gentle touch group were significantly less than those of the control group and the baseline values, Pineda et al. 2021 [16] revealed that no significant effect was observed between the two groups in terms of stress and anxiety at discharge (full term) or after one year. However, some of the mothers is Pineda et al. 2021 study applied techniques other than gentle touch such as massage and kangaroo care.

4. DISCUSSION

Admission to the NICU is a significant issue. Maternal stress and anxiety have been associated to NICU hospitalizations. Maternal stress and anxiety have a wide range of effects on maternal and child outcomes, including maternal-infant attachment, maternal sensitivity, increased negativity, and more maternal intrusion with their kid. We presented a scoping review of how positive touch methods, such as kangaroo care, infant massage, and gentle touch, improve anxiety and stress levels in mothers of premature infants in the NICU, either together or independently.

Anxiety and stress are experienced by the parents, particularly the mother, when they are separated from the child [28]. Furthermore, Mothers of preterm infants are more stressed than mothers of full-term infants [29]. Causes of stress for moms of preterm newborns include unfamiliarity with the NICU setting, the fragile appearance of the preterm infant, a change in caregiving responsibilities, and persistent worry over the infant's prognosis. Therefore, it is better that after childbirth, parents of premature newborns, particularly women, should be given the required preparations so that they can face their infants and engage with them appropriately in the NICU.

This engagement, however, should include physical interaction in order to reduce anxiety and stress. Feijo et al. 2006 [15] noticed that both mothers who observed their preterm newborn receiving a massage and women who performed a massage on their preterm infant reduced their depression symptoms. However, only mothers who massaged their preterm infants showed lower levels of anxiety. They explained that this was derived from the physical act of massaging their preterm infants or from feeling less helpless. This suggest that positive touch is necessary to reduce anxiety and stress levels.

We found that having mothers do positive touch, such as gentle touch, massage, and kangaroo care on their children dramatically reduced anxiety and stress levels compared to before the intervention and to mothers who did not execute any of the procedures on their infants. Positive touch, combining all three modalities, and infant massage alone produced the most consistent results across all of the studies.

While kangaroo care had a similar effect as infant massage in terms of reducing anxiety and stress as measured by the PSS: NICU and Self-administered Kangaroo Care Questionnaire, Mörelius et al. 2015 discovered no significant effect on stress using the Swedish parenthood stress questionnaire, in addition to the Souza-Vogler et al. 2021 study, which discovered no significant effect on cortisol and DHEA levels of mothers.

There are several reasons for this. As found by Malouf et al. 2021 [30], the differences between the results of the studies may be attributed to the disparity in the sensitivity of the tools employed to measure stress and anxiety. Additionally, the

degree of prematurity may be a factor, since babies who are more severely preterm exhibit more medical issues, require more care, and spend longer in the NICU, which heightens the impact of positive touch. This calls for standardizing the measurement of stress and anxiety as well as doing additional study to determine the relationship between the severity of prematurity and the favorable impact of positive touch on mothers' stress and anxiety.

Strengthens and limitations

We conducted a thorough search for all forms of positive touch, either combined or separately, evaluated their quality, and only included randomized clinical trials. However, the quality of most of the included studies was at high risk of bias. Moreover, the characteristics of the populations may vary across the studies. Furthermore, the tools used to assess the stress and anxiety varied across the studies.

5. CONCLUSION

Positive touch is effective in reducing the levels of stress and anxiety in mothers whose preterm infants are admitted to the NICU. Further large high-quality studies are required to confirm the findings and determine the relationship between the impact of the positive contact and the severity of the prematurity, as well as to standardize the technique used to measure stress and anxiety.

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