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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DOI: https://doi.org/10.5281/zenodo.10040857
Published Date: 25-October-2023

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

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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>
<thead>
<tr>
<th>Database</th>
<th>Search Terms</th>
<th>Search Field</th>
<th>Search Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>PubMed</td>
<td>(&quot;Positive Touch&quot; OR &quot;Kangaroo care&quot; OR &quot;infant massage&quot; OR &quot;gentle human touch&quot; OR &quot;gentle touch&quot; OR &quot;skin-to-skin contact&quot; OR “Support Program” OR “education program”) AND (&quot;Intensive Care&quot; OR “Preterm Infants”) AND (mother OR mothers OR paternal) AND (stress OR “Parental Stressor Scale” OR anxiety)</td>
<td>All Fields</td>
<td>90</td>
</tr>
<tr>
<td>Cochrane</td>
<td>(&quot;Positive Touch&quot; OR &quot;Kangaroo care&quot; OR &quot;infant massage&quot; OR &quot;gentle human touch&quot; OR &quot;gentle touch&quot; OR &quot;skin-to-skin contact&quot; OR “Support Program” OR “education program”) AND (&quot;Intensive Care&quot; OR “Preterm Infants”) AND (mother OR mothers OR paternal) AND (stress OR “Parental Stressor Scale” OR anxiety)</td>
<td>All Fields</td>
<td>80</td>
</tr>
<tr>
<td>Web of Science</td>
<td>(&quot;Positive Touch&quot; OR &quot;Kangaroo care&quot; OR &quot;infant massage&quot; OR &quot;gentle human touch&quot; OR &quot;gentle touch&quot; OR &quot;skin-to-skin contact&quot; OR “Support Program” OR “education program”) AND (&quot;Intensive Care&quot; OR “Preterm Infants”) AND (mother OR mothers OR paternal) AND (stress OR “Parental Stressor Scale” OR anxiety)</td>
<td>All Fields</td>
<td>194</td>
</tr>
<tr>
<td>SCOPUS</td>
<td>TITLE-ABS-KEY ((&quot;Positive Touch&quot; OR &quot;Kangaroo care&quot; OR &quot;infant massage&quot; OR &quot;gentle human touch&quot; OR &quot;gentle touch&quot; OR &quot;skin-to-skin contact&quot; OR &quot;Support Program&quot; OR &quot;education program&quot;) AND (&quot;Intensive Care&quot; OR &quot;Preterm Infants&quot;) AND (mother OR mothers OR paternal) AND (stress OR &quot;Parental Stressor Scale&quot; OR anxiety))</td>
<td>Title, Abstract, Keywords</td>
<td>191</td>
</tr>
</tbody>
</table>

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.


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

<table>
<thead>
<tr>
<th>Study ID</th>
<th>Country</th>
<th>Sample size (n)</th>
<th>Settings</th>
<th>Control group</th>
<th>Outcome/measure</th>
<th>Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kazemi et al. 2023 [24]</td>
<td>Iran</td>
<td>50 (30/30)</td>
<td>The Bahar Hospital with a tertiary level neonatal intensive care unit (NICU) in the northeast of Iran over eight months in 2018-2019, from December 2018 to July 2019.</td>
<td>Kangaroo Care group and the usual care and support group</td>
<td>Depression, Anxiety, and Stress Scale (DASS-21)</td>
<td>KMG and massage were effective in reducing stress and anxiety in mothers compared to the baseline and the control group</td>
</tr>
<tr>
<td>Efe et al. 2020 [19]</td>
<td>Turkey</td>
<td>20 (10-10)</td>
<td>Four university and regional rehabilitation hospitals in Turkey from February to October 2018.</td>
<td>Kangaroo Care group and the usual care</td>
<td>Self-administered Kangaroo Care Questionnaire</td>
<td>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' reported having fewer parenting stressors compared to the control group, with less stress (p &lt; 0.05).</td>
</tr>
<tr>
<td>Jefferies et al. 2021 [18]</td>
<td>Malaysia</td>
<td>96 (48-48)</td>
<td>At the NICU in a tertiary referral teaching hospital from February 2016 to July 2018, while the experimental group from October 2018 to April 2019.</td>
<td>Kangaroo Care</td>
<td>Self-administered Kangaroo Care Questionnaire</td>
<td>No significant effect was observed between the two groups in terms of stress and anxiety at discharge (full term) or after one year</td>
</tr>
<tr>
<td>Al-Ayshi et al. 2019 [17]</td>
<td>Iraq</td>
<td>52 (11-11)</td>
<td>In 2017, hospitalized in the NICU of the Tawke Teaching Hospital, Baghdad, Iraq.</td>
<td>Kangaroo Care</td>
<td>Psychometric scores of neonatal stress, and all maternal stress in the experimental group were significantly greater than those in the control group (p &lt; 0.05).</td>
<td></td>
</tr>
<tr>
<td>Saeed et al. 2021 [16]</td>
<td>USA</td>
<td>52 (24-28)</td>
<td>From consecutive admissions at St. Louis Children's Hospital NICU, an 80-bed unit, comparing 112 and during the course of the study, 43 NICU from August 2017 to 2018.</td>
<td>Kangaroo Care</td>
<td>No significant effect was observed between the two groups in terms of stress and anxiety at discharge (full term) or after one year</td>
<td></td>
</tr>
</tbody>
</table>

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 high risk of seven trials. Figure 2 shows the summary of the quality assessment 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 Khazaii 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.

**Strengths 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.

**REFERENCES**


