

Conference Paper

Bathing Method for Preterm Infants: A Systematic Review

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Abstract

Background: Current research suggests that routine daily bathing for preterm infants can render many adverse effects on physiological responses and comfort distress of the infant. Repeated stress on premature babies can have destructive longterm effects on brain development. **Objectives:** To identify the best current evidence regarding bathing method for preterm infants in enhancing neuro developmental care by using atraumatic care approach. **Methods:** A comprehensive literature search was performed in PubMed, ScienceDirect, Wiley Online Library, EbscoHost, Proquest from year of 2008 – May 2019 with the search strategy keywords: bathing, behavioral responses, physiological parameters, premature babies, preterm infants. Inclusion criteria for this study were an original research or systematic review about preterm/premature infants with gestational age is 30 – 37 weeks. PRISMA guideline was applied as a search strategy tool, compared to the used of another conceptualizing tool. **Results:** A total of 883 of records were identified. After removal of duplicates and initial screening, nine articles met the inclusion criteria of bathing methods for preterm infants. There are several bathing methods were identified: sponge bath, conventional/immersion tub bath, and swaddle bath which is related to physiological responses and behavioral distress during and after bathing intervention. This systematic review showed that swaddle bath had a positive effect on physiological measurement and behavioral responses to preterm infants compared to conventional tub bath and sponge bath which can increase physiological and behavioral discomfort to the preterm infants. **Conclusion:** This study showed that some of the processes actually reduce negative effects of bathing on the health of the preterm infants. Swaddle bath has proven to be the best and safest type of bathing method for preterm infants during hospitalization that produces fewer changes regarding physiological and behavioral distress to the preterm infants. It is recommended that swaddle bath should be used for preterm infants during they are hospitalized and to be considered as a standard operating procedure in the perinatology unit and neonatal intensive care unit or pediatric intensive care unit.

Keywords: Bathing, Behavioral Responses, Physiological Parameters, Premature Babies, Preterm Infants

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1. Introduction

Born premature becomes great challenges for the infants that is being exposed to a very different environment from the mother's womb and organ immaturity [1–5]. Painful procedure, sleep disturbances, separation from mother, noisy and very bright light are associated to stress elevation on hospitalized preterm infants [6]. Recurrent facing stress and having painful experience on premature babies can have detrimental long term effects on brain development [7–10].

One of the newborns' skin practices in the neonatal intensive care units is bathing, with the purpose to removing wastes and harmful substance on the surface of the skin, providing aesthetic appearance, and avoiding the colonization of microorganism [11, 12]. However, the daily bath for preterm infants is a routine activity which often traumatizes the baby. Nursing intervention of premature babies bathing procedure have not used pain reduction method or atraumatic care approach [3, 13].

Giving a daily bath is an extremely stressful on preterm infants, which can be triggered in some related physiological responses such as hypothermic, hypoxia, dyspnea, cyanosis, desaturated, and tachycardia [9, 14–16]. And behavioral (comfort) distress such as crying/fussing, eyes open, yawning, tongue extension, pain and stress level [14–18]. Despite of post bathing physiological and comfort distress, it provides many advantages such as cleansing and protecting the outer layer of the body, prevention of infections, wipe unwanted substance, in addition to stimulating the general circulation of the skin, alleviates pain, and providing comfort and well-being [2, 15, 19–21].

Most of the caregivers experienced that babies are so intense during bath intervention. The baby cries from the beginning even to the end of the intervention. Some babies become hypothermic. Sponge bath method is the most common bath method used in many hospitals in Indonesia because it is simple and saves time for nurses in their busy schedules. And few preterm babies will be given conventional tub bath before discharged from the hospital in Indonesia. The objective of our systematic review was to identify the best current evidence regarding bathing method for preterm infants in enhancing neuro developmental care by using atraumatic care approach. This systematic review will answer the following research question: in preterm infants, what the best bathing method for preterm infants to improve neuro development care during hospitalization?.

2. Methods

The systematic review was conducted by using Preferred Reporting of Items of Systematic reviews MetaAnalyses (PRISMA) guideline to evaluate the effects of bathing on the physiological responses and behavioral/comfort distress for preterm infants. The custom range of year publication is from year of 2008 – May 2019. The engine search was carried out in the subsequent databases: PubMed, ScienceDirect, Wiley Online Library, EbscoHost, Proquest. Using the search strategy keywords: Bathing, Behavioral Responses, Physiological Parameters, Premature Babies, Preterm Infants.

The Criteria inclusions are in English, full-text, full access article, preterm/premature infants with gestational age is 30 – 37 weeks. The selection of studies by synthesizing the article, removing the irrelevant and duplicate, screening the articles and excluded if its out of criteria inclusions. Exclusion criteria is the articles with full term/term infants, not in English, abstract only, not full accessed articles as seen below in Figure 1. Flow diagram of selection process.

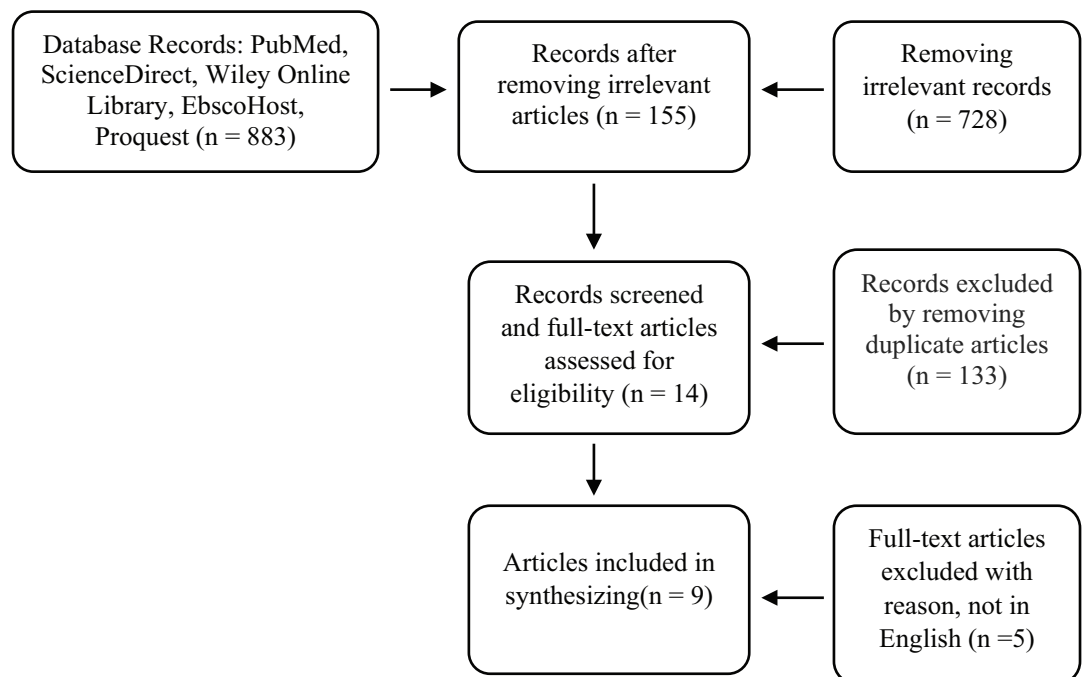


Figure 1: Flow diagram of selection process.

3. Results

In the explained articles, a total of 883 references were found, and 14 articles were reviewed and 5 articles were not in English. Finally, 9 articles met the inclusion and exclusion criteria of bathing method for preterm infants.

3.1. Charasteristic of Studies

One study was true experimental comparative research design [16], two articles were randomized clinical trial [14, 15], two randomized crossover clinical trial [17, 18]. The other study were two systematic review [23, 24], one randomized controlled trial [25], one randomized crossover trial [19]. The articles focused on physiological instability for preterm infants based on to the type of bath, differenting bath type with sponge bath, conventional or immersion bath (in bath tub), and swaddle bath, [14, 16–18, 24, 25].

The behavioral responses or distress (discomfort) of bathing method for preterm infants according to the type of bath: sponge bath, conventional or immersion bath (in bath tub), and swaddle bath [14–18]. A systematic review of bathing method comparison (sponge bath, conventional or immersion bath (in bath tub), and swaddle bath) for preterm infants [23, 24]. A description of the selected articles is given in Table 1. Description of the Selected Articles.

TABLE 1: Description of the Selected Articles.

No	Author	Methodology	Results
1	[16]	True experimental comparative research design. 60 preterm infants (30 in group A swaddle bath and 30 in group B conventional tub bath), to measure vital signs and crying duration.	The finding showed that there was no significant difference in pretest level of vital signs among the preterm infants between group A and group B. The unpaired, "t" value of thermal stability at 10th minute & at 30th minute after bath were 2.27, 4.33 for temperature; -7.39, -6.80 for heart rate; -10.75, -7.21 for respiratory rate; 2.40, 1.39 for oxygen saturation respectively which shows that there was significantly high difference between group A and group B at $p < 0.001$ level. The crying duration among preterm infants between group A and group B showed the premature infants with swaddle bath cried less than conventional bath. The calculated unpaired, "t" value was -10.92 which shows there was high statistical significance at $p < 0.001$.

No	Author	Methodology	Results
2	[14]	Randomized Clinical Trial. 50 premature infants (25 in experimental group and 25 in control group), to analyze body temperature at 10 minutes pretest and 10 minutes post bath and crying duration during bath.	The mean temperature loss was significantly less in the swaddle bath as experimental group (36.42) newborns compared to the conventional bath as control group (35.96) newborns with p value < 0.001 with independent t test. Furthermore, crying time was significantly less in the experimental group (mean = 5.81) than in the control group (mean 43.41) with p value < 0.001 through Mann Whitney U test.
3	[15]	Randomized Clinical Trial. 50 Preterm infants (25 in experimental group and 25 in control group), to analyze the behavioral responses.	The results during bath revealed that the behavioral responses as facial grimace (P<0.001), mouthing/yawing movements (P<0.001), tongue extension (P=0.017), eyes open (P=0.027), and fussing/crying (P<0.001) were significantly lower in the experimental group than those in the control group. In addition, the percentage of eyes closed was higher in the experimental group, compared to the control group (P=0.006).
4	[17]	Pilot Study, Randomized Crossover Clinical Trial. 15 preterm newborns were applied to two immersion or tub bath with the interval 24 and 48 hours from the previous bath. To analyze the axillary temperature.	There mean axillary temperatures at 10th and 20th minute post baths were similar which in swaddle bath (mean 36.3 and 36.3) and conventional immersion bath (mean 36.2 and 36.3) with p value > 0.005.
5	[19]	Randomized Crossover Trial. 21 preterm infants in conventional bath and 22 preterm infants in swaddle bath. To measure vital signs, stress salivary cortisol levels and sleep-wake states from baseline to 20 minutes post bath.	There were significant differences between the two bath types on body temperature, heart rate, oxygen saturation, and salivary cortisol level at 10 minutes pretest, 10 and 20 minutes post bath with p value > 0.05. And There were no significant differences in sleep-wake states with p value = 0.094.
6	[18]	Randomized Crossover Clinical Trial. 35 premature newborns (swaddle and sponge bath were applied to the same infants in 3 days interval), to analyse pretest and minutes 1,5,15,30. vital signs, crying time, pain and stress score.	There were statistically significant differences between bathing methods on vital signs, oxygen saturation levels, and crying times with p value < 0.05 except heart rate 30 minutes post bath were 0.304 with paired t test. Levels of stress and pain according to bathing type were significantly higher in the sponge bath condition (p <0.05).
7	[25]	Randomized Controlled Trial. A hundred (100) preterm infants (50 in sponge and 50 in immersion tub). To measure body temperature at 10 minutes prior to bathing, 10 and 30 minutes following bathing.	Infants who were tub bathed experienced significantly less variability in body temperature and overall were warmer 10 minutes and 30 minutes following the bath compared to infants who were sponge bathed (p = 0.024).
8	[24]	Systematic Review. Method: Systematic review using Pico format with keywords engine search:baths, premature, body temperature, neonatal nursing, review through Biblioteca Virtual em Saude/Lilacs (BVS), CINAHL, Cochrane Library, Google Scholar, PubMed, SCOPUS and Web of Science.To verify the effect of bathing on the body temperature of preterm infants.	A total of 824 published records were identified and 4 articles met the inclusion criteria which three analyzed the effect of sponge baths and the effect of immersion baths. Sponge baths showed a statistically significant drop in body temperature, while in immersion baths the body temperature remained stable.

No	Author	Methodology	Results
9	[23]	Systematic Review. A database engine search was carried out in the following: Pubmed, ScienceDirect, Web of Science, Scopus, Wiley, Biblioteca Virtual de Salud Joanna Briggs. The search strategy keywords: baths, infants, premature, preterm, neonatal prematurity, intensive care units, neonatal or ICU premature. To synthesize the best available evidence of bathing for premature newborns.	Ten articles (438 patients) met the inclusion criteria, of which one was a quasi-experimental trial, five randomized clinical trials, one cohort study and three followed a descriptive design. A comparison has been made according to the type of bath: sponge bath, bathtub and swaddle bath, showing that the swaddle bath was less related to temperature changes and stress levels. And, it has been observed that the nurse's behavior is also closely related to the stress suffered by the premature infant.

4. Discussion

This present study tried to analyze results of previous studies about several bathing methods for preterm infants to significantly minimize physiological and behavioral distress. Findings suggest there is evidence to support that best bathing method that can be used in preterm infants to provide a pleasant bathing type in enhancing neuro developmental care through atraumatic care approach.

One of the study by [16] conducted a true experimental comparative study at the NICU of Anand hospital in Surat India on 60 premature infants (30 in group A who received swaddle bath treatment and 30 in group B with conventional bath). The inclusion criteria were preterm infant born between 30 – 36 weeks gestational age, stable vital signs, umbilical cord is already fell of, body weight before bath \geq 1,500 grams. The other study, [14] studied a randomized clinical trial at the NICU of Hafez hospital in Shiraz Iran on 50 premature infants (25 in experimental group and 25 in control group) with the inclusion criteria were gestational age of 30 – 36 weeks, postnatal age of 7 – 30 days, not using sedatives or relaxants, no major congenital, chromosomal or neurological abnormalities, no need for surgery, no severe growth problems from birth, no evidence of grade II or higher intraventricular hemorrhage, stability of physiological parameters in the infant, and no substance abuse or sedative drug use by the mother.

The results of the study found that there was no significant difference in pretest level of vital signs among the preterm infants between group A and group B. The unpaired, "t" value of thermal stability at 10th minute & at 30th minute after bath were 2.27, 4.33 for temperature; -7.39, -6.80 for heart rate; -10.75, -7.21 for respiratory rate; 2.40, 1.39 for oxygen saturation respectively which shows that there was significantly high difference between group A and group B at $p < 0.001$ level [16]. While [14] showed that the mean temperature loss was significantly less in the swaddle bath as experimental group

(36.42) newborns compared to the conventional bath as control group (35.96) newborns with p value < 0.001 with independent t test.

[16] analyzed that crying duration among preterm infants between group A and group B showed the premature infants with swaddle bath cried less than conventional bath. The calculated unpaired „ t “ value was -10.92 which shows there was high statistical significance at $p < 0.001$. And the other study revealed similarly that crying time was significantly less in the experimental group (mean = 5.81) than in the control group (mean 43.41) with p value < 0.001 through Mann Whitney U test [14, 15] conducted randomized clinical trial to continue Edraki's research on 50 Preterm infants (25 in experimental group and 25 in control group), the results during bath revealed that the behavioral responses as facial grimace ($P < 0.001$), mouthing/yawning movements ($P < 0.001$), tongue extension ($P = 0.017$), eyes open ($P = 0.027$), and fussing/crying ($P < 0.001$) were significantly lower in the experimental group than those in the control group. In addition, the percentage of eyes closed was higher in the experimental group, compared to the control group ($P = 0.006$).

Pilot study, randomized crossover clinical trial were conducted in university of Sao Paulo hospital on 15 preterm newborns and applied two immersion or tub bath with the interval 24 and 48 hours from the previous bath with the inclusion criteria were with gestational age at birth up to 36 weeks and five days (36.71 weeks), postnatal age ≥ 24 hours, axillary temperature between $36.0 - 37.5^{\circ}\text{C}$, spontaneous breathing, without congenital anomalies or previous surgeries, nor the use of sedatives. There mean axillary temperatures at 10th and 20th minute post baths were similar which in swaddle bath (mean 36.3 and 36.3) and conventional immersion bath (mean 36.2 and 36.3) with p value > 0.005 [17].

[17] continued the study to a randomized crossover trial on 21 preterm infants in conventional bath and 22 preterm infants in swaddle bath. And the researchers were adding more specific inclusion criteria with gestational age between 32 – 36 weeks, axillary temperature $36.5 - 37.5^{\circ}\text{C}$, heart rate 120 – 160 beats/minute, $\text{SPO}_2 > 89\%$ during the 6 hours prior to the tub bath, fasting at least 1 hour before bathing. There were significant differences between the two bath types on body temperature, heart rate, oxygen saturation, and salivary cortisol level at 10 minutes pretest, 10 and 20 minutes post bath with p value > 0.05 . And There were no significant differences in sleep-wake states with p value = 0.094 .

Meanwhile, [18] study at NICU of public hospital in Denizli Turkey conducted randomized crossover clinical trial on 35 premature newborns (swaddle and sponge bath were

applied to the same infants in 3 days interval). And the inclusion criteria were 33–37 weeks gestational age, birth weight of 1,500 grams or more, stable vital signs, body temperature ranging from 36.5 - 37.5°C, no signs of infection, no neurological problems, no congenital defects, no deterioration of skin integrity, not receiving analgesic, sedative, or muscle relaxant medication. There were statistically significant differences between bathing methods on vital signs, oxygen saturation levels, and crying times with p value < 0.05 except heart rate 30 minutes post bath were 0.304 with paired t test. Levels of stress and pain according to bathing type were significantly higher in the sponge bath condition ($p < 0.05$).

Other study to see the effect of sponge bath were done by [25] with randomized controlled trial method on a hundred (100) preterm infants (50 in sponge and 50 in immersion tub) to measure body temperature at 10 minutes prior to bathing, 10 and 30 minutes following bathing. The Infants who were tub bathed experienced significantly less variability in body temperature and overall were warmer 10 minutes and 30 minutes following the bath compared to infants who were sponge bathed ($p = 0.024$). [24] conducted a systematic review using PICO format with keywords engine search: baths, premature, body temperature, neonatal nursing, review through Biblioteca Virtual em Saude/Lilacs (BVS), CINAHL, Cochrane Library, Google Scholar, PubMed, SCOPUS and Web of Science. A total of 824 published records were identified, 4 articles met the inclusion criteria which three analyzed the effect of sponge baths and the effect of immersion baths. Sponge baths showed a statistically significant drop in body temperature, while in immersion baths the body temperature remained stable.

An overview of the articles [23] using a systematic review on database engine search: Pubmed, ScienceDirect, Web of Science, Scopus, Wiley, Biblioteca Virtual de Salud Joanna Briggs. The search strategy keywords: baths, infants, premature, preterm, neonatal prematurity, intensive care units, neonatal or ICU premature. The review concluded that comparisons have been made for the sponge bath, tub bathing, and swaddle bath methods indicating that the swaddle bath is safer related to changes in body temperature and stress levels. And, it has been observed that the nurse's behavior is also closely related to the stress suffered by the premature infant.

This systematic review showed that swaddle bath had a positive effect on physiological measurement and behavioral responses to preterm infants compared to conventional and sponge bath. [22] showed that bathing with swaddling method was more effective in maintaining the baby's body temperature. Huge detrimental effects of sponge bath method is no longer recommended at European roundtable meetings [26, 27]. And it will give a huge contribution to improve neuro development highlights

important information for nursing practice in Indonesia to provide direction in caring for preterm infants in reducing stress and un-comfort situation during hospitalization.

5. Conclusions and Suggestions

In this systematic review, it showed that some of the processes actually reduce negative effects of bathing on the health of the preterm infants. Swaddle bath has proven to be the best and safest type of bathing method for preterm infants during hospitalization that produces fewer changes regarding physiological and behavioral distress to the preterm infants. It is recommended that swaddle bath should be used for preterm infants during they are hospitalized and to be considered as a standard operating procedure in the perinatology unit and neonatal intensive care unit or pediatric intensive care unit.

Conflict of Interest

The authors declare that they have no competing interests.

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