Indonesian Journal of Global Health Research
Volume 7 Number 2, April 2025
e-ISSN 2715-1972; p-ISSN 2714-9749
http://jurnal.globalhealthsciencegroup.com/index.php/IJGHR

NESTING TECHNIQUE AS A SIMPLE METHOD FOR OPTIMAL OUTCOMES IN PREMATURE INFANT CARE: A LITERATURE REVIEW

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ABSTRACT
Preterm birth accounts for up to two-thirds of total cases worldwide. Premature infants often face challenges in adapting to life outside the womb due to immature organ development. Nesting is a method designed to create an environment resembling conditions in the womb by positioning the infant's body in a flexed posture and surrounding it with rolled cloth. This study aims to identify the physiological and psychological benefits of nesting while also providing evidence-based implementation guidelines for neonatal clinical practice. This study utilized a literature review design guided by the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA). Article searches were conducted through electronic databases, including PubMed, Google Scholar, Crossref, OpenAlex, and Semantic Scholar. The search keywords used the Boolean operator (AND): "nesting AND preterm". Based on the review of 16 articles, the findings suggest that the nesting technique significantly contributes to improving physiological and behavioral parameters in premature infants. This technique provides numerous benefits, including enhanced vital stability, sleep quality, and neurobehavioral development. Overall, the nesting technique is an effective, safe, and easy-to-implement non-pharmacological method for improving the quality of care for premature infants. This intervention holds great potential to support physiological stability, sleep quality, and overall infant development.

Keywords: nesting; premature infants; simple method; sleep quality; vital stability

How to cite (in APA style)
Indartik, I., Khasanah, N. N., & Wahyuni, S. (2025). Nesting Technique as A Simple Method for Optimal Outcomes in Premature Infant Care: A Literature Review. Indonesian Journal of Global Health Research, 7(2), 583-594. https://doi.org/10.37287/ijghr.v7i2.5650.

INTRODUCTION

Premature birth, defined as delivery before 37 weeks of gestation, is one of the leading causes of neonatal mortality, accounting for up to two-thirds of global cases (Rohmah et al., 2020). Premature infants often face various challenges in adapting to life outside the womb due to underdeveloped organs. This condition increases the risk of severe complications, such as Respiratory Distress Syndrome (RDS), hypothermia, and significant weight loss resulting from inadequate fat reserves (Rohmah et al., 2020). Therefore, appropriate and evidence-based interventions are essential to support the physiological stability and development of premature infants (Rohmah et al., 2020).

Nesting is one such simple intervention designed to create a womb-like environment. This technique aims to support the adaptation of premature infants in the Neonatal Intensive Care Unit (NICU) by promoting controlled body positioning, such as midline orientation and limb flexion (Efendi et al., 2019). Nesting enables infants to achieve physiological positioning that enhances comfort, vital stability, and neuromuscular development (Efendi et al., 2019). By providing postural support that mimics intrauterine conditions, nesting improves respiratory efficiency, optimizes blood circulation, and promotes motor function development (Efendi et al., 2019). Numerous studies have demonstrated the significant benefits of nesting for premature infants. This technique has been shown to improve hemodynamic stability, reduce

the risk of respiratory distress, and enhance sleep quality. Additionally, nesting helps conserve energy, allowing the available energy to be utilized for growth and development (Efendi et al., 2019). The foundation of nesting lies in meeting the need for appropriate postural support in premature infants (Efendi et al., 2019). These infants often struggle to adjust to the external environment due to organ immaturity. However, implementing nesting faces challenges in various healthcare facilities. The lack of suitable tools and insufficient training of healthcare providers are major obstacles (Efendi et al., 2019). In developing countries, modified cloth-based nesting is often used as a solution, but without adequate knowledge and skills, the outcomes may be suboptimal (Efendi et al., 2019). Although the benefits of nesting interventions have been widely reported, studies show variations in effectiveness based on factors such as resource availability, implementation approaches, and healthcare providers' skills (Ahmed et al., 2024). Therefore, a systematic literature review is needed to comprehensively understand the impact of nesting interventions on premature infants. This review aims to identify the physiological and psychological benefits of nesting while offering evidence-based implementation guidelines for neonatal clinical practice.

METHOD

This study was conducted as a systematic literature review following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines (Moher et al., 2009). Articles were retrieved from electronic databases, including PubMed, Google Scholar, Crossref, OpenAlex, and Semantic Scholar, to ensure comprehensive coverage of relevant literature. The keywords used included "nesting" and "preterm," combined with Boolean operators (AND) to enhance search sensitivity and specificity. Literature published between 2019 and 2024 was selected to ensure the use of the most up-to-date data.

Articles included in this review met the following criteria: (a) primary research with clear and measurable methodology, (b) quantitative studies with experimental, quasi-experimental, or cohort designs documenting the effects of interventions, (c) articles published in peer-reviewed journals, (d) studies published in English or Indonesian, and (e) studies providing comprehensive reports on physiological outcomes, motor development, or behavioral stability of premature infants. Exclusion criteria included case reports, editorials, or review articles that did not provide empirical data. Selection and Data Collection Process. The selection process involved two stages. In the first stage, abstracts and titles were screened to evaluate initial relevance. In the second stage, articles that passed the initial screening were read in full to ensure they met the inclusion criteria.

Once the articles were selected, data were extracted using a standardized form. The extracted information included (a) study design, (b) sample size and characteristics, (c) type of nesting intervention, and (d) primary outcomes reported, such as body temperature stability, sleep patterns, or vital parameters. Data were analyzed narratively and descriptively to identify patterns or trends in the study findings. A synthesis of the results was conducted to categorize the benefits of nesting based on physiological and developmental aspects of premature infants. The PICO framework (Population, Intervention, Comparison, Outcome) was applied to formulate a systematic research question, guiding the analysis of relevant literature in a focused manner. This framework helped define the research scope based on population, intervention, comparison, and relevant outcomes. The initial PICO formulation for this topic is as follows:

Table 1.
PICO Analysis

Criteria	Inclusion	Exclusion
Population	- Premature infants born at less than 37 weeks of gestation. - Infants admitted to the NICU or specialized neonatal care units. - Medically stable infants eligible to receive positioning interventions.	- Studies involving full-term infants (gestational age ≥37 weeks). - Infants with severe medical conditions (e.g., major congenital anomalies or acute illnesses such as sepsis) that could influence intervention outcomes. - Infants not admitted to the NICU or specialized neonatal care units.
Intervention	- Studies implementing the Nesting method as the primary approach in infant care. - Nesting is performed using specialized devices or tools designed to ergonomically support the infant's posture. - The duration and frequency of Nesting are recorded and described in detail within the study.	- Studies that do not utilize the Nesting method as the primary intervention. - Use of alternative methods or tools for infant positioning (e.g., Kangaroo Care). - Interventions conducted without a clear protocol or standardized duration.
Comparison	- Studies with a control group receiving standard care without the use of Nesting. - Comparable alternative care methods.	- Research without a control group receiving standard care. - Research utilizing comparison groups with methods that are irrelevant or not equivalent.
Outcome	The reported outcomes should include one or more of the following: - Physiological stability (e.g., body temperature, oxygen saturation). - Motor development. - Behavioral stability (e.g., sleep patterns, response to stress).	- Studies that do not report data on infant physiological outcomes, motor development, or stress indicators. - Studies focused solely on subjective aspects, such as the experiences of parents or caregivers, without objective data on the infant.

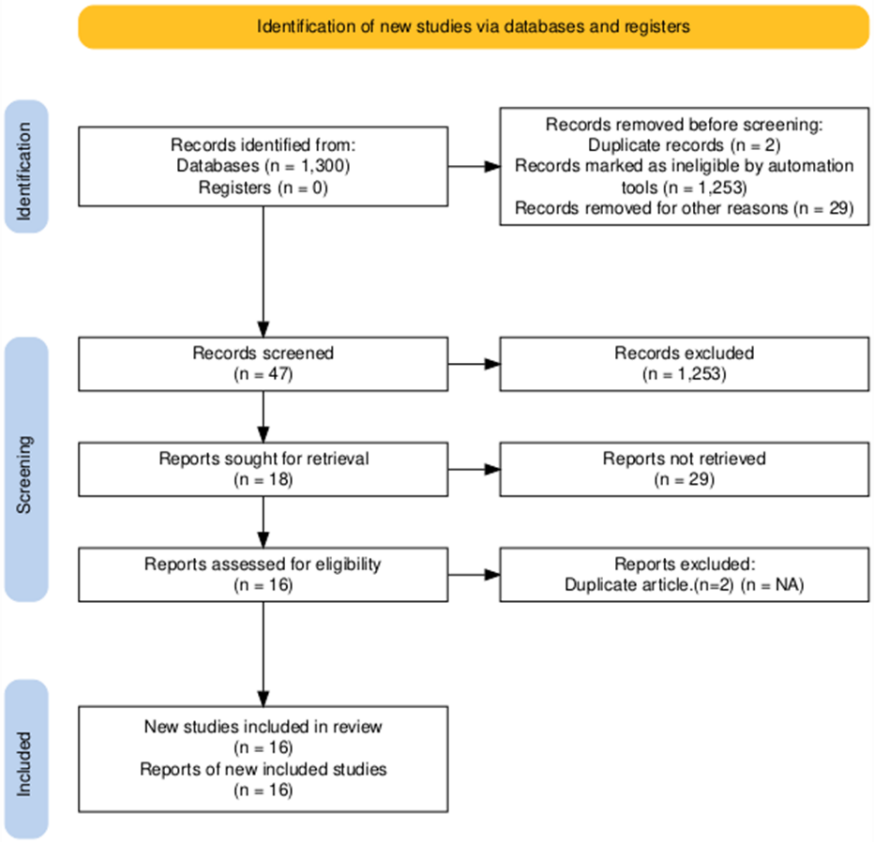

Diagram 1. PRISMA Diagram

RESULT

The nesting intervention has been proven to have a significant impact on the physiological and behavioral parameters of preterm infants across various studies. For instance, Costa et al.

found that infants receiving the nesting technique demonstrated significant improvements in posture and motor abilities compared to the control group, although no meaningful differences were observed in other parameters (Costa et al., 2019). Meanwhile, Rohmah reported an increase in oxygen saturation from 91% to 95.71%, a decrease in respiratory rate from 64 to 53.43 breaths per minute, and a weight gain of 28.57 grams in the nesting group (Rohmah et al., 2020). Another study by Vadakkan and Prabakaran reported that preterm infants in a nesting position had an average sleep duration of 206.4 minutes (SD: 28), which was higher than the swaddling group's 183.1 minutes (SD: 34.78) (Vadakkan & Prabakaran, 2022). The frequency of awakening was also lower in the nesting group, indicating better sleep quality (Vadakkan & Prabakaran, 2022). Pahadi et al. (2024) supported these findings, reporting an increase in sleep duration of 19.95 minutes in the experimental group compared to the control group ($p < 0.001$) (Pahadi et al., 2024).

Sayed and Hassan (2020) demonstrated that 85.7% of infants using the nesting technique achieved normal body temperature, while the control group did not reach this outcome (Sayed & Hassan, 2020). Additionally, 100% of infants in the nesting group had oxygen saturation levels of ≥95%, compared to 90% in the non-nesting group (Sayed & Hassan, 2020). This technique was also effective in reducing pain, with 85.8% of infants in the nesting group reporting mild or no pain, compared to only 20% in the control group (Sayed & Hassan, 2020). Furthermore, Shamkhi and Shawq (2024) found significant improvements in cardiorespiratory parameters after three days of nesting intervention. For example, heart rates decreased from 156 bpm to 133 bpm in the supine position, while oxygen saturation increased from 93–94% to 96–98% (Abdul et al., 2024). A similar study by Kaur et al. (2022) indicated that the nesting technique enhanced the stability of physiological parameters, such as heart rate, respiratory rate, and oxygen saturation, with p-values < 0.05 (Kaur et al., 2022).With this extensive quantitative evidence, it can be concluded that the nesting technique provides significant benefits in improving the physiological stability and behavior of preterm infants and can be widely implemented as a care intervention.

Table 2
Data Extraction

Title	Author/ Year	Research Objectives	Type of Research	Population/ Sample	Research Results
Hammock and Nesting in Preterm Infants: A Randomized Controlled Trial	(Costa et al., 2019)	To compare the physiological variables and the sleep-wake pattern presented by preterm in nesting and hammock positions after diaper change	Randomize Controlled Trial (RCT	NICU of a public hospital reference in maternal and child care in Brasilia, Federal District, from September 2015 to March 2016. Sample 20 preterm infants	No differences were identified between the nest and the hammock; however, the use of the hammock favored the sleep of preterm infants compared to its non-use.
Effectiveness of Use of Nesting on Body Weight, Oxygen Saturation Stability, and Breath Frequency in Prematures in NICU Room Gambiran Hospital	(Rohmah et al., 2020)	to determine the effectiveness of the use of nesting 5 and 7 days in maintaining the stability of oxygen saturation, breathing frequency and body weight in premature infants in the NICU Room at Gambiran	quasi-eksperimen with one-group pretest-posttest	population was 30 preterm infants. 14 samples of preterm infants.	Nesting is effective in improving oxygenation stability, reducing respiratory rate, and increasing the weight of preterm infants.

Title	Author/ Year	Research Objectives	Type of Research	Population/ Sample	Research Results
		City Hospital in Kediri.			
Comparison of the Effect of Nesting and Swaddling on Sleep Duration and Arousal Frequency among Preterm Neonates: A Randomized Clinical Trial	(Vadakkan & Prabakaran, 2022)	Compared to swaddling position, nesting position improved sleep duration and reduced frequency of arousal and stabilized vital signs.	Randomize Controlled Trial (RCT	76 preterm neonates in NICU of a tertiary care center.	Conclusion: Nesting enhances the duration of sleep among preterm neonates and hence this can be given priority in NICU.
Effect of Supportive Positioning on COMFORT Scale Scores in Preterm Newborns	(Yapicioğlu Yildizdaş et al., 2021)	To evaluate the effect of supportive positioning on weight gain, vital signs, feeding intolerance, duration of ventilation, duration of hospitalization and comfort scale scores of the premature babies in neonatal intensive care unit.	Experiment with two group	Sample 50 premature infants	The nesting position has a positive effect on comfort scores and oxygen saturation in preterm infants.
Effect of Positioning on Physiological Parameters on Low Birth Weight Preterm Babies in Neonatal Intensive Care Unit	(Alice Jeba et al., 2019)	this study intended to determine the changes in parameters of preterm infants in terms of heart rate, respiratory rate, temperature & oxygen saturation before and after the nesting.	The experimental design was chosen, consisting of pre-test and post-test control group. Simple Random sampling	NICU if NRR hospital Bangalore Sample : 40 preterm infants (20 in experimental & 20 in the control group	The nesting intervention is effective in improving and stabilizing the physiological parameters of preterm infants in the NICU.
Effectiveness of Nesting Technique on Posture and Physiological Parameters	(Sumathy, 2020)	The study concluded that nesting technique among preterm and low birth weight babies helps stabilize the vital parameters and posture maintenance.	quasi experimental one group pre- and posttest design	Sample : 40 preterm and low birth weight babies	The study concluded that nesting technique among preterm and low birth weight babies helps stabilize the vital parameters and posture maintenance.
Effect of Nesting on Physiological Parameters among Preterm Babies Admitted in NICU	(Unnikrishnan & Aneesha, 2024)	to analyze the physiological parameters among preterm babies, determine the effect of nesting on physiological parameters among preterm babies, and also to find the association between physiological parameters with baseline variables.	Cross-over design with a quantitative approach. purposive sampling technique	Neonatal Intensive Care Unit of Amala Institute of Medical Sciences, Thrissur, Kerala. Sample 20 preterm babies	Nesting is effective in improving the physiological stability of preterm infants, particularly in increasing oxygen saturation.
Pain Relief in Late Preterm Neonates: A Comparative Study of Kangaroo Mother Care, Oral Dextrose 50%, and Supine Nesting Position	(Kapoor, Anju; Khan, Mohammad Asad; Beoh, 2021)	To study KMC and oral dextrose 50% are equally effective and superior to supine nesting position in reducing pain response in late preterm neonates during heel prick	Randomized controlled trial paralel, non-blinded	NICU and postnatal ward of a tertiary care hospital from January 2017 to October 2018. Sample 149 preterm neonates	The analgesic effect of KMC and oral D50 is comparable and found to be superior to supine nesting position in reducing pain of

Title	Author/ Year	Research Objectives	Type of Research	Population/ Sample	Research Results
					heel prick.
Nesting Technique: It's Effect on Physiological Parameters and Neurobehavioral Organization in Preterm Infants	(Sayed & Hassan, 2020)	The aim of this study was to examine the effect of the nesting technique on physiological parameters and behavioural organization in preterm infants.	Quasi-experimental	Neonatal Intensive Care Unit at EL-Menoufia University Hospital, Shebin El-Kom City, Egypt. Sample 60 Preterm infants	Conclusion: the study concluded that preterm infants who received nesting technique had a better physiological adjustment and neurobehavioral organization than preterm infants in the study group II
An Experimental Study to Assess the Effectiveness of Nesting on Physiological Parameters and Posture of Preterm Babies in a Selected Hospital, New Delhi	(Kaur et al., 2022)	To find out the association between the physiological parameters with the selected variables of preterm babies.	A pure experimental study, comparing the intervention group (nesting) and the control group (without nesting). probability sampling technique (simple random sampling)	the Neonatal Intensive Care Unit of Kasturba Hospital and Hindu Rao Hospital, Delhi. A total of 60 samples (30in the experimental and 30 in the control group)	Nesting significantly stabilizes HR (heart rate), RR (respiratory rate), and SaO_2 (oxygen saturation) and improves the posture of premature infants compared to the control group.
Effect of Nesting on Extensor Motor Behaviors in Preterm Infants: A Randomized Clinical Trial	(Eskandari et al., 2020)	To investigate the effect of bedding preterm infants in nests on their motor behaviors in a neonatal intensive care unit (NICU) in Iran.	Randomized Controlled Trial (RCT)	44 clinically stable preterm infants, admitted to the NICU	The use of nesting can be a cost-effective and efficient approach to support the motor development of premature infants in the NICU.
Effect of Nesting and Swaddled Position on Behavioral Readiness and Feeding Progression of Preterm Neonates	(Ahmed et al., 2024)	This study aims to determine the effect of nesting and swaddled position on behavioral readiness and feeding progression of preterm neonates	Quasi-experimental design	Sample 80 preterm neonates in Hospital routine care	a. Nesting and swaddling positions support feeding readiness and the progression of feeding in premature neonates. b. Neonates exhibited improved oral-motor coordination, physiological stability, weight gain, and milk intake.
Effectiveness of Nesting Practice on Posture and Movements Among Preterm Babies in NICU of a Tertiary Care Hospital at	(Garnayak et al., 2024)	To find-out the correlation between posture and movement among preterm babies of experimental and control group.	Quasi-experimental with a non-randomized pretest-posttest control group	preterm babies from the NICU of KIMS Hospital. Sample 30 participants with 15 participantsin	Nesting practice was significantly effective on posture and movements which was highly statistically

Title	Author/ Year	Research Objectives	Type of Research	Population/ Sample	Research Results
Bhubaneswar			design.	each group. Instrument : the standardized observational Albert scale	significance at p value ≤0.05.
Efficacy of Nesting on Physiological Parameters among Preterm Babies Admitted at Tertiary Care Hospital Karad	(Priyanka Nivas Nikam et al., 2023)	To assess physiological parameters among control group and experimental group, to evaluate the effectiveness of nesting on physoulostal parameters ar preterm babies and to find an association physiological parameters with deciul sociodemographia variables	Experimental pretest–posttest control group design	60 preterm babies were selected (30 experimental group and 30 control group) from Krishna Hospital and Medical Research Center, Karad	Study concluded that nesting was effectively stabilizing the physiological parameters of preterm babies (temperature, heart rate, respiration rate, SpO2, and weight).
Effect of Nesting and Swaddling on Sleep Duration of Preterm Neonate Hospitalized at Tertiary Care Centre of Eastern Nepal	(Pahadi et al., 2024)	The objective of this study was to assess the effect of nesting and swaddling on sleep duration	True experimental post-test control design, Consecutive sampling	36 preterm neonates, admitted in Nursery and Neonatal Unit of BPKIHS, Instrument : AASM (American Academy of sleep Medicine).	Nesting and Swaddling can be used as convenient and effective method to increase neonatal sleep duration or rest period.
Nesting Technique: The Effects on Preterm Cardiorespiratory Indicators	(Abdul et al., 2024)	The study aims to assess the impact of the nesting technique on preterm cardio-respiratory parameters in various positions (supine, prone, and right lateral).	Randomized Controlled Trial (RCT). simple random sampling technique.	Sample : 60 preterm infant	The Nesting technique with supine, prone, and right lateral positions is effective in stabilizing the cardiorespiratory parameters of premature neonates in the NICU.

DISCUSSION

The analysis results indicate that the nesting technique significantly contributes to the improvement of physiological and behavioral parameters in preterm infants. This technique offers various benefits, including enhanced vital stability, sleep quality, and neurobehavioral development.

Stability Physiological

The nesting technique has been proven effective in improving the stability of vital parameters in preterm infants. A study by Rohmah et al. (2020) reported an increase in oxygen saturation from 91% to 95.71% and a decrease in respiratory rate from 64 to 53.43 breaths per minute following nesting intervention (Rohmah et al., 2020). Similarly, Kaur et al. (2022) confirmed that this technique improved the stability of heart rate, respiratory rate, and oxygen saturation with a significance level of $p < 0.05$ (Kaur et al., 2022). Additionally, Shamkhi and Shawq (2024) demonstrated an increase in oxygen saturation from 93–94% to 96–98% and a decrease in average heart rate from 156 bpm to 133 bpm in the supine position after three days of intervention (Abdul et al., 2024). Alice Jeba et al. (2019) demonstrated that nesting interventions are effective in improving and stabilizing the physiological parameters of

preterm infants in the NICU (Alice Jeba et al., 2019). Krishnaja et al. (2024) found that nesting is effective in enhancing the physiological stability of preterm infants, particularly in improving oxygen saturation levels (Unnikrishnan & Aneesha, 2024) . Sayed & Hassan et al. (2020) reported that preterm infants who received nesting techniques exhibited more stable physiological parameters, including temperature, oxygen saturation, and heart rate (Sayed & Hassan, 2020). Priyanka Nivas Nikam et al. (2023) also confirmed that nesting is effective in stabilizing physiological parameters such as body temperature, heart rate, respiratory rate, and oxygen saturation (SpO_2) in preterm infants (Priyanka Nivas Nikam et al., 2023). Furthermore, Abdul et al. (2024) highlighted that nesting techniques using the supine, prone, and right lateral positions effectively stabilize the cardiorespiratory parameters of preterm neonates in the NICU (Abdul et al., 2024).

Sleep Quality

Another benefit of the nesting technique is the improvement in sleep quality among preterm infants. Vadakkan and Prabakaran (2022) found that infants receiving the nesting intervention had an average sleep duration of 206.4 minutes (SD: 28), compared to 183.1 minutes (SD: 34.78) in the swaddling method. This improvement was supported by Pahadi et al. (2024), who reported that the sleep duration of the nesting group increased by 19.95 minutes compared to the control group. These findings indicate that the nesting technique helps preterm infants achieve more stable and high-quality sleep patterns.

Neurobehavioral Behavior

In addition to physiological stability, the nesting technique also provides significant benefits for neurobehavioral behavior. El Sayed and Hassan (2020) reported that 85.8% of infants in the nesting group experienced mild or no pain, compared to only 20% in the control group. They also found that sleep patterns improved to 100% in the nesting group, compared to just 10% in the non-nesting group. Furthermore, Eskandari et al. (2020) highlighted that the technique effectively enhances motor stability and self-regulation in preterm infants, thereby supporting better behavioral development. A study by Kassandra et al. (2019) indicated that the nesting group showed improvements in posture and motor performance compared to the control group (Costa et al., 2019). Yildizdas et al. (2021) reported that the nesting position had a positive effect on comfort scores and oxygen saturation levels in preterm infants (Yapicioğlu Yildizdaş et al., 2021). According to Nariman Ahmed (2024), both nesting and swaddling positions support feeding readiness and the progression of enteral feeding in preterm neonates. Additionally, these techniques enhance oral-motor coordination, physiological stability, weight gain, and milk consumption (Ahmed et al., 2024). Soumya Ranjan et al. (2024) observed a significant improvement in body posture among the nesting group, including adducted shoulders, flexed elbows, and flexed hips, compared to the control group ($p < 0.01$) (Garnayak et al., 2024).

Comparison with Other Methods

The findings also indicate that the nesting technique has advantages over other methods, such as swaddling or the supine position. Costa et al. (2019) noted that nesting provided significant benefits for infant posture and motor development, although the difference was not substantial compared to the hammock method (Costa et al., 2019). Conversely, Kapoor et al. (2021) reported that techniques like Kangaroo Mother Care (KMC) and oral dextrose offer better analgesic effects than nesting, suggesting that nesting is more suitable as part of a multidimensional approach to neonatal care in NICUs (Kapoor, Anju; Khan, Mohammad Asad; Beohar, n.d.). A study on the effectiveness of Kangaroo Mother Care (KMC) in improving infant sleep duration showed that the majority of successful KMC cases accounted

for 26 (86.7%). Sleep quality before KMC on the third day was recorded at 28 (93.3%), while after KMC, it was 27 (90%). The study concluded that Kangaroo Mother Care is effective in improving sleep quality in low birth weight infants (LBW) at RSUDP NTB in 2017 (Fatmawati & Meliati, 2019). Another study on the effectiveness of KMC in enhancing infant sleep duration found that statistical analysis revealed an average LBW sleep duration of 9.33 hours before KMC, with a standard deviation of 1.768. After KMC, the sleep duration increased to 9.80 hours, with a standard deviation of 1.769. The mean difference between pre- and post-KMC measurements was 0.47, leading to the conclusion that there is a significant difference in sleep duration before and after KMC, with a longer sleep duration observed post-intervention (Nur Halimah & Surtiati, 2022). A study on Kangaroo Mother Care demonstrated its effectiveness in promoting neonatal weight gain. Among 573 neonates, only 2 (0.35%) died during KMC, while the majority experienced significant weight gain. The successful implementation of Kangaroo Mother Care was supported by the Zambian government and hospitals, which included training for healthcare workers (Muttau et al., 2022). Research by Anne-Marie Bergh et al. (2014) identified key factors contributing to the successful implementation of KMC, including healthcare worker training, proper supervision, integration into quality improvement systems, and support from the government and healthcare institutions (Bergh et al., 2014).

Another study highlighted the limitations in Kangaroo Mother Care facilities and infrastructure, such as the lack of dedicated spaces and KMC-specific clothing. The readiness of LBW infants' families improves with comprehensive and accurate education. However, the availability of healthcare workers remains limited, and competency in Kangaroo Mother Care is not yet uniformly distributed (Khasanah et al., 2024). Another study identified major barriers to KMC implementation, including social stigma, lack of information, shortages of human and material resources, and negative attitudes among nurses. Many parents feel unsupported in practicing Kangaroo Mother Care due to the lack of dedicated facilities, including adequate spaces (Esewe & Phetlhu, 2022). Research by Yueyang Tian (2024) indicated that Kangaroo Mother Care is recommended by the WHO for low birth weight infants. However, its impact on autonomic cardiac control in preterm infants with fetal growth restriction remains unclear (Tian et al., 2024). Another study explained that KMC is effective in reducing the length of hospital stay, with an average reduction of 1.75 days (MD -1.75 days, 95% CI -3.22 to -0.28). The subgroup receiving KMC for less than six hours per day showed a significant reduction (MD -4.66 days, 95% CI -7.15 to -2.17), whereas the subgroup receiving KMC for more than six hours per day did not show a significant difference (MD -0.79 days, 95% CI -2.52 to 0.90) (Narciso et al., 2022).

Clinical Implications

Overall, the nesting technique offers significant benefits for preterm infants, particularly in enhancing physiological stability, sleep duration, and neurobehavioral behavior. This intervention is simple, cost-effective, and can be easily implemented in various healthcare settings. However, consistent implementation standards and further research are needed to explore the long-term benefits of this.

CONCLUSION

Research findings indicate that the nesting technique has a significant impact on supporting the physiological and behavioral development of preterm infants, particularly in NICU settings. This technique has been proven to enhance the stability of vital parameters, such as increasing oxygen saturation to as high as 95.71% and reducing respiratory rates to 53.43 breaths per minute after the intervention. Additionally, the nesting technique effectively

improves the sleep quality of preterm infants. Studies have recorded an average sleep duration of 206.4 minutes for infants using the nesting technique, compared to only 183.1 minutes with the swaddling method. These improvements positively impact the neurological development of preterm infants.In terms of behavior, the nesting technique helps reduce pain levels and enhances neurobehavioral stability. As many as 85.8% of infants in the intervention group reported mild or no pain, while 100% demonstrated improved sleep patterns. Furthermore, this technique also promotes motor stability and self-regulation in preterm infants, supporting healthier behavioral development.However, some studies have limitations, such as non-randomized designs and variations in measurement methods. These limitations highlight the need for further research to ensure the long-term effectiveness of this technique and to develop standardized implementation guidelines.Overall, the nesting technique is a non-pharmacological method that is effective, safe, and easy to implement for improving the quality of care for preterm infants in NICUs. This intervention holds great potential to support physiological stability, sleep quality, and the overall development of preterm infants.

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