Article

The Effect of Nesting on Thermoregulation in LowBirth Weight Infants in the Perinatology Unit

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Abstract

Background: Low Birth Weight Infants (LBWI) are at high risk of impaired thermoregulation due to limited fat reserves and immature temperature regulation systems. According to WHO (2018), over one million newborns die within the first 24 hours, with prematurity being a leading cause. Nesting is a non-pharmacological intervention that can help stabilize body temperature. Nesting is the practice of positioning the baby by placing them in a bed that has been modified to resemble the mother's womb, using rolled cloths or towels. Nesting creates a comfortable environment for the baby's sleeping position and helps maintain the baby's body temperature stability.
Objective: This study aimed to determine the effect of nesting on thermoregulation in LBWI.
Methods: *The research used a quasi-experimental design with a one-group pretest-posttest approach. A total of 17 LBWI who met the inclusion criteria—birth weight of 1500–2500 grams and gestational age <37 weeks—were selected using purposive sampling. The instruments used were an axillary digital thermometer and observation sheets. Data analysis involved the Shapiro-Wilk normality test followed by a paired t-test.*
Results: The results showed an increase in body temperature from an average of 35.565°C before nesting to 36.176°C after nesting, with a p-value of 0.000 (<0.05), indicating a significant difference.
Conclusion: Nesting has been proven effective in increasing body temperature and supporting thermoregulation stability in lowbirth weight infants (LBWI). As a simple, non-invasive intervention that aligns with developmental care principles, it is recommended to be incorporated into neonatal nursing practice. Hospitals are encouraged to implement nesting interventions, and it is expected to serve as educational material in nursing education institutions.
Keywords: *baby, body temperature, LBWI, nesting, thermoregulation*

INTRODUCTION

Low Birth Weight Infants (LBWI) are at a higher risk of complications, including thermoregulation instability, due to insufficient fat reserves and an underdeveloped hypothalamic thermoregulatory center. Globally, neonatal hypothermia is a major contributor to neonatal mortality, with the WHO reporting over 1 million newborn deaths in the first 24 hours of life (WHO, 2018). In Indonesia, the prevalence of LBWI remains high, reaching 6.2% nationally (Kemenkes, 2020). Thermoregulation in neonates involves maintaining body temperature within a narrow optimal range. LBWI, due to their physiological immaturity, are prone to hypothermia which may lead to metabolic acidosis, hypoglycemia, increased oxygen consumption, and even mortality. Nesting is a non-pharmacological intervention designed to replicate the intrauterine environment by providing boundaries using rolled cloths to maintain a flexed position. This position limits heat loss and promotes physiological stability. Although previous studies support the effectiveness of nesting in improving physiological parameters, research

specifically targeting thermoregulation outcomes in LBWI remains limited. This study aimed to fill this gap by examining the impact of nesting on the body temperature of LBWI in a perinatology setting.

METHODE

A quantitative, quasi-experimental design with a one-group pretest-posttest approach was used. The study was conducted in the Perinatology Unit of RSIA Limijati, Bandung, from May 5 to June 12, 2025. Participants were selected using purposive sampling. The sample consisted of 17 LBWI, Inclusion criteria included LBWI with birth weights between 1500 and 2500 grams, gestational age <37 weeks, and stable clinical condition. Infants receiving phototherapy or in critical condition were excluded. A total of 17 infants participated in thestudy. Instrument and Procedure: Temperature was measured using a digital axillary thermometer. The nesting intervention involved placing the infant in a flexed position using rolled cloths around the body to mimic the fetal posture for approximately 30 minutes. Pre- and post-intervention temperature were recordered. Ethical approval was granted by the Research Ethics Committee of STIKep PPNI Jawa Barat. Informed consent was obtained from parents. Data Analysis included descriptive statistics, normality testing using Shapiro-Wilk, and the paired t-test to determine the significance of the intervention's effect. SPSS version 25 was used for analysis.

RESULTS

Table 1. **Frequency Distribution of Respondent Characteristics**

Characteristic	Frequences	Percentage
Sex		
Male	9	52.9%
Female	8	47.1%
Total	17	100%

The research findings presented in Table 1 show that the majority of respondents were male, totaling 9 infants (52.9%). The gender distribution was relatively balanced, indicating that sex did not significantly dominate within the study population.

Table 2. **Distribution of Respondents Based on Gestational Age and Birth Weight**

	Usia Gestasi	Berat Badan Lahir
Mean	34,12	2041,65
Median	34,00	2061
Std Deviation	.993	274,3

Based on Table 4.2, the gestational age in this study had a mean of 34.12 weeks with a standard deviation of 0.993. The median value was 34.00 weeks, indicating that half of the respondents had a gestational age of less than 34 weeks. The analysis of birth weight showed a mean of 2041.65 grams with a standard deviation of ±274 grams. The median birth weight was 2061 grams, indicating that a portion of the respondents had a birth weight of 2061 grams.

Table 3. Distribution of Respondents Based on Body Temperature Before and After Nesting

	suhu sebelum *nesting*	suhu setelah diberi *nesting*
Mean	35.565	36.176
Median	35.600	36.200
Std. Deviation	.2572	.1954

From Table 3, the average body temperature before nesting was 35.565°C, with a median of 35.600°C and a standard deviation of 0.2572. This indicates that the infants' body temperatures before the nesting intervention were still below the normal range and showed some variability. After the nesting intervention, there was an increase in body temperature, as shown by the average temperature of 36.176°C, a median of 36.2°C, and a decreased standard deviation of 0.1954.

Tabel 4. Normality Test Using Shapiro-Wilk

Variable	Statistik	Df	Sign *P* Value
Themperatur before *nesting*	.165	17	.364
Themperatur after *nesting*	.148	17	.406

Based on Table 4, the results of the Shapiro-Wilk normality test showed that the pre-nesting temperature data had a p-value of 0.364 ($p > 0.05$), indicating that the data were normally distributed. Similarly, the post-nesting temperature data had a p-value of 0.406 ($p > 0.05$), also indicating a normal distribution. Since both datasets were normally distributed, the appropriate statistical test used was the paired t-test.

Tabel 5. The Effect of Nesting on Thermoregulation in Low Birth Weight Infants in the Perinatology Unit of RSIA Limijati Bandung

VARIABEL	MEAN DIFFERANCE	95 % CI		T	P -VALUE*
		LOWER	UPPER		
THEMPERATUR BEFORE NESTING **Themperatur after Nesting**	**-.6118**	**-.7335**	**-.4900**	**-10.649**	**.000**

Based on Table 5, there was a difference in the average body temperature of infants before and after the nesting intervention, with a mean difference of -0.6118°C. The results of the paired t-test showed a significance value (p-value) of 0.000 ($p < 0.05$), indicating a statistically significant difference in body temperature before and after the use of nesting. It can be concluded that nesting has a significant effect on thermoregulation in low birth weight infants (LBWI) in the Perinatology Unit.

DISCUSSION

1. Univariate Analysis of Respondents' Characteristic.

Based on the study results, the characteristics of respondents by gender showed that the majority of infants were male, with 9 out of 17 infants (52.9%) being boys. Although there was a slight difference between the number of male and female infants, the distribution was relatively balanced. In the context of this study, such balance is important to prevent gender dominance that could affect the analysis of body temperature and the response to the nesting intervention. According to neonatal development theory, both male and female infants generally have similar physiological responses to external stimuli such as environmental changes or care interventions. However, some studies suggest that male infants may be slightly more vulnerable to respiratory or thermal disturbances (Kent et al., 2019).

The gestational age characteristic showed an average gestational age of 34.12 weeks, with a median of 34 weeks and a standard deviation of 0.993. The close similarity between the mean and median indicates a relatively even distribution, with most respondents categorized as late preterm infants (32–34 weeks). According to WHO classification, infants born at less than 37 weeks of gestation are considered premature. Those born between 32–34 weeks fall into the late preterm category and often require additional support for thermoregulation due to immature central nervous system and metabolic functions (Ginting et al., 2021).

Prematurity occurring before 37 weeks gestation results in underdevelopment of various body systems, including the central nervous system and thermoregulatory mechanisms. A study by Jain et al. (2022) found that

preterm infants have limited brown fat reserves and a large body surface area relative to their mass, increasing their risk of heat loss. This reinforces the importance of interventions that support temperature stability, such as nesting, especially for infants with a gestational age under 35 weeks, as in this study. Regarding birth weight, the mean was 2041.65 grams, with a median of 2061 grams and a standard deviation of ±274.3 grams. This indicates that the majority of infants fell within the low birth weight (LBW) range of 1500–2499 grams. According to WHO (2018), infants weighing less than 2500 grams at birth are classified as LBW.

The small difference between the mean and median suggests a normal distribution of birth weights, while the standard deviation of 274 grams indicates slight variation, which is still acceptable in LBW populations. Infants with low birth weight are at high risk of thermoregulation disorders due to their thin subcutaneous fat and limited metabolic and thermogenic capacities. According to a study by Stothers (2020), LBWI often struggle to maintain body temperature due to immature temperature regulation and energy metabolism systems. Therefore, LBWI greatly benefit from the nesting intervention, which aims to simulate the intrauterine environment, provide a comfortable body position, and reduce heat loss through conduction, convection, evaporation, and radiation.

Overall, the respondent characteristics in this study indicate a physiologically vulnerable group in terms of thermoregulation, both due to prematurity and low birth weight. These findings highlight the urgency of applying nesting as a simple, safe, and effective intervention to help maintain body temperature stability. Thus, the respondents' characteristics not only provide context for the effectiveness of nesting but also emphasize that it is a clinically relevant approach for infants with such conditions.

2. Temperature Measurement Before and After Nesting

The results of the paired t-test revealed a significant difference between pre- and post-intervention body temperature ($p = 0.000$), with a mean difference of -0.6118°C. Therefore, the null hypothesis (Ho) is rejected, and the alternative hypothesis (Ha) is accepted, indicating that the nesting intervention significantly affects the increase in LBWI body temperature.

This result indicates that nesting has a significant impact on increasing infant body temperature. It is consistent with thermoregulation theory by Maniraju et al. (2018), which states that supportive and warm environmental interventions can enhance the body's ability to maintain a normal temperature. From the perspective of heat loss mechanisms, nesting helps reduce loss through conduction (by limiting direct contact with cold surfaces), convection (by maintaining a closed and stable environment), radiation, and evaporation (by promoting a flexed position and a stable covering) (Rosha, 2018).Statistically, these results support that the use of nesting positively impacts infant body temperature and contributes to non-pharmacological efforts in thermoregulation stabilization.

The observed temperature increase demonstrates that nesting is effective in maintaining body temperature stability. According to thermoregulation theory, LBWI are highly prone to heat loss through conduction, convection, evaporation, and radiation (Rosha, 2018). Nesting minimizes this heat loss by restricting movement, ensuring a comfortable position, and mimicking the intrauterine environment. This study is in line with the findings of Nanang Saprudin et al. (2018), which showed an increase in body temperature and oxygen saturation in LBWI following nesting. Similarly, Eka Adithia Pratiwi et al. (2024) found that nesting significantly affected physiological parameters such as body temperature ($p = 0.000$). Consistently, Yogi Adam Pratama et al. (2020) also reported that 30 minutes of nesting improved body temperature and other physiological parameters. The increase in body temperature after nesting can be explained physiologically. Nesting allows the infant to maintain a flexed position similar to the fetal posture. This position reduces the exposed body surface area, minimizing heat loss (Lucas, 2015). Additionally, the comfortable position decreases excessive motor activity and conserves energy for thermogenesis.

The hypothalamus, which regulates body temperature, functions more optimally when heat loss is reduced. With nesting, infants tend to be calmer, reducing metabolic stress and supporting physiological stability (Padila & Agustien, 2019). Overall, this study reinforces existing theories and previous findings that nesting is effective in helping stabilize body temperature in LBWI. This intervention is safe, non-invasive, easy to implement, and can be adopted as a standard procedure in neonatal care. Its success supports the importance of developmental supportive care in premature infant management. Therefore, nesting is recommended as part of neonatal nursing practices that promote developmental care and enhance the quality of life for LBWI.

CONCLUSION

Nesting is an effective intervention for enhancing thermoregulation in LBWI. It supports developmental care principles and is recommended for routine use in neonatal intensive care units. Further research is needed to explore long-term outcomes and benefits in broader clinical settings.

Suggestions

1. For Healthcare Institutions

a. It is recommended that nesting be implemented as a standard non-pharmacological intervention in the care of LBWI, especially in perinatology units, to help maintain body temperature stability.
b. Development of a standard operating procedure (SOP) for the safe and effective implementation of nesting is needed.

2. For Future Researchers

a. Further research with a larger sample size and a control group design is recommended to strengthen the results.
b. Future studies are encouraged to assess other physiological parameters such as oxygen saturation, heart rate, and infant behavior to evaluate the comprehensive impact of nesting.
c. Long-term monitoring of body temperature after the nesting intervention is suggested to determine the duration of the intervention's effect and the stability of thermoregulation

Limitations

The limitations encountered by the researcher during this study included difficulties in recruiting respondents who met the inclusion criteria, resulting in a relatively small sample size. Additionally, body temperature was measured only before and after the nesting intervention, which does not fully reflect the sustainability of the intervention's effects over a longer period.

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Autor Contribution

R.O : Conceptualization, data collection, data analysis, manuscript, drafting.
D.S : Supervision, manuscript review and editing.

Conflic Of Interest

The authors declare no conflict of interest in this study.

REFERENCES

Adithia Pratiwi, E., et al. (2024). Pengaruh Nesting terhadap Perubahan Fisiologis dan Perilaku Bayi BBLR. Kabupaten Lombok: Laporan Penelitian.

Chrismis Novalinda Ginting, et al. (2022). Efektivitas Penggunaan Nesting dan Posisi Prone terhadap Suhu tubuh, Saturasi oksigen dan Frekuensi Nadi bayi prematur dan BBLR. RSU Dr. Pringadi Medan.

Damayanti, R. A., et al. (2019). Gangguan Termoregulasi pada BBLR. Jurnal Keperawatan.

Donnellan, L., et al. (2020). Neonatal Thermoregulation and Care Strategies. Neonatal Nursing Journal.

Efendi, F., et al. (2019). Panduan Praktik Nesting di Indonesia. Buku Ajar Keperawatan Neonatus.

Eliyanti & Noeraini. (2020). Nesting sebagai Upaya Perawatan Perkembangan pada Bayi Prematur. Jurnal Ilmu Kesehatan.

Fridely, J. (2017). Hypothermia in Neonates: Metabolic Implications. Pediatrics Journal.
Ginting, C. N., et al. (2021). Perbandingan Posisi Nesting dan Prone pada Bayi Prematur. RSUP H. Adam Malik Medan.
Hendayani, A. (2019). Karakteristik BBLR dan Penanganannya. Yogyakarta: Pustaka Pelajar.
Hikmah, A. (2016). Konsep dan Manajemen Termoregulasi pada Neonatus. Jakarta: Salemba Medika.
Hockenberry, M., et al. (2019). Wong's Essentials of Pediatric Nursing. 11th ed. Elsevier.
Humaidah, N., et al. (2019). Mekanisme Termoregulasi pada Neonatus. Jurnal Keperawatan Indonesia.
Kemenkes RI. (2020). Profil Kesehatan Indonesia Tahun 2020. Jakarta: Kementerian Kesehatan Republik Indonesia.
Kuraesin, I., Setia Sari, R., et al. (2020). Pengaruh Nesting terhadap Fisiologi dan Perilaku Bayi Prematur. RSUD Kabupaten Tangerang.
Maniraju, M., et al. (2018). Hipotalamus dan Termoregulasi pada Neonatus. Medica Journal.
Nanang Saprudin, et al. (2022). Pengaruh Penggunaan Nesting terhadap Suhu Tubuh, Saturasi Oksigen, dan Frekuensi Nadi BBLR. RS Gunung Jati Cirebon.
Padila & Agustien, R. (2019). Konsep Termoregulasi Bayi Baru Lahir. Buku Ajar Keperawatan Dasar.
Pantiawati, T. (2016). Bayi Berat Lahir Rendah: Permasalahan dan Penanganannya. Bandung: Refika Aditama.
Proverawati, A. & Ismawati, C. (2016). Bayi Berat Lahir Rendah dan Implikasinya. Jakarta: EGC.
Rosha, R. (2018). Metode Kehilangan Panas pada Bayi Baru Lahir. Jurnal Gizi dan Kesehatan Anak.
Sastra, R. (2019). Penanganan Masalah Termoregulasi pada BBLR. Jurnal Keperawatan Perinatal.
Sofariah Rahmawaty, et al. (2016). Pengaruh Nesting terhadap Saturasi dan Berat Badan Bayi Prematur. RSUP Dr. Hasan Sadikin Bandung.
WHO.(2018).Newborns: Reducing Mortality. https://www.who.int/news-room/fact-sheets/detail/newborns-reducing-mortality
Zen, I. (2017). Pengaruh Nesting terhadap Perkembangan Bayi Neonatus. Jurnal Keperawatan Anak.