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ANALYSIS OF INTERVENTION RECOMMENDATIONS TO IMPROVE WEIGHT AND SLEEP QUALITY OF PREMATURE INFANTS IN THE HOSPITAL: LITERATURE REVIEW

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ABSTRACT

Premature infants are at high risk for developmental disorders, including low body weight and poor sleep quality. Intensive care in the NICU often focuses on medical approaches, but non – medical intervensions such as infant massage, kangaroo mother care (KMC), and nesting techniques have been shown to be effective improving weight gain and sleep quality in premature infants. This study is a literature review study of 20 experimental articles published in 2019-2025, which were obtained from the PubMed and Google Scholar databases with specific inclusion criteria. The results show that infant massage therapy can stimulate the vagus nerve system, thereby accelerating metabolism and increasing infant appetite. Kangoroo care support weight gain and sleep quality by providing warmth from skin to skin. Nesting techniques, by positioning the baby's body in a stable and comfortable position, can significantly improve infant sleep quality. Nursing intervetions such as infant massage, KMC, and nesting are effective and simple approaches to improving weight gain and sleep quality in premature infants during NICU care.

Keywords: Nursing Intervention, Premature Infants, Sleep Quality, Weight Gain

ABSTRAK

Bayi prematur memiliki risiko tinggi gangguan tumbuh kembang, termasuk berat badan rendah dan kualitas tidur yang buruk. Perawatan intensif di NICU sering kali berfokus pada pendekatan medis, namun intervensi non-medis seperti pijat bayi, perawatan metode kanguru (PMK), dan teknik nesting telah terbukti efektif meningkatkan berat badan serta kualitas tidur bayi prematur. Penelitian ini merupakan studi *literature review* terhadap 20 artikel eksperimental yang dipublikasikan pada tahun 2019-2025, yang diperoleh dari database *PubMed* dan *Google Scholar* dengan kriteria inklusi yang spesifik. Hasil menunjukan bahwa terapi pijat bayi dapat merangsang sistem saraf vagus sehingga mempercepat metabolisme dan meningkatkan nafsu makan bayi. Perawatan Metode Kanguru mendukung pertumbuhan berat badan dan kualitas tidur dengan memberikan kehangatan dari kulit ke kulit. Teknik nesting, dengan memposisikan tubuh bayi dalam posisi yang stabil dan nyaman, mampu memberikan peningkatan yang signifikan terhadap kualitas tidur bayi. Intervensi keperawatan seperti pijat bayi, PMK, dan *nest* merupakan pendekatan yang efektif dan sederhana untuk meningkatkan berat badan serta kualitas tidur bayi prematur selama perawatan di NICU.

Kata Kunci: Bayi Prematur, Berat Badan, Intervensi Keperawatan, Kualitas Tidur

INTRODUCTION

The World Health Organization (WHO) stated that a global increase in preterm births was recorded by 2020, with 13.4 million premature babies born worldwide, equivalent to 1 in 10 births, or approximately 9.9% of all live births (Rohsiswatmo et al., 2023). A similar situation also occurred in Indonesia before 2024, indicating that Indonesia had a high preterm birth rate, approximately 600,000 cases annually (Lestari et al., 2021).

A premature baby is a baby born before 37 weeks of gestation. Therefore, they tend to be born with a low birth weight. Low birth weight babies are at higher risk of health problems and death in the neonatal period compared to babies with a normal birth weight. Babies weighing 2000–2500 grams have a four-fold greater chance of neonatal death than babies weighing 3000–3500 grams (Lestari et al., 2021). Premature babies face far more complex physiological challenges than full-term babies. They require specialized care in the Neonatal Intensive Care Unit (NICU) (Mehrpisheh et al., 2022; Zhang et al., 2023).

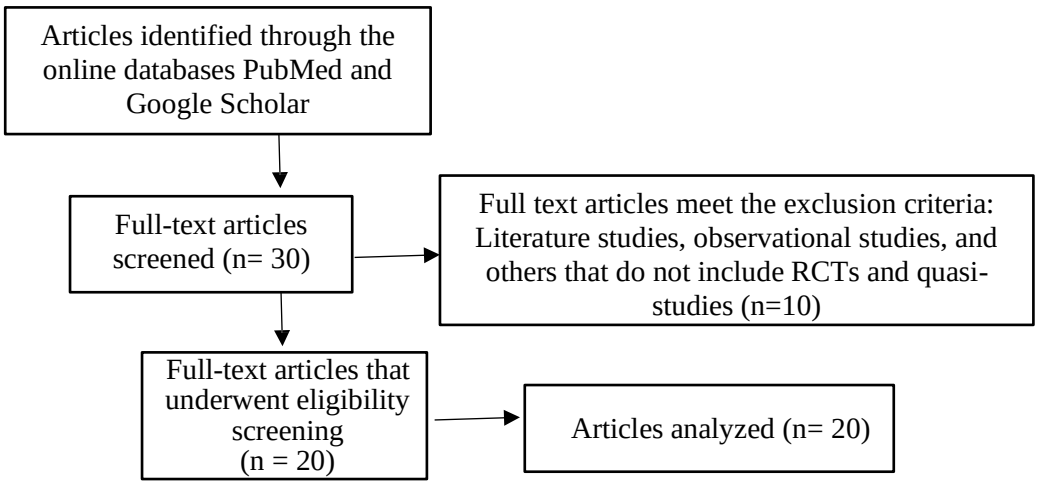
Premature babies typically have lower weight and length than full-term babies. One of the main challenges often faced by premature babies is difficulty maintaining body temperature, problems with sleep patterns, and delayed growth (Roychoudhury & Yusuf, 2023). These are also risk factors for premature babies experiencing stunting in childhood (Lestari et al., 2021). Several other factors that increase the risk of premature babies experiencing stunting later in life include short gestational age, inadequate maternal nutritional status during pregnancy, and parental age less than 20 or more than 35 (Sari & Sartika, 2021). Therefore, a non-medical approach that supports the natural development of babies is essential during the hospitalization process.

Several interventions that have been widely studied for their positive effects on premature infants include kangaroo mother care (KMC), skin-to-skin contact, and nesting. KMC involves placing the infant directly on the mother's chest to create skin-to-skin contact (Y. Li et al., 2022). Another intervention that is increasingly being applied in the NICU is the use of nesting, a technique for positioning the infant's body using rolled-up cloths or small pillows to mimic the position of the fetus in the womb (Vadakkan & Prabakaran, 2022). Interventions such as baby massage can also benefit infants. Infant massage, a gentle, regular physical touch therapy that has been shown to be effective in stimulating the bones, muscles, and vagus nerve system, can impact weight gain in premature infants (Peng et al., 2023a).

Optimizing strategies to increase infant weight gain and sleep quality in premature infants requires nurses in the NICU. Therefore, nurses need to understand the various interventions to improve infant weight gain and sleep quality. This article aims to explain the various types of nursing interventions that can be provided to premature infants based on a review of the latest literature.

RESEARCH METHODS

This article was written using a literature review approach to experimental studies (Randomized Controlled Trials (RCT) and Quasi Experimental in the online databases Google Scholar and PubMed. The search strategy used in writing this literature review was using the keywords "Preterm infant", "Sleep Quality", "Weight Gain", "Nursing Intervention", "Baby Massage", "Kangaroo Mother Care", "Nest". The articles collected were 20 articles with criteria including English articles published in 2019-2025, research settings in the NICU room and research samples were premature babies.



RESULTS AND DISCUSSION

The search yielded 20 articles that met the criteria for analysis. The results of the article analysis are presented in Table 1, which shows the study characteristics, methods used, and key findings from each article. These are presented in the following table:

Table 1. Research on interventions that impact sleep quality and weight of premature infants in the NICU

No	1st *Author* (Year), Country	Sample	Number of Samples in Group		Design	Intervention	Results
			Intervention	Control			
1	(Lestari et al., 2021), Indonesia	A premature baby weighing 2,295 grams	16	16	QE	Baby massage is performed one hour after breastfeeding, when the baby is not hungry.	Increases weight gain by 200 grams per day
2	(Weerakul et al., 2025), China	Premature babies weighing >1500 grams	18	20	RCT	Massage was performed for 15 minutes per session for 14 days.	Increased body weight by 63.04 grams per day
3	(Garbi et al., 2022), switzerland	Premature babies weighing <2500grams	18	18	RCT	Massage performed for 5 days/10-minute sessions twice daily.	Increased weight by 12.3-1.4 grams/day
4	(Naseh et al., 2023), Iran	Premature babies weighing <2000gram/ week	33	30	RCT	Baby massage is performed using the fingertips in three stages for 5 minutes.	Increase body weight by 49.24-94.32 grams/5 days
5	(Peng et al., 2023b), China	Premature babies weighing 1000-2000 grams	52	52	RCT	Pijat bayi dilakukan selama 7 hari 2x sehari	Meringan kan gejala *Feeding Intoleranc e* (FI)
6	(Jamshaid et al., 2021), Pakistan	Premature babies weighing <2500 gram	70	70	RCT	Baby massage is done twice a day	Body weight increased by 35 grams/ day
7	(dos Anjos et al., 2022), Iran	Premature babies weighing 1000-2000 gram	22	22	RCT	Baby massage for 5 days (1 time/day, duration 8 minutes)	Body weight increased by 25-32 gram/day
8	(Düken & Yayan, 2024), Turki	Premature babies weighing <2000gr am	40	40	RCT	Baby massage for 3 time /day, duration 15 minutes	Improve sleep quality

No	1st *Author* (Year), Country	Sample	Number of Samples in Group		Design	Intervention	Results
			Intervention	Control			
9	(Liao et al., 2021), Taiwan	Babies with a birth weight of 1500-2500 grams	16	32	RCT	Baby massage for 7 days /3 time massage	Body weight increased by 30 gram/day
10	(Fatmawati et al., 2021), Indonesia	Babies with a birth weight of 1500-2000 gram	24	22	RCT	Baby massage for 10 days/2 time, with duration of 15 minutes.	Body weight increased
11	(Abdeyazdan et al., 2020), Irian	Prematur babies	19	20	RCT	Nesting is done in 2 periods with a duration of 2 hours (the baby is placed in a nest made of rolled cotton)	Improve sleep quality
12	(Vadakkan & Prabakaran, 2022), India	Prematur babies	38	38	RCT	Placing the baby in a nest supported by soft material for 2 hours, twice daily, for 2 days	The nesting method is effective in increasing sleep duration for 3 hours.
13	(Costa et al., 2019), Brazil	Prematur babies	10	10	RCT	The baby is positioned lying on its back in a nest of rolled cotton cloth forming the mother's womb.	Improve sleep quality
14	(Pahadi et al., 2024), Nepal	Prematur babies	18	18	RCT	Placing the baby in a nest supported by soft material, the duration of sleep is seen through a video for 2 hours.	There was an increase of 59 minutes.
15	(Yapicioğlu Yildizdaş et al., 2021), Turki	Prematur babies	25	25	RCT	Placing the baby using a blanket and pillow to mimic the mother's womb	Improve sleep quality for babies

No	1st *Author* (Year), Country	Sample	Number of Samples in Group		Design	Intervention	Results
			Intervention	Control			
						(nesting).	
16	(Jamehdar et al., 2022), Iran	Premature babies at 32-35 weeks of gestation	34	36	RCT	KMC is carried out for 4 days/day 3 periods of 60 minutes	Improve sleep quality for babies
17	(Du et al., 2025), China	Premature babies at 28-36 weeks of gestation	46	46	RCT	KMC is carried out for 24 hours with mother	Experiencing weight gain on days 3 and 7 in the observation group
18	(Mehrpisheh et al., 2022), Iran	Premature babies at <37 weeks of gestation	50	50	QE	KMC is carried out for 2x/day with duration 45 minutes	The weight gain in the intervention group was 481 grams, while the control group was 372 grams
19	(Deepak, 2024), India	Prematur babies	100	100	QE	KMS is carried out during 9 days with duration 4 hours	Experiencing significant weight gain
20	(W. Li et al., 2022), China	Premature babies at <37 weeks of gestation	186	161	RCT	KMC is carried out 3x/days during at NICU	Improve sleep quality for babies

Information: QE = *Quasy Experimental*; RCT = *Randomized Controlled Trial*

Figure 1. Source: Efendi *et al.* (2019)

Research related to infants born earlier than they should be and children with low birth weight tends to show suboptimal growth and development in the future. This becomes a vital consideration in determining the possibility of disease occurrence in the future. In a study on brain and cognitive development of premature infants who received massage therapy, it was proven that infants showed better cognitive abilities at 12 months of age. At 6 months of age, infants also had higher mental development scores. By the age of 2 years, premature infants who received massage showed superior mental development indicators (Naseh et al., 2023; Zhang et al., 2023).

One intervention that can help improve the health of premature infants is massage therapy. Infant massage is the most efficient form of direct skin-to-skin interaction (M. et al., 2023). Infant massage provides various benefits for newborns. For example, premature infants will experience significant health improvements and good weight gain. Infant massage is a tactile stimulation that can activate bones, muscles, and the vagus nervous system (Peng et al., 2023b). This nerve will

enhance intestinal peristaltic movement, so that gastric emptying occurs faster and the infant will feel hungry more easily. In addition, this nerve will also improve blood circulation and increase the infant's metabolism, which will promote the formation of glycogen, fat, and protein to increase their weight, so the infant's weight will increase (Lestari et al., 2021; Priyadarshi et al., 2022; Zhang et al., 2023). Infant massage not only can increase weight but also can improve sleep quality. Studies show that infants have a 1.85 times higher chance of being discharged from the hospital sooner compared to infants in the control group (Garbi et al., 2022; Weerakul et al., 2025). They also experience fewer postnatal complications (Weerakul et al., 2025; Zhang et al., 2023).

Infant massage is performed for 15 minutes divided into three stages. The first stage is tactile stimulation (5 minutes) by applying moderate pressure to the head, face, neck, shoulders, back, thighs, and legs while the infant is in a prone position. The second stage is kinesthetic stimulation (5 minutes) involving flexion and extension movements of the arms and legs while the infant is in a supine position. The third stage is repeating tactile stimulation (5 minutes) by starting again from the first stage (Chan WK, 2023; Peng et al., 2023b).

Another intervention variation that can increase weight and sleep quality in premature infants is Kangaroo Mother Care. Kangaroo Mother Care is defined as continuous skin-to-skin contact of the infant with the mother's chest. This action is one of the most effective interventions to prevent death in premature infants (Adejuyigbe, 2021). Kangaroo Mother Care combined with touch on the infant's skin can stimulate the nervous system more effectively so that it can increase metabolism and produce calming and relaxing effects on the infant, thereby improving the infant's sleep quality (Cai et al., 2022).

Kangaroo Mother Care can enhance the infant's sense of smell. When the aroma of breast milk is detected by the infant, salivary glands (amylase and lipase) begin to produce fluid, which then stimulates secretions in the gastrointestinal glands, making the breastfeeding process easier and more enjoyable for the infant and can help increase their weight (Jamehdar et al., 2022). The Kangaroo Mother Care intervention is performed once a day for 60 minutes until NICU care ends (Jamehdar et al., 2022). Some researchers prove that Kangaroo Mother Care that can produce a weight gain effect can be given for 45 minutes (Mehrpisheh et al., 2022). Another intervention duration is 30 minutes (Kucukoglu et al., 2021). The method of administration is by positioning the infant directly on the mother's chest without clothes and only wearing a diaper and baby hat for skin-to-skin contact, performed 1-2 hours after breastfeeding (Du et al., 2025).

Various intervention models lead to stimulation given to the skin through infant massage touch and Kangaroo Mother Care. A different intervention to improve sleep quality can use a nest. The application of nesting techniques has been proven successful in improving sleep quality in premature infants (Pahadi et al., 2024; Yapicioğlu Yildizdaş et al., 2021). In the context of developmental care, the nesting method shows a significant impact in extending total sleep time and quiet sleep. Research reveals that during the use of nesting techniques, premature infants show a significant increase in sleep time and a reduction in the frequency of awakening compared to periods without this technique, making it a simple yet effective intervention to improve newborn sleep quality in intensive care settings (Abdeyazdan et al., 2020; Vadakkan & Prabakaran, 2022).

This effectiveness is closely related to the scientific principles underlying the benefits of nesting in infant sleep. The nesting position mimics the uterine environment by supporting the entire infant's body, helping maintain a natural flexed position and stabilizing the head in the midline (Pahadi et al., 2024; Vadakkan & Prabakaran, 2022; Yapicioğlu Yildizdaş et al., 2021). This reduces unexpected movements, lowers energy consumption, and creates comfort that supports the transition to quieter sleep phases. In addition, nesting also contributes to vestibular system stimulation, reduces stress due to medical procedures, and supports neurobehavioral development. With a more stable sleep environment and fewer stimuli, premature infants can achieve longer and higher quality sleep cycles, which are important for brain development, hormone secretion, and long-term memory strengthening (Abdeyazdan et al., 2020; Costa et al., 2019; Vadakkan & Prabakaran, 2022).

CONCLUSION

Based on the results of the literature review, nursing interventions such as infant massage, Kangaroo Mother Care, and nesting are proven effective in increasing weight and sleep quality of premature infants in the NICU. These three interventions provide sensory and physiological stimulation that supports holistic infant development. The application of these interventions not only has a positive impact on infant growth and development, but can also accelerate the recovery process and shorten the duration of hospital care. Therefore, it is important for healthcare professionals, especially NICU nurses, to integrate these interventions into nursing practice to improve the quality of care and outcomes for premature infants

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