ORIGINAL ARTICLE

Respiratory status and behavioral response of premature infant with nesting model care approach in neonatal intensive care unit

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ABSTRACT

Introduction: *The increase in mortality of newborns, especially premature babies, is caused by non-optimal lung development where the production of less surfactant triggers lung collapse and compliance. This causes stress on the newborn and requires more intensive care. One of the cares taken to overcome these problems is the nesting application.* ***Objectives:*** *To identify the effect of nesting model care on premature infants' respiratory status and behavioral responses.* ***Methods:*** *This study is a quasi-experimental design with a pre-post-test group design. The samples were premature infants admitted to the Neonatal Intensive Care Unit (NICU), with 40 respondents. The sampling technique is purposive sampling. The instruments used are the score down to measure the respiratory status and the Anderson Behavior State Scale (ABSS) for the behavioral responses of respondents. Data were analyzed using the Mann-Whitney test and Wilcoxon test.* ***Results:*** *The results showed no significant differences between the respiratory status in modern nesting and conventional nesting with P-value = 0.292. In contrast, there was a significant difference in behavioral responses in both groups with P = 0.027. There was an effect on respiratory status before and after nesting in the modern nesting group. The significance was P = 0.001, and there was no effect in the conventional nesting group with a P-value = 0066. Regarding behavioral responses, there was a significant value in two of the group before and after nesting, where the value significance respectively P = 0.009 and P = 0.025.* ***Conclusions:*** *Modern nesting influences reducing scores down and behavioral responses in premature infants, while conventional nesting only reduces scores of behavioral responses. It is expected that the use of nesting in the NICU room specifically for premature babies prefers the use of modern nesting compared to conventional nesting babies to maintain stability in terms of both respiratory and response behavior.*

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1. Introduction

Premature birth is a problem that often occurs in newborns. World Health Organization (WHO) defines premature birth as a baby born before 37 weeks of pregnancy or less than 259 days counted from the first day of the last menstrual period. Most babies admitted to neonatal care had a gestational age between 34 and 36 weeks (AlJohani, Qaraqei, & Al-Matary, 2020). Premature births occur associated with several factors such as socio-demographic, obstetrical, maternal, and environmental factors (Altimier & Phillips, 2016).

Premature birth is a global problem that occurs in several countries worldwide. The estimated global data shows that in 2014, approximately 10.6% of all live births globally were

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preterm, and Asia is the highest proportion of global preterm birth (Chawanpaiboon et al., 2019). In 2010, Indonesia ranked the fifth country with the world's most premature babies (675 700) after India (3.5 million babies), China (1.2 million children), Nigeria (773 600 infants), and Pakistan (748 100 infants) (WHO, 2012).

On Preterm birth, respiratory organs have not developed optimally especially respiratory control centers. Additionally, surfactant production was still lacking, causing lung collapse and occurred in compliance with lung or lung stiffness. As a result, premature babies will be susceptible to respiratory distress and die (Lissauer & Fanaroff, 2009). Stressors after premature birth include environmental conditions, reduced oxygen saturation, increased rates of apnea and bradycardia, wide fluctuations in blood pressure, increased excitement and agitation, crying, and sleep disturbances (Ribaupierre, 2013).

The attention to efforts to reduce neonatal mortality rates (age 0-28 days) is essential for neonatal deaths contributing to 59% of infant deaths. Based on the Indonesia Demographic and Health Survey results in 2012, the neonatal mortality rate 2012 was 19 per 1.000 live births. While the results of the Inter-Census Population Survey (SUPAS) in 2015 showed an infant mortality rate of 22.23 per 1.000 live births (Kemenkes, 2017).

Premature birth complications are the leading cause of death among children under five years of age, responsible for approximately 1 million deaths in 2015 (Liu et al., 2016). Research conducted in Indonesia stated that of 259 perinatal deaths, the highest cause of death was due to premature birth by 44% (Deviany et al., 2022). In addition, Premature birth is responsible for about 10% of perinatal deaths (13 of 133 infants), and premature mortality is most increased in infants with Very Low Birth Weight (VLBW infants), amounting to 77.8% (Saputera, 2015).

Increased mortality in premature infants cannot be separated from the care provided. Premature babies require special care to support safety. Neonatal Intensive Care Unit (NICU) is an intensive care unit for infants (up to age 28 days) that require treatment intending to prevent organ failure resulting in death. NICU is an effective place to support and facilitate the stabilisation, recovery and development of infants with prematurity (Boxwell, 2010). However, the NICU environment can be trigger stress to the infants during hospitalization which has a negative impact on the infant's brain development (Weber & Harrison, 2019).

One model of care applied in premature infants is the implementation of Developmental Care. Developmental care is a clinical guide used in baby care in the NICU (Efendi & Rustina, 2013). This treatment model consists of 6 items, and one of them is positioning and nesting. Nesting can increase comfort and reduce stress levels in premature infants. Nesting is a delicate instrument that surrounds the baby's body so that the baby is still flexed as when in the womb, making the baby sleep longer and improve physiological responses such as breathing (Altimier & Phillips, 2016). NICU as developmental care has a significant effect on preterm infants' mental and motor development (Soleimani et al., 2020). Therefore, this study aims to identify the effect of nesting model care on premature infants' respiratory status and behavioral responses.

2. Research methods

This study is a quasi-experimental design with a pre-post-test group design. In this study, subjects were divided into two groups. The intervention group was given treatment using modern nesting, and the control group received the usual simple nesting treatment applied in the hospital, or this study is called conventional nesting. The population in this study were all patients with premature infants admitted to the Neonatal Intensive Care Unit (NICU) Hospital Dr. Wahidin Sudirohusodo. The sampling technique is purposive sampling. The inclusion criteria were premature babies treated on the first day and cared for in an incubator. At the same time, exclusion criteria were premature babies using a mechanical ventilator.

The number of samples were determined based on a previous study conducted by Zen (2017) where the average behavior of infants in the non-nesting phase was 6.22 with a standard

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deviation of 2.92. In the nesting phase, the average behavior of the babies was 3.61 with a standard deviation of 2.27. To anticipate the possibility of respondents dropping out, 10% of the total sample was added to 20, so the total sample of the control and treatment groups was 40.

Instruments used to measure the respiratory status of the respondent, the researcher used score down as an indicator (Kosim, Yunanto, Dewi, Irawan, & Usman, 2014) and for behavioral responses using *the Anderson Behavior State Scale* (ABSS) (Yang, Yang, & Chang, 2014), (Duran et al., 2012). Data were analyzed using the Mann-Whitney test to determine the differences between the two groups and the Wilcoxon test to determine the effect before and after the intervention.

This research has received ethical approval from the Health Research Ethics Committee of the Medical Faculty, Hasanuddin University with number: 647/H4.8.4.5.31/PP36.KOMETIK/2018.

3. Result and discussion

3.1 Characteristics of respondents

The total sample of this study was 40 premature infants admitted in the Neonatal Intensive Care Unit (NICU) and consisted of two groups: Modern Nesting and Conventional Nesting. Girls dominated the Characteristics of respondents as many as 55%, birth weight of respondents in importance between 1500-2499, for the gestational age, more than 80% of the respondents in the range 33-37 weeks gestation, and approximately 80% of an infant suffering respiratory distress (Table 1).

Table 1. Characteristics of respondents by sex, birth weight, gestational age, and medical diagnosis (n=40)

Characteristics	Frequency distribution	
	n	Percentage (%)
Gender		
Boys	18	45
Girls	22	55
Birth Weight		
<1000	5	12,5
1000-1499	11	27,5
1500-2499	21	52,5
2500-4000	3	7,5
Gestational age		
<28 weeks	2	5
28-32 weeks	6	15
33-37 weeks	32	80
Medical diagnosis		
Respiratory Distress Neonatorum	32	80
Anorectal malformations, stenosis ani	2	5
omphalocele	1	2,5
Susp. Stenosis duodenum	2	5
obstructive ileus	1	2,5
gastroschisis	1	2,5
Rectal prolapse	1	2,5

3.2 Respiratory Status of modern nesting group and conventional nesting group

Respiratory status was measured using a score down. Figure 1 below shows a decrease in score down before the intervention and after the intervention of the first day until the seventh

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day. The decrease scores down in the modern nesting group of 3.6 into a 1.95 or a decrease of 1.65. As for the conventional nesting group also experienced a decline in scores is from 2.4 down into 1.45 or deterioration of 0.95.

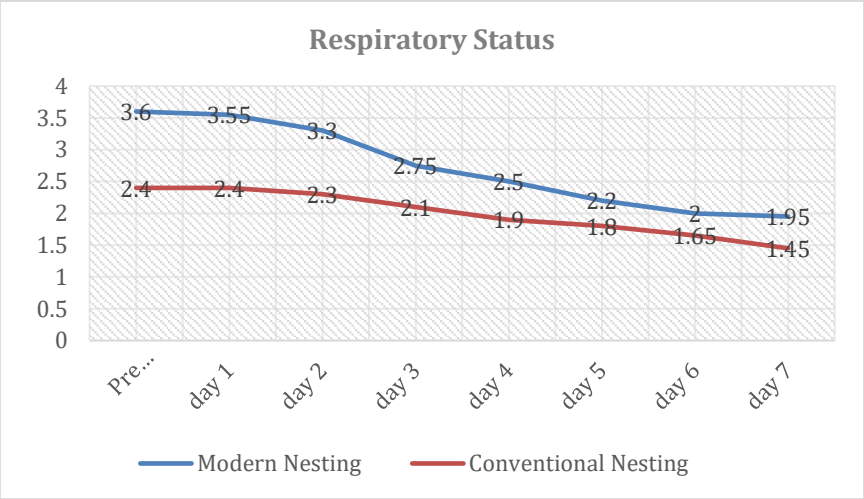

Figure 1. Respiratory status before and after nesting by two groups during 7 days

Based on the result of this study, a respiratory status measured by score down in two of the groups shown that there was a gradual decrease of score down in the first day to the seventh day and there was no significant value the differences score of two groups. This was due to the two groups of this study using nesting devices as intervention even though it was only a differentiating model both of them. The use of nesting with fixation has an impact on the pulse rate and the client's breathing. Pulse frequency and the baby's breathing is more stable by using a nesting device during NICU (Noor, Hasanah, & Ginting, 2016).

The differences in the respiratory status of two groups using score down with the Mann Whitney test showed that there was not significant of this study with P-value = 0.292. (Table 2).

Table 2. Differences in the respiratory status of two groups using score down

Scores Down	N	Mean Rank	Sum of Ranks	P-value
Modern Nesting	20	22,43	448,50	0,292
Conventional Nesting	20	18,58	371,50	

On the other hand, with using the Wilcoxon test to identify the effect of nesting model care from two groups, the result shown that there is significant value on respiratory status in the modern nesting group before and after intervention where P value = 0.001 whereas conventional nesting has no significant effect (table 3).

Table 3. The Effect Nesting Model Care to Respiratory Status with using Score Down

Group	Scores Down	mean	Std Deviation	Minimum	Maximum	P-Value
Modern Nesting	pre	3,60	1,46	0	5	0,001
	Post	2,60	1,50	0	4,43	
Conventional Nesting	pre	2,40	1,87	0	5	0,066
	Post	1,94	1,75	0	4,43	

The effect of nesting model cares for respiratory status using score down shown that group of Modern Nesting has a significant value compared with Conventional Nesting. This contrast with the research conducted by Zen (2017) that there was not significant in breathing frequency pre- and post-intervention. Meanwhile, Gill, Kumar, & Sharin (2015) reported that the respiratory rate of an infant after nesting intervention was the lower value of mean than before

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the intervention. In this study, the materials of Modern Nesting made from cotton with dacron as a cushion and completely with 2 fixations on the top of infant body's so that makes covered it and baby feel more comfortable during putting on the nest. Nevertheless, nesting traditional using rolls of blankets and towels to form a nest. During the observation, the size of conventional nesting sometimes not suitable for infant bodies and not to be fully covered. The use of nest with the standard procedure and giving the right position to the baby can provide a sense of calm and comfort to the baby even though wearing respiratory devices during in NICU (Efendi et al., 2019). Supportive positions through applying nesting techniques have useful for better oxygenation in premature infants (Yildizdas, Barutcu, Gulcu, Ozlu, & Leventeli, 2021).

3.3 Behavioral responses of modern nesting group and conventional nesting group

In terms of behavioral responses, it can be seen in the group of modern nesting, especially on day 1 which dramatically decreased from 5.5 to 3 or a decrease of 2.5. Meanwhile, conventional nesting plummets from 3.8 to 2.3 or went down to 1.5 (Figure 2).

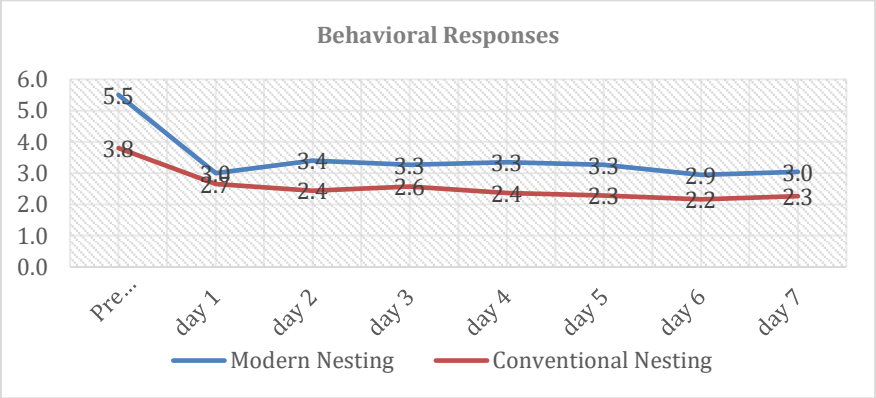

Figure 2. Behavioral responses before and after nesting by two groups during 7 days

The differences in behavioral responses in the two groups illustrate that there is significant value with P = 0.027 (table 4).

Table 4. The differences in the behavioral responses of two group

Response Behavior	N	Mean Rank	Sum of Ranks	P-Value
Modern Nesting	20	24,60	492,00	0,027
Conventional Nesting	20	16,40	328,00	

More details about behavioral responses, there is an effect nesting model care with two models of nesting before and after the intervention to behavioral responses where each value respectively P = 0.009 and P = 0.025 (table 5).

Table 5. The Effect Nesting Model Care to Behavioral Responses

Group	Behavioral Response	Mean	Std Deviation	Minimum	Maximum	P-Value
Modern Nesting	pre	5,50	3,269	1	10	0,009
	Post	3,1695	1,250	1,64	5,68	
Conventional Nesting	pre	3,80	2,60	1	9	0,025
	Post	2,39	0,90	1,78	5,99	

The score of Anderson Behavior State Scale (ABSS) in two groups of nesting showed a dramatic declined in the first-day intervention and steadily go down until the seventh day. The

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mean score of behavioral response from two groups in the last intervention respectively 3 for Modern Nesting and 2.3 for Conventional Nesting, means that the respondents in intervention group have restless sleep, while in control group have irregular quiet sleep. These results contrast with Mony, Selvam, Diwakar, & Vijaya Raghavan (2018) who mentioned that there was a significant increase in quite sleep on a preterm infant with using nesting than with routine care. However, this study has a significant effect in both modern nesting and conventional nesting to improve behavioral responses. Similarly with Saied, El-Nagger, & Ragab Bayoumi (2016) that there were statistically significant differences concerning behavioral response as regards infants 'sleep/awake state where the premature infant having deep sleep during applying positioning in nesting. Nesting as a developmental care application in premature infants reduces crying times of infants during the invasive procedure due to prone position increased the respiratory function and oxygenation (Kahraman, Basbakkal, Yalaz, & Sozmen, 2018). Moreover, nest posture increased the deep sleep hours of premature infants as the most imperative state of brain development (Reyhani, Ramezani, Boskabadi, & Mazlom, 2016).

4. Limitation

The limitation in this study is the frequency of down score observation of each respondent is carried out differently. In addition, confounding factors such as the use of breathing support were not identified in relation to the downs score in both intervention and control groups.

5. Conclusion and recommendation

Based on the results, it can be concluded that there were no significant differences between respiratory status between modern nesting and conventional nesting of this study. While behavioral response has a significant value. Besides, Modern nesting has a significant effect on the respiratory status and behavioral responses. Whereas conventional nesting only significant in behavioral responses. It can be recommended that the use of modern nesting can be beneficial in premature infants, especially in improving down scores and behavioral responses.

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