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Effects of nesting and murottal Al-Qur'an on vital sign change in infants with low birth weight

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Abstract

Background: A comfortable position, touch, soothing sound sensory will produce a neuroligic response that will make the infant feel relaxed, calm and can help in the stability of physiological functions of infants with low birth weight.
Purpose: To determine effectiveness of nesting and murottal Al-Qur'an on vital sign change in infants with low birth weight
Method: Samples were divided into two groups infants with low birth weight in stable conditions, 15 infants with low birth weight were listened to the murottal Qur'an by using meli's nesting for 45 minutes daily for 3 days, the murottal Qur'an was listened to with a noise level of 50-65dB. 15 infants of control group have not any intervention, the measurements of vital signs were carried out toward control and intervention group before and after the intervention.
Results: Analysis of wilcoxon test showed that significance in vital signs only occurred in changes in oxygen saturation with a value of $\alpha = 0.006$ (significance of $\alpha < 0.05$), the heart rate, respiratory rate, and body temperature experienced changes in numbers which all led to normal values of the physiological condition of infants with low birth weight.
Conclusion: The use of meli's nesting and murottal Qur'an is combined therapy to newborns which is able to improve the physiological function of low birth weight infants seen through their vital signs.

Keywords: Infants; Low Birth Weight (LBW); Murrotal Al-Qur'an; Nesting; Vital Signs.

INTRODUCTION

Infant with low birth weight is one of the high-risk infants who need more extra care than infants with normal birth weight (Cutland, Lackritz, Mallett-Moore, Bardají, Chandrasekaran, Lahariya, Nisar, Tapia, Pathirana, Kochhar, & Muñoz, 2017; United Nations Children's Fund, 2004). The Indonesian Demographic and Health Survey in 2018 showed Neonatal Mortality Rate at 15 per 1,000 live births, Infant Mortality Rate 24 per 1,000 live births and as many as 6.2% were born with low birth weight conditions (Ministry of Health of the Republic of Indonesia, 2018). The process of adaptation from intrauterine to extrauterine needs to be monitored to prevent morbidity that can have an impact on adult life, and the risk of premature infant or low birth weight death is 70 times higher than that of infants with enough months, so that the treatment of newborns with low birth weight is often carried out in the perinatology room or NICU (Neonatal Intensive Care Unit) (Hockenberry, Wilson, & Rodgers, 2016; Trihono, Windiastuti, Pardede, Endyarni, & Alatas, 2013).

Treatment in the perinatology and NICU rooms can affect the physiological growth and development

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of premature infants, noise caused by the sound of monitors and other aids, the voices of nurses and on-duty doctors, and painful treatment actions (such as the installation of infusions) make infants more susceptible to brain damage (Aita, Johnston, Goulet, Oberlander, & Snider, 2013; May, & Ma Himesh, 2014; Pineda, Guth, Herring, Reynolds, Oberle, & Smith, 2017). Other treatments are needed to minimize the impact that occurs on low birth weight during treatment in the perinatology room and NICU. Various methods have been used to stimulate the process of nervous system development in preventing disability in premature infants and low birth weight such as massage therapy, sound therapy as well as music therapy and integrated care to newborns with the concept of The Newborn and Infant Developmental Care and Assessment Program (NIDCAP), one of which is nesting (Hockenberry et al., 2021; Jabraeili, Sabet, Gharebaghi, Jafarabadi, & Arshadi, 2016; May, & Ma Himesh, 2014).

Nesting is to support the baby's sleeping position so that it remains flexed. This is intended to prevent drastic changes in the baby's position which can cause stress, thus affecting the baby's physiological response and reducing the loss of a lot of energy from the baby's body. Meli's nesting is designed as an effort to facilitate the growth and development of premature or low birth weight babies being treated in the NICU to increase the stabilization of physiological functions and reduce stress, by keeping the baby's position within limits that resemble conditions in the womb. Mel's nesting is a product designed by a research team that is different from products already on the market. Mel's nesting is made by hand sewing using materials that are softer and more comfortable for babies and have been tested in previous research (Deviana, 2020; Jeyabarathi & Shalini, 2018; Kahraman, Başbakkal, Yalaz, & Sözmen, 2018).

Sound therapy is a form of sensory therapy that can help overcome low birth weight problems, proven to reduce anxiety and produce a relaxing effect on the body. Murrotal Al-Qur'an is a method of listening to harmonious tones from the reading of Al-Qur'an suras which can release endorphins by influencing the brain and stimulating alpha waves to reduce stress, reduce negative emotions, create relaxation, and improve the quality of life. immune system (Mirghafourvand, Shafaie, Charandabi, & Jabbari, 2016; Vaghefi, Nasrabadi, Golpayegani, Mohammadi, & Gharibzadeh, 2015). Murottal Al-Qur'an can influence the increase in oxygen saturation and stabilization of vital signs in premature babies treated in the NICU (Damayanti, Ismail, & Warsiti, 2018).

Non-pharmacological treatments are needed for the process of stimulation of low birth weight growth and development in the perinatology ward as well as in the NICU. The combination of two touch sensory methods from Mel's nesting and murottal Al-Qur'an which has the benefits of calming, reducing pain and improving the body's physiological functions which can be assessed from the response to the body's vital signs.

RESEARCH METHOD

This study is a quasy experiment with a non-equivalent control group design, the design of this study there was a group with intervention (treatment) and one control group (without intervention of meli's nesting and murottal Qur'an). Figure 1 describes the research process plan to be carried out in the intervention group and the control group.

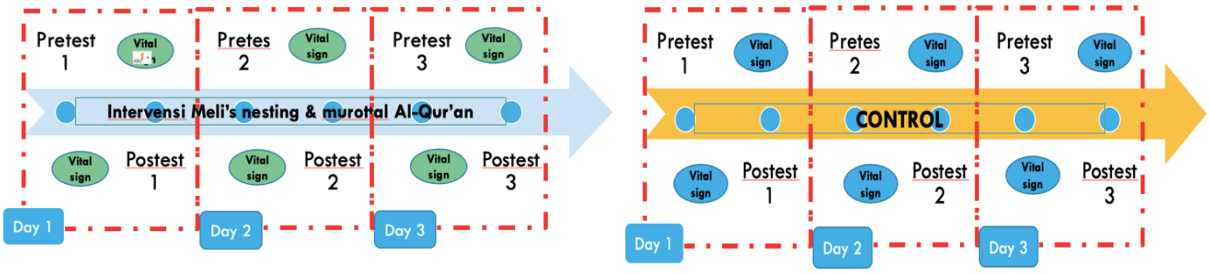

Figure study design

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The sampling technique used non probability sampling with consecutive sampling. Samples were taken from the affordable population by assigning subjects who meet the study criteria included in the study for a certain period of time, so that the number of participants can be met. The participants were 30 Infants with low birth weight who were treated in the Perinatal ward of the Koja Regional Public Hospital, North Jakarta, DKI Jakarta. Participant with criteria; The family were Muslim and willing to allow their infants, born with a weight of 1500 grams - 2500 grams, and without any contra indication.

The Instruments Used

Meli's nesting, the result of nesting modifications that are used as a buffer in the sleeping position in the infant so that it remains in a flexible position, this is intended in order that there is no drastic change in position in the infant that can cause stress so that it has an effect on the infant's physiological response and suppresses the loss of a lot of energy from the neonatal body (Jeyabarathi & Shalini, 2018; Kahraman et al., 2018). Meli's nesting is designed to resemble the conditions in the mother's womb that are made around the infant's body that can be adjusted to the length of the infant's body. It is sought to maintain the position of the infant with restrictions that resemble the condition when in the womb, so that the infant has a body surface to touch (Deviana, 2020). The use of meli's nesting is an effort to facilitate the development of premature infants or low birth weight in improving the stabilization of physiological functions and reducing stress.

Body temperature assessment used digital temperature placed on the armpits until the temperature indicator showed that it had finished taking measurements, with a normal temperature value of 36.5 °C – 37.5 °C (Hockenberry et al., 2021). Assessment of oxygen saturation and heart rate used an oximetry device placed on the infant's feet for 1 minute to see the results. The normal value of oxygen saturation was 90% - 100% and the normal heart rate value of the infant was at a value of 110 - 160 x / min (Lissauer, Fanaroff, Miall, & Fanaroff, 2020).

Listening to the murottal Qur'an used new bluetooth speaker that has a long voice and can be adjusted volume remotely. The resulting volume was controlled using a sound level meter. The participant who were have the intervention were 15 and 15 other as a control group. The intervention provided was that the low birth weight was placed on meli's nesting and listened to the murottal Qur'an using a speaker placed under the infant's feet (with a minimum distance of 30 cm from the ear) and a sound noise level of 50-65dB which was measured using a sound level meter, an overview of the interventions carried out can be seen in figure (Bieleninik, Ghetti, & Gold, 2016; Standley, 2012).

The intervention was carried out for 45 minutes, before the intervention the infant was assessed for vital signs (temperature, respiration, heart rate, and oxygen saturation) as pretest values. After the intervention, the infant's vital signs (temperature, respiration, heart rate, and oxygen saturation) was reassessed again as posttest values. In the control group, no intervention, only have standard care owned by the Koja Regional Public Hospital, DKI Jakarta. However, the assessment of vital signs (temperature, respiration, heart rate, and oxygen saturation) as pretest values was carried out, in a pause of 45 minutes an assessment of vital signs (temperature, respiration, heart rate, and oxygen saturation) was carried out again as a posttest value. This study was ethically approved by Fakultas Kedokteran dan Kesehatan Universitas Muhammadiyah Jakarta, under the approval number 162/PE/KE/FKK-UMJ/VII/2022, dated July 27, 2022.

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RESEARCH RESULTS

Table1. Characteristics of Infants (N = 30)

Variables	Results
Gender (n/%)	
Male	16/53.3
Female	14/46.7
Delivery Method (n/%)	
Vaginal birth	15/50
Caesarean section	15/50
Current Body Weight (n/%)	
1500 – 1999 grams	15/50
2000 – 2450 grams	15/50

Table 1 shows the characteristics of participants including gender, type of delivery, birth weight. The male infants tended to be dominant in the subjects of this study compared to female infants. This type of labor shows a balanced result between the type of spontaneous delivery of per-vaginal and the type of delivery of the caesarean section. The same thing occurred also in the birth weight characteristics having a significant amount between 1500-1999 grams and 2000–2450 grams.

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Table 2. Comparison of Vital Sign Change After Intervention

Characteristics	Mean	SD	Min	Max
	Oxygen Saturation			
Intervention				
Pretest	94.53 %	2.87	89.0	99
Postest	98.47 %	0.74	97.0	100
Control				
Pretest	95.00%	3.36	90	100
Postest	97.07%	1.67	94	99
	Respiratory Rate			
Intervention				
Pretest	45.60 x/minute	4.35	40	52
Postest	44.40 x/minute	3.22	40	52
Control				
Pretest	50.00 x/minute	6.59	40	60
Postest	47.40 x/minute	6.77	40	60
	Heart Rate			
Intervention				
Pretest	135.8 x/minute	22.23	85	170
Postest	136.0 x/minute	11.98	110	158
Control				
Pretest	135.9 x/minute	14.43	105	158
Postest	134.2 x/minute	12.98	118	165
	Body Temperature			
Intervention				
Pretest	36.7 °C	0.40	36.3	37.8
Postest	36.9 °C	0.27	36.5	37.3
Control				
Pretest	36.8 °C	0.26	36.3	37.3
Postest	36.8 °C	0.34	36.4	37.6
	Weight			
Intervention				
Pretest	2043.3 gram	248.45	1640	2465
Postest	2055.0 gram	237.78	1635	2490
Control				
Pretest	2065.0 gram	260.73	1525	2415
Postest	2063.7 gram	260.65	1500	2415

Table 2 shows that the value of oxygen saturation, heart rate, respiration and body temperature in low birth weight infants has increased from before the intervention (pretest) to after the murottal Qur'an intervention and the use of Meli's nesting simultaneously (posttest). The intervention group showed an increase or change in the

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mean values in oxygen saturation, heart rate, respiration and body temperature in low birth weight infants as study subjects were still within normal limits.

The control group showed that the results of changes in the average value of oxygen saturation increased, respiratory and heart rates decreased, and the average temperature value did not change in pretest and posttest values. However, the change in the average value in the control group participants was still within normal limits.

Table 3. Normality Test with Shapiro-Wilk

Characteristics	N	Prob>z
Oxygen Saturation		
Intervention		
Pretest	15	0.74
Postest	15	0.18
Control		
Pretest	15	0.28
Postest	15	0.22
Respiratory Rate		
Intervention		
Pretest	15	0.12
Postest	15	0.15
Control		
Pretest	15	0.28
Postest	15	0.27
Heart Rate		
Intervention		
Pretest	15	0.67
Postest	15	0.24
Control		
Pretest	15	0.84
Postest	15	0.82
Body Temperature		
Intervention		
Pretest	15	0.03
Postest	15	0.01
Control		
Pretest	15	0.99
Postest	15	0.28
Weight		
Intervention		
Pretest	15	0.41
Postest	15	0.54
Control		
Pretest	15	0.16
Postest	15	0.29

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Results of the normality test using Shapiro-Wilk in Table 3, the value < α (0.05) is body temperature data (pretest and posttest) at intervention group, it means data is not normally distributed so parametric testing cannot be carried out. Results for data oxygen saturation, respiratory rate, heart rate and body weight show values > α (0.05), this value indicates that the data is normally distributed so that parametric tests can be carried out.

Table 4. Effects of Nesting and Murottal Al-Qur'an on Vital Sign Change

Characteristics	Z	Sign (2-tailed)
Oxygen Saturation		
Intervensi		
Pretest	-2.993	0.003
Postest	-2.754	0.006
Control		
Pretest	-1.741	0.082
Postest	-1.567	0.117
Respiratory Rate		
Intervensi		
Pretest	-0.060	0.952
Postest	-0.239	0.811
Control		
Pretest	-1.066	0.286
Postest	-0.316	0.752
Heart Rate		
Intervensi		
Pretest	-0.471	0.637
Postest	-0.094	0.925
Control		
Pretest	-1.876	0.061
Postest	-1.195	0.232
Weight		
Intervensi		
Pretest	-0.877	0.332
Postest	-0.913	0.361
Control		
Pretest	-0.304	0.729
Postest	-0.315	0.753

Table 4 the results of data analysis using wilcoxon test, showed a significant value (α < 0.05) on the value of oxygen saturation after intervention by listening to the murottal Qur'an and the use of meli's nesting (α = 0.006). Respiratory rate, heart rate, body temperature, and weight did not show significant results (α > 0.05) from the intervention of listening to the murottal Qur'an and the use of meli's nesting. The control group showed no significant results on changes in the values of vital signs (oxygen saturation, respiratory rate, heart rate, and body temperature).

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DISCUSSION

Non-pharmacological treatments that can help high-risk infant conditions such as voice therapy and nesting. In this study, the results of the analysis in table 3 showed that participants in the intervention group of therapy of murottal Qur'an and meli's nesting showed significant results (α < 0.05) on the oxygen saturation value after intervention with a value (α = 0.006). As for the respiratory rate, heart rate, and body temperature values did not show significant results (α > 0.05).

These results are in line with previous studies showing that the intervention of Al-Qur'an murottal has a significant effect on increasing oxygen saturation for 3 days in premature infants (Damayanti et al., 2018). Likewise, the results of previous studies showed that the results of statistical tests obtained a p value of 0.000 <α (0.05), so it can be concluded that there is a difference in oxygen saturation of participants before and after the use of nesting in low birth weight infants (Saprudin & Sari, 2018). Research conducted in Iran showed an increase in oxygen saturation values of 0.3% before and after listening to Al-Qur'an murottal in neonates in the NICU for 10 minutes (Qolizadeh, Myaneh, & Rashvand, 2019).

The normal oxygen saturation value was >94% and it was shown in the results of this study, the increase in oxygen saturation that occurred in this study led to a better state, judging by the average value of oxygen saturation obtained during the study showed the minimum value before having the intervention which showed a figure of 89% to 97%. The increase in oxygen saturation is influenced by a decrease in metabolic activity due to a sense of comfort and relaxation from the use of nesting and listening to the sound of the murottal Qur'an and the remaining phase of hemoglobin accumulation until the intake of nutrients obtained by the participants.

The respiratory rate, heart rate, and body temperature values from the results of this study analysis did not show significant results but still experienced changes in the average value of the results of pretest and posttest measurements. The change in values seen in the increase in heart rate in the subjects of this study was seen in the average values of respiratory rate, heart rate, and body temperature leading to physiological changes in values, which can be used as a condyle picture of infants with low birth weight to a more stable condition. Other studies that showed similar results on vital signs after having Quranic murottal therapy interventions as well as with nesting therapy showed changes in values before and after the intervention on respiratory, heart rate and body temperature (Kahraman et al., 2018; Saprudin & Sari, 2018).

In this study, although infants received the treatments of nesting and the murottal Qur'an, around the infant's environment there was still a stimulus that became a stressor such as room noise, some medical procedures and nursing measures (Byrne & Garber, 2013; Pineda et al., 2017). This does not rule out the possibility of this condition being a source of stress that can increase sympathetic nerves so that it increases the contractility of the heart so that the heart rate will increase.

The control group that have not the intervention did not show significant results on the pretest and posttest values of the participants' vital signs. The average value showed the result of increasing from posttest to pretest on oxygen saturation only, a decrease in the average value occurred in the results of respiratory values and heart rate, while the average values of pretests and posttest of body temperature experienced constant results there was no increase or decrease. The noise generated from medical devices in the perinatology and NICU rooms such as incubators and other monitoring devices made the infant less comfortable so that it interfered with the sleep process and the physiological work of the organs of the infant with low birth weight (Hutchinson, De Luca, Doyle, Roberts, Anderson, & Victorian Infant Collaborative Study Group, 2013).; Rajalakshmi, Sunitha, & Venkataraman, 2019). In this study, participants in the group were treated inside the incubator, changes in vital signs that occurred during observation showed results that varied but still within normal limits did not affect the physiological condition of the infant.

Listening to the murottal Qur'an has a mechanism of action by improving the working system of the myelinated vagus (parasympathetic nerve) as well as suppressing the work of the sympathetic nerve and the unmyelinated vagus

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(parasympathetic nerve) (Al-Kaheel, 2011; Porges, Bazhenova, Bal, Carlson, Sorokin, Heilman, Cook, & Lewis, 2014).

The position of flexion, infants are facilitated to increase hand-to-mouth and hand-grasping activities (Hockenberry et al., 2016; Lissauer et al., 2020). This condition can indirectly increase muscle movement activity which is directly proportional to the increase in metabolism so that it leads to an increase in body temperature. Nesting is able to facilitate the participant to return to the position of flexion. This position increases the participant's ability to maintain flexion positions such as shoulder and elbow adduction, hip and knee flexion and the head is in the middle line. Infants are also easier to move the upper limbs to the mouth or hand movements. Nesting is useful for supporting the infant's body and also provides a comfortable place.

Sensory stimulation from listening to the murottal Qur'an and touch from meli's nesting will affect the mindset present in the central nervous system which then diverts motor stimuli in the peripheral nervous system to rebuild the process of homeostasis in compensating for body systems. One of the forms of body compensation that can be seen is through vital signs such as oxygen saturation, heart rate, respiratory rate, and body temperature.

The research process went well and received a positive response from parents or guardians and the hospital. The strength of this researcher is used of instruments in the intervention process, listening to murottal Al-Qur'an for non-pharmacological therapy at babies has not been widely used. Nesting used in this research was not one that was already available on the market, but was made by the research team by hand sewing. The obstacle we faced during this study was the existence of confounding or external variables that could not be controlled in this study. The confounding that was found during this research was that the standard treatment procedure in the perinatology room at hospital was incubator care, so that the body temperature variable was greatly affected by the incubator temperature because during the research process it was according to permission from the doctor, the participant remains in the incubator care. The next confounding is sound, the noise from medical devices in the perinatology room during the research process will affect the murottal sounds heard by the baby so that the delivery of the murottal Al-Qur'an sounds is not optimal.

For future researchers should select a larger number of participants using randomization techniques and add a control group so that the generalization of the results becomes wider. Heart rate assessment can be done using the HRV (Heart Rate Variability) method so that the sensitivity of the value can be measured and seen clearly. Non-pharmacological treatment by providing sound therapy through murottal Al-Qur'an intervention and nesting can be used as a consideration for alternative therapy methods in treating low birth weight babies in the NICU so that it can accelerate the baby's recovery process.

CONCLUSION

The results of this study are expected to be able to provide new treatment innovations or interventions for the care of low birth weight and premature infants in the NICU, because so far the management of low birth weight and premature infant care in Indonesia is merely focused on the treatment of physical health conditions but ignores psychological treatment. Hopefully the implementation of two methods of handling low birth weight and premature problems with the use of Meli's nesting and listening to the murottal Qur'an can help stabilize the vital signs of low birth weight infants during treatment in the perinatology and NICU room.

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