IJNH Innovational Journal of Nursing and Healthcare (IJNH)

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Research article

Effect of nesting versus non nesting on sleep pattern and physiological parameters among premature infants

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Abstract

Motivation: Optimal sleep is essential to normal growth and development and aids recovery. Studies show that sleep has a role in the development and function of the brain. Sleep deprivation may have a negative impact on the health and development of the newborn and lowers the threshold for pain which has been proved in adult sleep deprivation studies. Preterm infants require more than 18 hours sleep per day for normal growth and development. Over 2 million children today have some type of sleep disorder ((National Institute of Lung and Heart Disease, 2015). As there are only a few studies conducted on the effect of nesting on the sleeping pattern and physiological parameters and also nurses in NICU (Neonatal Intensive Care Unit) are not giving much significance to sleeping pattern of premature infants. So the investigator felt the need to conduct a study on this area of interest. **Design and methods:** This crossover clinical trial was performed at a tertiary neonatal intensive care unit (NICU). 21 preterm infants who met the inclusion criteria were enrolled. They were randomly assigned to two groups of nest and routine procedure. Physiological parameters such as Oxygen saturation, body temperature, heart rate and respiration were evaluated by using leads and probes connected to centralized monitor during each stage of sleep between inter epoch two feed were recorded and analyzed by using a paired t-test. **Results:** There was an improvement in physiological parameters among preterm infants with nesting compared to routine care, which was tested by paired t-test. With regard to oxygen saturation, there was a significant increase in active sleep ($p<0.05$) and quiet sleep ($p<0.005$), heart rate was significantly decreased and maintained stable during quiet sleep ($p<0.05$) respiratory rate was decreased and maintained stable but statistically not significant ($p>0.05$) in all stages of sleep, There was increase in mean body temperature value in all stages of sleep, statistical significance exhibited only in indeterminate sleep ($p<0.05$). **Conclusion:** Use of nesting aids in comfort and helps to maintain stable physiological parameters. Thus using nesting for a preterm infant is recommended to facilitate stability of physiological parameters in NICU.

Key words: Sleep pattern, sleep deprivation, neonatal, premature infants.

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1. Introduction

Pre-term babies are babies born before completion of 37 weeks of gestation (WHO FACT-SHEET 2014). About 8-10% of babies in our country are born preterm. These infants are anatomically and functionally immature leading to high neonatal morbidity and mortality. They are more prone to develop impaired sleep pattern, hypothermia, fluctuation of heart rate, hypoxia etc. Premature babies have more difficulty settling into a pattern of waking and sleeping pattern. Contributing factor for this is, premature babies brains are going through maturation and also disturbed hospital environment. These ultimately lead to poor brain development and behavioral problems in children [1].

Globally preterm birth continues to increase despite advances in modern medicine. In Caucasian infant 7% of live birth, African American that becomes doubled to 14%. In the world 10% of all the white babies and 20% of all black babies born prematurely (National Vital

Access this article online

Website: www.ijnursing.com | ISSN No: 2454-4906

How to cite this article: Mony. K, V. Indra Selvam Venkatakrishnan, Effect of nesting versus non nesting on sleep pattern and physiological parameters among premature infants. Inno J Nur Health 2018; 4(2): 55-59.

Statistics Reports 2015) [2]. In India, National centre for health statistics shows that preterm birth rate in 2004 was 12.5% that increased to 12.8% in 2006. In India infant mortality rate in low and middle-income countries was approximately 88/1000 live birth .of this 28 death occurred in the early neonatal period (National Vital Statistics Reports) [3].

According to WHO neonatal causes of death were infections 34%, asphyxia 28% problems linked with preterm birth 23%. More premature babies survive but serious health problems remain unchanged, survival rate shows in 1995 -40% and 53% in 2006, but the proportion of survivors leaving the hospital with major health problems is unchanged. Preterm birth is associated with respiratory complications and lung disease. Problems with bowel function and long-term neurological damage etc [4].

Nesting facilitates the transformation of sleep pattern from erratic disturbed spells to deep peaceful nights and contented days thus conserving energy and minimizing weight loss. Again the flexed posture reduces the surface area exposed to the environment, minimizing the heat loss which prevents huge weight loss [5].

Objectives:

Find out the effect of nesting and non nesting on sleep pattern and physiological parameters among premature babies

Operational definitions:

Effect

It means a change produced by an action or cause, a result or an outcome.

In this study it refers to the extent to which nesting intervention has achieved the desired effect in the sleeping pattern, thermoregulation heart rate, respiratory rate, oxygen saturation and weight as measured by observational checklist and bio-physiological measures.

Nesting

It means to create and settle into a warm and secure refuge (American Heritage Dictionary)

In this study, it refers to the application of snug and secure boundary or an enclosure using a rolled blanket around the immediate physical environment of the neonate.

Sleep pattern

It refers to a pattern of sleeping and waking especially a regular pattern of sleeping and walking designed to promote health.

In this study, it refers to a pattern of sleeping and waking, as sleep cycle consists of active sleep, quiet sleep, and indeterminate sleep as measured by observational checklist [6]

Physiological parameters:

In these study physiological parameters refers to the parameters such as body temperature, heart rate, respiratory rate and oxygen saturation.

Thermoregulation

It refers to the maintenance of constant internal body temperature, independent of environmental temperature (American Heritage Dictionary)

In this study, it refers to the maintenance of constant internal body temperature of a neonate independent of the environmental temperature during nesting and nonnesting as measured by thermal skin probe

Pulse rate

It refers to the rhythmical throbbing of arteries as blood is propelled along them as felt on the wrist or temples (Oxford English dictionary)

In this study, it refers to the rhythmic throbbing of the arteries as blood is propelled along them as measured by a pulse oximeter.

Respiratory rate

It refers to the rate at which air is drawn into and sent-out of lungs during the process of breathing

In this study, it refers to the rate at which air is drawn into and sent out of lungs during the process of breathing as measured by a pulse oximeter

Oxygen saturation

It refers to the concentration of oxygen in the blood

In this study, oxygen saturation refers to the concentration of oxygen in the blood as measured by a percutaneous pulse oximeter

Premature neonate

Premature neonate refers to a baby born before completion of 37weeks of gestation [7]

In this study, it refers to neonate born before completion of 37 weeks of gestation and weight between 1.25 to1.5 kg.

Hypotheses

H1- There is a significant difference in scores of sleep pattern and physiological parameters of premature infants with nesting and nonnesting.

Conceptual framework:
A system model of Ludwig Von Bertalanffy (1968)

Assumptions

1. Nesting may help to improve sleep pattern of premature neonates
2. Nesting may help to maintain normal physiological parameters
3. Care with nesting may help to reduce the incidence of neurological impairment

Delimitations
The study is delimited to premature neonates with a weight between 1.25- 1.5kg

2. Research methodology

Research approach- Quantitative approach
Research design- Crossover design

Subject	Treatment schedule	
Sub-1	Treatment-A	Treatment-B
Sub-2	Treatment-B	Treatment- A

Population- Premature infants admitted in Neonatal ICU
Sample size- 21
Sampling technique- Simple random sampling will be used for selection of study participants for intervention
Setting- NICU of MOSC Medical College Hospital, Kolenchery

Inclusion criteria
1. Premature neonates with a weight between 1.25kg to1.5kg
2. Premature neonates admitted in NICU
3. Premature neonates who are not on a ventilator and critically ill

Exclusion criteria
1. Premature neonate with chronic illness
2. Neonates who are unstable

Research tools and techniques:

Tool 1- Structured questionnaire to collect demographic variables
Tool 2- an Observational checklist to assess the sleeping pattern of premature infants
Tool 3- Pulse oximeter to assess heart rate, respiratory rate, oxygen saturation
Tool 4- Temperature probe to check the temperature

Pilot study

A pilot study will be conducted in NICU to check feasibility and practicability of the study

Plan for data collection

After obtaining ethical clearance from Institutional Review Board (IRB) of MOSC Hospital and IRB of Saveetha University and consent from the parents of premature neonates, the study subjects will be selected by simple random sampling technique.
Subjects will be allotted randomly for intervention and then nesting will be done on subject 1 and subject 2 will be kept on usual wrapping method. These babies will be allowed to sleep after a feed. Sleeping pattern and physiological parameters will be observed during sleep waking period for 3 hours between two feeds.

Plan for data analysis

The data will be analyzed by using descriptive and inferential statistics

Ethical consideration

Ethical clearance will be obtained from (IRB) of MOSC Medical College hospital and IRB of Saveetha University, Chennai, India. Informed consent will be obtained from parents of premature babies.

3. Results

Out of 21 infants in the study, 12 were male and 9 were female. Mean of gestational age of study subjects were 32.81+1.365 weeks. The mean of postnatal age of study subjects was 6.38+5.343days Mean birth weight of the subjects were 1.67+ 0.1849.

Table no 1: Comparison of physiological parameters in stages of sleep in nesting Vs routine care among preterm infants

Variables	Mean		Standard deviation	
	Nesting	Routine Care	Nesting	Routing Care
Oxygen saturation				
Active sleep	98.52	97.19	1.289	1.401
Quiet sleep	98.52	97.67	1.250	1.197
Indeterminate sleep	98.00	97.81	1.897	1.692
Heart rate				
Active sleep	140.67	146.71	11.710	14.036
Quiet sleep	135.81	142.62	12.496	16.539
Indeterminate sleep	139.29	142.14	11.786	13.665
Respiratory rate				
Active sleep	51.29	50.90	5.900	6.877
Quiet sleep	47.62	49.05	7.658	5.563
Indeterminate sleep	49.65	55.65	5.932	5.088

Variables	Mean		Standard deviation	
	Nesting	Routine Care	Nesting	Routing Care
Body Temperature				
Active sleep	36.72	36.767	0.276	0.3746
Quiet sleep	36.8319	36.705	0.332	0.3442
Indeterminate sleep	36.84	36.743	0.157	0.1599

Table 1 depicts that infants experienced stable physiological parameters in both procedures even though there was improvement during the period of nesting as compared to routine care in terms level of oxygen saturation was improved, heart rate decreased and maintained normal, respiratory rate maintained stable, body temperature increased to normal level with nesting as compared to routine procedure in all stages of sleep. This difference may be due to the effect of nesting.

4. Discussion

In Neonatal Intensive Care Unit, preterm infants get disturbed due to the effect of many factors like noise, light, lack of confined environment. This may be compensated by caring infant with nesting. In the present study showed that there were an improvement and stability in Physiological parameters like oxygen saturation, heart rate, respiratory rate and temperature in all stages of sleep among infants with nesting as compared to routine care. This shows nesting may be effective in maintaining stable physiological parameters, which in turn an indicator of good health. This was supported by findings of the study conducted [8] on the effect of nesting on posture discomfort and physiological parameters of low birth weight infants. The study concluded that infants with nesting experienced stable physiological parameters of heart rate, respiratory rate, and temperature. Another study was conducted on [9] the effect of nesting and swaddled positioning support in the prone position on heart rate sleep distribution and behavior state in very low birth weight infants. The study concluded that a prone position with nested and swaddled positioning support might facilitate sleep and heart rate stability compared to prone positioning alone.

[9] Conducted a non controlled clinical trial among 12 newborns infants on physiological responses of preterm newborn infants submitted to musical therapy. Infants with gestational age <36 wks and spontaneously breathing were included in the study The preterm infants were submitted to 15 minutes sessions of classical music therapy twice a day (morning and afternoon) for three consecutive days. The variables heart rate and respiratory rate, oxygen saturation, diastolic and systolic arterial pressures and body temperature were analyzed before and immediately after each musical session. Result showed that there was a decrease in heart rate after the second session of music therapy (paired t-test; p=0.02) and an increase at the end of the third session (paired t-test; p=0.005)Respiratory rate decreased during the fourth and fifth session (paired t-test; p=0.01and 0.03 respectively)Regarding oxygen saturation, there was an increase after the fifth session (p=0.008).comparison of physiological parameters among sessions, for the six studied sessions ,showed only that the gain in oxygen saturation during the fifth session was significantly higher than during the sixth one (Turkey's test after variance analysis: p=0.04) Conclusion: Music therapy may modify short term physiological responses of hospitalized preterm newborn infants.

A study on the effect of kangaroo Mother care on vital physiological Parameters of low birth weight newborn. A study conducted among 265 mother-baby pairs. The sample selected by purposive sampling. Initially, KMC was started for the 1hour duration (at a stretch) on the first day and then increased by one hour each day for next 2 days. Auxiliary temperature, respiration rate, heart rate (Hr/min) and oxygen saturation (SpO2) were assessed for 3 consecutive days immediately before and after KMC. The result showed that mean temperature rose by about 4 degrees C, RR by 3 per minute, HR by 5 bpm and SpO2 by 5% following KMC session which was statistically significant ($p<0.05$)[10].

Another study conducted on newborn physiological responses to noise in the neonatal unit among 61 low weight newborns admitted in neonatal units and in the incubator. That was a prospective, observational quantitative exploratory descriptive study. Data collected by using assessment of Preterm Infant Behavior Scale and noise analyzer from September 2012 to April 2013. The result showed that there was an increase in heart rate (p=0000+10.36sd, when sleeping and 8.7 in noise, respectively) and a decrease of oxygen saturation in newborns in incubators, in the presence of higher environmental noise levels (p=0.0000and SD of 1.05and of 1.12, when sleeping and in noise respectively). Conclusion: there were high sound pressure levels in the NICU. There was variation in physiological or functional changes due to the effect of noise. There are very limited numbers of studies conducted on the effect of nesting on physiological parameters. So the investigator felt the need to conduct a study on this area of interest [11].

Conclusion

The findings of the research study showed that nesting is effective in maintaining stable physiological parameters among infants admitted in neonatal intensive care units. These study findings can be utilized for caring preterm infants in neonatal intensive care units and in a situation where there is a lack in parental care to prevent the crippling complications like abnormal psychomotor and neurological sequelae that manifested by abnormal variations in physiological parameters.

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