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"An Interventional Study to Evaluate the Effectiveness of Nesting on Sleep Pattern and Physiological Parameters among Preterm Infants Admitted in NICU, Tertiary Teaching Hospital, Dharwad"

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ABSTRACT

Background of the study

The Neonatal Intensive Care Unit is specially built to prevent pain, promote quiet sleep and maintain stable physiological parameters among preterm neonates. However, preterm newborns below 32 weeks of gestational age (extreme premature) are considered high risk for developing neuromotor changes throughout their lives. The essential components of brain development in neonatal period is sleep. Nesting is individually modeled and specially designed and has proved in providing effective comfort, support and help preterm to develop normally in NICU. Neonatal Nurse requires skill, dedication and emotional strength to care for newborn, preterm and sick infants.

Aims:

Evaluate effectiveness of nesting on sleep pattern and physiological parameters of preterm infants and also to find the correlation between the sleep pattern with physiological parameters.

Modified Kolcaba's Comfort theory

Method: Quantitative evaluative approach was used for the study. The independent variable was Nesting and dependent variable was Sleep Pattern and Physiological Parameters such as body temperature, heart and respiratory rate and weight of Preterm infant. The study was conducted on 30 preterm infants admitted in NICU of tertiary care teaching Hospital, Dharwad. Non-probability-purposive technique was used for the selection of the sample. Data was collected by using the MPPS and MPCS for sleep pattern.

Results: The findings of the study revealed that there was a significant improvement in Physiological Parameters and Sleep Pattern after intervention of Nesting at 'p' value < 0.05 level of significance.

Interpretation and Conclusion: The mean Post test score of **S**leep Pattern and PP(Physiological Parameters) 6.80 and 8.97 were significantly higher than the mean pretest score of 10.37 and 7.73 the findings clearly

revealed that nesting was effective in increasing the Physiological Parameters and Sleep Pattern in the Preterm Neonates. And a significant correlation at $p<0.05$.

KEY WORDS
Nesting, Physiological Parameter, Precht's Criteria, NICU.

Introduction

The birth of a baby is exiting as well as traumatic experience for both, the mother and the baby. Anxiety doubles in the parents when the newborn is preterm. The preterm is vulnerable as he has not completed the required days in the mother's womb, the internal environment being vital for development physically and physiologically, especially the development of brain and primitive reflex for survival. This change in environment can cause brain injury because the developing brain must now process all the information from the new environment, which may adversely affect their neuro-motor development**.** To make things even more complicated, babies who are born early can be really sick in other ways, which can also impact brain development.

Moreover, the preterm baby Normally newborns sleep 18 hours over the course of 24 hours which leads to the development of newborn physiological parameters and weight gain.

Sleep in the first few hours of essential criterion of Neonatal Intensive Care Unit is prevention of pain, promotion of quiet sleep and stable physiological parameters among preterm and term neonates. According to the definition of the World Health Organization (WHO), Preterm birth, occurring before 37 completed weeks of pregnancy, is the number one cause of newborn deaths and the second leading cause of deaths in children under five. Preterm babies are at increased risk of illness, disability and death**.**

Premature infants are fetuses living outside the uterus, where brain development occurs faster than any other stage in life. If the fetus is separated from the protective environment of uterus in this critical period, special treatment is required in Neonatal Intensive Care Units (NICU).The development of intensive care in recent decades led to the survival of a large number of premature newborns. However, preterm newborns (PTNB's) below 32 weeks of gestational age (extreme premature) are considered high risk for developing neuromotor changes throughout their lives

It is believed that premature newborn may present neuro psychomotor development delay (NPMD) and damage to the central nervous system (CNS) due to the immaturity and fragility of their nervous system. One of the essential components of brain development in neonatal period is sleep. Adequate sleep is of great importance in neonates as it affects the development of sensory system, the structure of hippocampus, Pons, brainstem, middle brain, motor system, limbic, learning, long-term memory, thermoregulation, preservation of the capacity of coping with changes, and appropriate responses to environmental stimulations.[5]

Hospitalization of the neonates in neonatal intensive care unit (NICU) and contact with various environmental stimulations leads to shortening of their sleep time or development of a sleep disorders

Nesting is individually modeled and specially designed for comfort, support and help premature and ill infants to continue normal development with containment. and it also 'Improves neonates' sleep quality through preservation of neonates' curved limb position and reduction of sudden movements as well as immobility of the arms and legs. It also helps to save the energy of the child and improve the physiological parameters such as temperature, heart rate, respiration and weight gain.

Nesting facilitates transformation of sleep pattern from erratic disturbed spells, to deep peaceful nights and contented days, thus conserving energy (may be lost in crying) and minimizing weight loss. A To determine the effectiveness of the postural support on the distress and pain during the diaper change in preterm infants. It was found that all the babies displayed increased distress and pain score during diaper change and this was significantly less for babies who were nested.

1. Nesting is also effective in improving the physiological parameter of preterm infants in early neonatal period. This finding of the study was consistent with the study conducted by Ms.Ramya Poulose. et al.

(2015) in the selected government hospital, Delhi. With the aim to evaluate the effect of nesting on posture discomfort and physiological parameters of low-birth-weight infants. As a result, the study concluded that that low birth weight infants in experimental group experience stable Physiological parameters in terms of heart rate and respiration during the stay in NICU.F Ferrari, N Bertoncelli, C Gallo, M F Roversi, M P Guerra, A Ranzi, M Hadders-Algra Posture and movement in healthy preterm infants in supine position in and outside the nest:https://www.researchgate.net/publication/6463077

So as review of literature and study evidences shows that nesting provides an effective sleep pattern and improve physiological parameters, Thereby, promoting better patient outcomes. Therefore, the investigator felt a need to introduce and evaluate the effectiveness of nesting in preterm infants admitted in NICU of selected hospital Dharwad

Title of the Project

"An interventional study to evaluate the effectiveness of nesting on sleep pattern and physiological parameters of preterm infants admitted in NICU of SDM Hospital, Dharwad"

Aims & Objectives of the study:

1. To assess and evaluate the effectiveness of nesting on sleep pattern of preterm infants
2. To assess and evaluate the effectiveness of nesting on physiological parameters of preterm infants
3. To find the correlation between the sleep pattern with physiological parameters of preterm infants.

Hypothesis

Following hypotheses were stated to determine the statistical evidence of the findings at 0.05 level of significance.

H_1: The mean post- interventional scores of sleep pattern will be significantly higher than mean pre- interventional scores of preterm infants at 0.05 level of significance.

H_2: The mean post- interventional scores of physiological parameters will be significantly higher than mean pre-interventional scores of Preterm Infants at 0.05 level of significance.

H_3: There will be a significant correlation between the Sleep Pattern Scores with Physiological Parameters Scores of Preterm Infants at 0.05 level of significance.

Conceptual/Theoretical Framework.

The conceptual frame work used for the study was adopted from major concepts of modified Kolcaba's Comfort theory.

Methodology

Research Approach : Quantitative Evaluative Research Approach

Research Design : Pre-Experimental; one group pre-test post-test design.

Samples : Preterm Infants

Sampling Technique : Non-Probability Purposive sampling technique

Sample Size : 30 Preterm infants

Setting of the Study: Study was conducted in NICU of tertiary care teaching Hospital, Dharwad.

Sampling Criteria: Present study samples were selected by keeping in view of the following criteria.

Inclusion criteria:

Preterm infants

- Admitted in NICU of tertiary care teaching Hospital, Dharwad.
- Birth weight between 1000 grams and 2,499 grams
- Age < 7 days old
- Gestational age at the birth between 28 to 34 weeks Parents/guardians willing for participation of baby in the study.

Exclusion criteria: Preterm infant who

- Were diagnosed with Congenital Anomalies,
- Suffered Compromised Respiratory Function
- Were diagnosed with Birth Asphyxia,
- Had Seizures, Sepsis or Apnea
- Intracerebral Hemorrhage
- Metabolic Disorders and Anemia.

Variables:

- **Independent variable:** Nesting
- **Dependent variable:** Sleep Pattern and Physiological Parameters

Description of the tool:

Two tools were developed for the study

Modified Physiological Parameters Scale [MPPS]

MPPS is a method of collecting data through assessment. Physiological Parameters like [respiratory rate, heart rate, temperature and weight] assessed through.

- ❖ Respiratory rate: Inspection
- ❖ Heart rate: Stethoscope
- ❖ Temperature: Thermometer
- ❖ Weight: Calibrated Weighing Machine and

Further according to total score of MPPS was categorized as follows:

- ❖ Low PP [4-8]
- ❖ Normal PP [9-13]
- ❖ High PP [14-18]

Modified Precht's Criteria Scale [MPCS]

MPCS for Sleep Pattern was developed to observe the sleep pattern of preterm infants as per study criteria. The MPCS for Sleep Pattern consist of 3- states:

- ❖ **State 1: Quiet Sleep** with **four** characteristics (closed eyes without rapid eye movements, no body movements, heart and breath rate regular, very rarely micro awakening)
- ❖ **State 2: Active Sleep** with **four** characteristics (close with rapid eye movement, body movements various motility types, heart and breath rate irregular, many micro awakening)
- ❖ **State 3: Indeterminate Sleep** with **four** characteristics (open eyes, few body movements harmonious, increased heart rate and breath rate, vocalization and crying)

Further according to total score of MPCS was categorized as follows:

- ❖ Quiet Sleep [0-8]
- ❖ Active Sleep [9-17]
- ❖ Indeterminate Sleep [18-26].

Content validity:

Content validity of the tool was ensured by 6 experts in the field. The suggestions were considered and modified

Reliability of the tool:

The reliability of the tools was tested through Pearson's correlation coefficient formula. Correlation coefficient Perceived for MPPS, **r=0.75.** Correlation coefficient perceived for MPCS, **r=0.992,** pilot study revealed that the developed tool was found to be reliable and feasible to conduct main study

Data collection procedure:

The main study was conducted in NICU of SDM Hospital, Dharwad from Jan to March 2018

- The neonates who fulfilled the criteria were selected and subjected to assessment and nesting
- The nesting continued for complete 7 days and as per plan periodic assessment and observation was documented on 7th day
- To note the progress in the physiological parameters and sleep pattern the assessment and observation were done every 8th hourly for 24 hour that is 8am, 4pm and 12pm.
- However, 12 midnight readings only were included in the final analysis of the data.

Data analyses:

The data obtained were analyzed in the terms of the objective of the study using descriptive and inferential statistics.

Results:

Pre and Post Frequency and Percentage distribution of sleep pattern and physiological parameters scores of preterm infants collected by using modified Precht's Criteria Scale and Physiological Parameter Scale.

Table 1: Pre And Post Frequency, Percentage Distribution of Modified Precht's Criteria Scale Scores for Sleep Pattern of Preterm Infants.

		Pre test		Post test	
Sl No	**Characteristics**	**Frequency**	**Percentage**	**Frequency**	**Percentage**
1	**Quiet sleep**	00	0%	28	93.33%
2	**Active sleep**	30	100%	2	6.66%
3	**Indeterminate sleep**	00	0%	00	0%
Total		30	100%	30	100%

The data presented in the **Table 1** indicates that in the pretest subjects 0 (0%) belonged to quiet sleep and indeterminate sleep. Maximum subjects 30 (100%) were in active sleep. In the posttest the maximum subjects 28(93.33%) were in quiet sleep. 2(6.66%) were in active sleep and none were in indeterminate sleep.

Table 2: Pre and Posttest Frequency, Percentage Distribution of Modified Physiological Parameter Scale Scores of Preterm Infants.

		Pre test		Post test	
Sl.No	**Characteristics**	**Frequency**	**Percentage**	**Frequency**	**Percentage**
1	**Low PP**	25	83.33%	03	10%
2	**Normal PP**	0	16.66%	27	90%
3	**High PP**	00	0%	00	0%
Total		30	100%	30	100%

The data presented in the **Table 2** indicates that in the pretest maximum subjects 25 (83.33%) showed Low physiological parameter. Minimum subjects 05 (16.66%) were Normal physiological parameter and none were in high physiological parameter. The posttest revealed minimum 03 (10%) in Low physiological parameter. Maximum 27 (90%) Normal physiological parameters and none were in high physiological parameter.

Comparison of pre and posttest scores of preterm infants by using Wilcoxon matched pairs test.

Table 3: Computation of mean, standard deviation, mean difference, standard difference for the data collected by using modified Precht's criteria Scale

Area of Analysis	**Mean**	**Standard Deviation**	**Mean Diff.**	**SD Diff.**	**% of change**	**Z-value**	**p-value**
Pretest	10.37	1.94					
Posttest	6.80	0.55	3.57	1.99	34.44	4.7821	***0.0001**

***p<0.05**

The data presented in the **Table 3** indicates that there is a significant difference between pretest and posttest Modified Precht's criteria scale scores (Z=4.7821, p=0.0001) at p<0.05 level of significance and 34.41% of improvement.

Table 4: Computation of mean, standard deviation, mean difference, standard difference for the data collected by using modified Physiological Parameters Scale.

Area of analysis	**Mean**	**Standard deviation.**	**Mean Diff.**	**SD Diff.**	**% of change**	**Z-value**	**p-value**
Pretest	7.73						
Posttest	8.97	0.41	-1.23	0.63	-15.95	4.5407	***0.0001**

***p<0.05**

The data presented in the **Table 4** reveals that there is a significant difference between pretest and posttest Modified Physiological parameter scale scores (z=4.5407, p=0.0001) at p<0.05 level of significance and -15.95% improvement.

Establishment of Correlation between pre and posttest data of sleep pattern and physiological parameters by Spearman's Rank Correlation Coefficient Method.

Table 5: Correlation Between Pre and Posttest of MPCS &MPPS Scores

Correlation Between MPCS with MPPS	**N**	**Spearman R**	**t-value**	**p-level**
Pretest and Posttest Modified Physiological parameter scale	30	0.3892	2.2359	0.0335*
Pretest and posttest Modified Precht's criteria scale	30	0.5459	3.4476	0.0018*

***p<0.05**

The data presented in the **Table 5** indicates that there was correlation between Pretest and posttest Modified Physiological parameter scale scores (r =0.3892, p-level 0.0335) at p<0.05 and also notable correlation between Pretest and posttest Modified Precht's criteria scale Scores (r =0.5459, p-level0.0018) at p<0.05. Hence, nesting was effective in improving sleep pattern and physiological parameters of preterm infants.

Discussion

The main objective of the present study was to evaluate the effectiveness of nesting on sleep pattern and physiological parameters of preterm infants admitted in NICU of SDM hospital, Dharwad".

The findings of the study indicated that the mean pre- interventional score of the sleep pattern was ±10.37 and SD was ±1.94 whereas the mean post-interventional score of sleep pattern was ±6.80 and SD was ±0.55 with z = 4.782 highly significant at p<0.0001 level of significance.

The findings of the study also indicated that the mean pre interventional score of the physiological parameters was ±7.73 and SD was ±8.97 whereas the mean post interventional score of physiological parameters was ±8.97 and SD was ±0.41 with z = 4.5407 highly significant at p < 0.0001 level of significance.

The finding of this study was consistent with the study conducted by government hospital, Delhi.[10]

The findings of the study also demonstrated that there is significant correlation between Pretest and posttest Modified Physiological parameter scale scores (r =0.3892, p-level 0.0335) and correlation between Pretest and posttest x

Recommendations

- A similar study on large and wider sample for the longer period of time would be more pertinent in making broad generalizations.
- A study can be conducted to assess the impact of nesting on quality of life
- A structured teaching programme on nesting among the NICU staff nurses can also be used to improve the knowledge

A study can be conducted to find out the effectiveness of nesting on VLBW neonates.

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Conflict of Interest : Nil