Research Article

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EFFECTIVENESS OF PRONE POSITION ON PHYSIOLOGICAL PARAMETERS AMONG NEONATES ON OXYGEN THERAPY AT NICU, GOVERNMENT RAJAJI HOSPITAL, MADURAI.

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ABSTRACT

Background: Neonates receiving oxygen therapy in NICU are at risk of physiological instability, requiring effective nursing interventions to improve outcomes. Prone positioning has been suggested as a beneficial strategy, but evidence is limited in the Indian context. **Aim:** To evaluate the effectiveness of prone positioning on physiological parameters among neonates on oxygen therapy in Government Rajaji Hospital, Madurai. **Methods:** A quantitative quasi-experimental design with intervention and control groups was adopted. Sixty neonates (30 per group) were selected using purposive sampling. Physiological parameters were assessed before and after intervention using structured observation. Descriptive and inferential statistics, including paired t-test, independent t-test, and chi-square test, were applied. **Results:** In the intervention group, the mean pretest score (7.17 ± 2.40) significantly reduced to 2.13 ± 1.22 in the posttest ($t = 15.7$, $p < 0.001$), indicating improved physiological stability. The control group showed no significant improvement (6.90 ± 2.05 to 6.40 ± 2.54). Posttest comparison between groups revealed a very highly significant difference ($t = 8.28$, $p < 0.001$). A significant association was found between posttest physiological parameters and mode of oxygen delivery ($\chi^2 = 4.61$, $p = 0.04$), while no association was observed with sociodemographic variables. **Conclusion:** The study proved that prone positioning is highly effective in improving physiological parameters among neonates on oxygen therapy. Incorporating prone positioning as a routine nursing intervention may enhance neonatal care outcomes.

Keywords: Neonates, oxygen therapy, physiological parameters, NICU

INTRODUCTION:

Children are an essential component of society, imparting joy, hope, and happiness to their surroundings. They represent the forthcoming generation that will uphold the flame and perpetuate the legacy of the current era. India possesses a substantial child population, rendering early investment in children crucial for future prosperity. Health encompasses not only bodily aspects but also mental, emotional, and social well-being. The World Health Organisation (WHO) defines health as an individual's whole physical, mental, and social wellness.

Respiratory distress is a prevalent cause of newborn hospitalisation and mortality, affecting 15% of term infants and 29% of late preterm infants with considerable respiratory morbidity. Healthcare practitioners must identify indications and symptoms of respiratory distress, distinguish underlying causes, and implement therapeutic methods to avert complications or mortality. Oxygen therapy is the most often administered treatment for neonatal care, utilising multiple delivery methods. Positioning preterm newborns in prone, side-lying, and head-up tilted orientations can enhance oxygenation, pulmonary capillary perfusion, motor development, and mitigate mortality associated with sudden infant death syndrome (SIDS).

Prone positioning can enhance cardiovascular and pulmonary system development, improve sleep states, and avert respiratory difficulties. Positioning newborns receiving oxygen therapy in a prone or face-down orientation serves multiple benefits, particularly in clinical environments and developmental phases. The efficacy of prone positioning in enhancing physiological parameters in infants undergoing oxygen therapy is vital for their overall health.

Annually, about 5.9 million children succumb to preventable or easily curable diseases, with 95% of these fatalities occurring in underdeveloped nations. Pneumonia and other respiratory illnesses are the primary causes of mortality in neonates, with hypoxaemia as the most fatal consequence. In developing nations, oxygen therapy is unattainable for a significant number of hospitalised children. Appropriate nursing interventions, including prone placement, are vital for enhancing the patient's condition. In India, the second-highest mortality rate among children under five in 2018 from pneumonia and other respiratory disorders was attributed to hypoxia, preterm, low birth weight, and infections. Enhancements in neonatal care are essential to achieve the National Health Policy's objectives of decreasing infant and perinatal mortality rates, as well as the incidence of low-birth-weight infants. The neonatal mortality rate (NMR) in Tamil Nadu decreased from 13 per 1000 live births in 2020 to 8.2 per 1000 live births in December 2023, attributable to numerous child health initiatives and infrastructural enhancements under the National Health Mission (NHM). In 2023, the

mortality rate at Government Rajaji Hospital, Madurai, was 5.9%, predominantly among neonates in the Neonatal Intensive Care Unit, attributed to respiratory distress, birth asphyxia, and neonatal infection. The study seeks to assess the efficacy of prone positioning on physiological parameters in neonates receiving oxygen therapy and proposes that prone positioning may be incorporated into standard care practices.

The research intends to investigate the physiological parameters of infants undergoing oxygen therapy at Government Rajaji Hospital, Madurai, and to assess the efficacy of prone placement on these parameters. The investigation identified substantial disparities between the pretest and post-test physiological indicators in both the intervention and control groups. The research identified a substantial correlation between physiological measures and sociodemographic and clinical factors. The study employed the Modified News (Neonatal Early Warning Score) to assess the impact of prone positioning on physiological measures, including temperature, pulse rate, respiration, oxygen saturation, and capillary refill time. The research is confined to infants undergoing oxygen therapy in the NICU, with a data collecting duration of 4 to 6 weeks.

NEED FOR THE STUDY

Every year, over 5.9 million children die from preventable or treatable diseases, with more than 95% of these deaths occurring in developing countries. Pneumonia remains the leading cause of child mortality, with hypoxemia as its most fatal complication, while neonatal conditions such as birth asphyxia, sepsis, and low birth weight also account for a significant share. Despite the proven benefits of oxygen therapy and simple nursing measures like proper positioning, access to these interventions is limited. Prone positioning, first identified in 1970, has been shown to improve lung aeration and physiological outcomes in neonates with respiratory distress. Globally, in 2021 alone, 2.3 million newborns died in the first month of life, with India recording particularly high child mortality from pneumonia and other respiratory illnesses.

However, progress has been noted; for instance, Tamil Nadu's neonatal mortality rate has dropped due to state-level interventions and infrastructure improvements under NHM. At Government Rajaji Hospital, Madurai, neonatal death rates have declined significantly over recent years due to improved care. Still, observations show that while many neonates receive oxygen therapy, adequate positioning is often neglected. This highlights the need to evaluate and integrate prone positioning as a routine nursing intervention to improve survival and health outcomes among neonates on oxygen therapy

AIM OF THE STUDY:

The aim of the study to evaluate the effectiveness of prone position on physiological parameters among neonates on oxygen therapy at NICU, Government Rajaji Hospital, Madurai.

MATERIALS AND METHODS

Study design and participants

A quantitative evaluative approach with a randomized controlled trial pre-test post-test design was adopted. The study was conducted in the Neonatal Intensive Care Unit (NICU) of Government Rajaji Hospital, Madurai. A total of 60 neonates on oxygen therapy were selected through simple random sampling and divided into two groups: intervention group (n=30) and control group (n=30).

Inclusion and exclusion criteria

Inclusion criteria:

- Neonates on oxygen therapy via hood, nasal prongs, or high-flow nasal cannula
- Gestational age > 36 weeks
- Birth weight > 2.5 kg
- Both sexes

Exclusion criteria:

- Critically ill neonates, Neonates on invasive or mechanical ventilation
- Neonates with congenital anomalies, fractures, or diaphragmatic hernia
- Neonates with umbilical vein catheters or intercostal drainage

Tools

Data were collected using a structured tool consisting of:

- **Section A:** Sociodemographic variables (age, gender, family type, domicile, parental education, income, occupation)
- **Section B:** Clinical variables (mode of delivery, nutrition, oxygen requirement, oxygen delivery method, surfactant therapy history)
- **Section C:** *Modified Neonatal Early Warning Score (NEWS)* assessing temperature, pulse, respiration, oxygen saturation, and capillary refill time.
  Validity was established through expert review, and tool reliability was confirmed with an inter-rater correlation coefficient of **r = 0.80**.

Ethical clearance

Ethical approval was obtained from the **Institutional Ethical Committee, Madurai Medical College**, along with formal permissions from relevant authorities. Written and verbal informed consent was obtained from caregivers. Confidentiality, anonymity, and the right to withdraw at any stage were ensured.

Data Collection Procedure

Data collection was carried out from **03.06.2024 to 06.07.2024**. Pre-test assessment of physiological parameters was done using NEWS. The **intervention group** neonates were placed in the **prone position** for 30 minutes, one hour after feeding, at 3-hour intervals (three times per day). Continuous monitoring was done

with a multipara monitor. The **control group** neonates were kept supine and received routine care. Post-test assessments were done after three prone positioning sessions.

Data Analysis

Data were organized, tabulated, and analyzed using **descriptive and inferential statistics**.

- *Descriptive statistics*: Frequency, percentage, mean, and standard deviation for sociodemographic, clinical variables, and pre/post-test scores.
- *Inferential statistics*: Chi-square test to determine association between physiological parameters and variables; paired and unpaired *t*-tests to evaluate the effectiveness of prone positioning.

RESULTS:

Demographic and clinical variables:

In the intervention group, most neonates were aged 0–7 days (70%) and male (60%), with half from nuclear families. Urban residence (36.7%), family income of ₹21,914–36,526 (43.3%), and fathers with primary education (40%) were common, while 36.7% of mothers had primary education. The majority of breadwinners (70%) worked in private jobs. Over half were delivered vaginally (56.7%), one-third (33.3%) were exclusively breastfed, and half required 41–65% oxygen, predominantly via hood (50%). Surfactant therapy was reported in 23.3%. In the control group, 40% were aged 8–28 days, and 60% were female, with nearly half (46.7%) from joint families. Rural domicile (36.7%) and family income of ₹21,914–36,526 (40%) were more frequent. Fathers mainly had primary education (43.3%), while half of mothers (50%) had secondary education. Most breadwinners (63.3%) worked in private jobs. Half were vaginally delivered, 30% had assisted delivery, and 46.6% received combined breastfeeding and expressed milk. Nearly half required 41–65% oxygen, 50% received it via hood, and 10% had prior surfactant therapy. (Table 1 and Table 2)

Level of physiological parameters:

The findings revealed that in the intervention group, none of the neonates were normal at pre-test, whereas after prone positioning, 86.7% improved to mild and 13.3% to normal, with no cases of moderate or severe level. In contrast, the control group showed minimal change, with most neonates remaining in the moderate category (60%). (Table 3)

Comparison of Mean score:

The paired t-test showed a significant reduction in mean physiological parameter scores in the intervention group from 7.17 ± 2.40 (pre-test) to 2.13 ± 1.22 (post-test), with a mean difference of 5.04 ($t = 15.7$, df = 29, $p < 0.001$), indicating very high significance (VHS)*. (Table 4) The independent t-test further confirmed that

post-test mean scores were significantly lower in the intervention group (2.13 ± 1.22) compared to the control group (6.40 ± 2.54), with a mean difference of -4.26 ($t = 8.28$, df = 58, $p < 0.001$), establishing the effectiveness of prone positioning in improving physiological parameters among neonates on oxygen therapy. (Table 5)

Association between the post-test level of knowledge:

Chi-square analysis showed a significant association between post-test physiological parameters and mode of oxygen delivery in the intervention group ($\chi^2 = 4.61$, p = 0.04). No significant association was found between post-test physiological parameters and sociodemographic variables in either intervention or control groups at the 0.05 level of significance.

Table 1: Demographic data of neonates. (n=60)

S. No	Socio-Demographic Variables	Intervention Group f (%)	Control Group f (%)
1	Age		
	0–7 days	21 (70)	18 (60)
	8–28 days	9 (30)	12 (40)
2	Gender		
	Male	18 (60)	12 (40)
	Female	12 (40)	18 (60)
3	Type of Family		
	Nuclear	15 (50)	10 (33.3)
	Joint	8 (26.7)	14 (46.7)
	Extended	7 (23.3)	6 (20)
4	Place of Domicile		
	Rural	9 (30)	11 (36.7)
	Urban	11 (36.7)	12 (40)
	Sub-Urban	10 (33.3)	7 (23.3)
5	Family Income (₹/month)		
	≤ 7,315	3 (10)	4 (13.3)
	7,316 – 21,913	10 (33.3)	9 (30)
	21,914 – 36,526	13 (43.3)	12 (40)

	> 36,526	4 (13.4)	5 (16.7)
6	Education of Father		
	No formal education	7 (23.3)	6 (20)
	Primary	12 (40)	13 (43.3)
	Secondary	6 (20)	6 (20)
	Graduate	5 (16.7)	5 (16.7)
7	Education of Mother		
	No formal education	5 (16.7)	6 (20)
	Primary	11 (36.7)	6 (20)
	Secondary	7 (23.3)	15 (50)
	Graduate	7 (23.3)	3 (10)
8	Occupation of Breadwinner		
	Unemployed	2 (6.7)	2 (6.7)
	Private job	21 (70)	19 (63.3)
	Self-employed	7 (23.3)	9 (30)
	Retired	0 (0)	0 (0)

Table 2: Clinical variables of the neonates. (n=60)

S. No	Clinical Variables	Intervention Group f (%)	Control Group f (%)
1	**Mode of Delivery**		
	Normal vaginal delivery	17 (56.7)	15 (50)
	LSCS	11 (36.7)	6 (20)
	Assisted delivery	2 (6.7)	9 (30)
2	**Mode of Nutrition**		
	Direct Breastfeeding (DBF) only	10 (33.3)	8 (26.7)
	Expressed Breast Milk (EBM) only	8 (26.7)	5 (16.7)
	DBF & EBM	7 (23.3)	14 (46.6)
	IV fluids	5 (16.7)	3 (10)

3	**Amount of Oxygen Required**		
	22–40%	12 (40)	12 (40)
	41–65%	15 (50)	14 (46.7)
	66–80%	3 (10)	4 (13.3)
	> 80%	0 (0)	0 (0)
4	**Mode of Oxygen Delivery**		
	Nasal prongs	10 (33.3)	11 (36.7)
	Oxygen hood	15 (50)	15 (50)
	High-flow nasal cannula	5 (16.7)	4 (13.3)
5	**Previous History of Surfactant Therapy**		
	Yes	7 (23.3)	3 (10)
	No	23 (76.7)	27 (90)

Table 3: Pre-test and Post-test Level of Physiological Parameters Among Neonates on Oxygen Therapy. (n=60)

Level of Physiological Parameters	Intervention Group Pre-test f (%)	Intervention Group Post-test f (%)	Control Group Pre-test f (%)	Control Group Post-test f (%)
Normal	0 (0)	4 (13.3)	0 (0)	0 (0)
Mild	8 (26.7)	26 (86.7)	9 (30)	12 (40)
Moderate	19 (63.3)	0 (0)	19 (63.3)	18 (60)
Severe	3 (10)	0 (0)	2 (6.7)	0 (0)
Mean ± SD	7.17 ± 2.40	2.13 ± 1.22	6.90 ± 2.05	6.40 ± 2.54

Table 4: Paired 't' test showing the comparison of pretest and post-test level of physiological parameters among neonates on oxygen therapy in intervention group. (n = 60)

Group	Test	Mean	Standard Deviation	Mean Difference	Paired 't' Value	df	'p' Value	Significance
Intervention	Pre-test	7.17	2.40					
	Post-test	2.13	1.22	5.04	15.7	29	0.000	VHS***

***** p < 0.001 Very highly significant.**

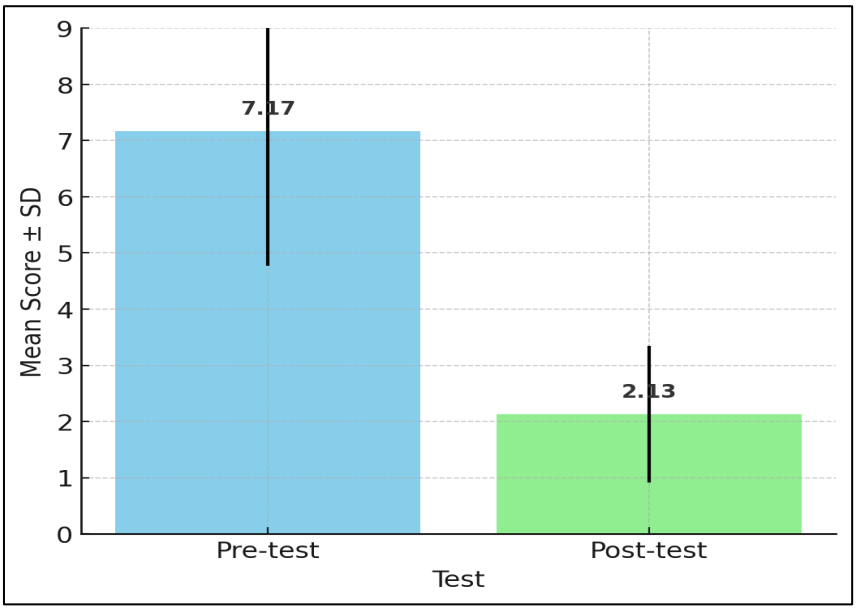

Figure 1: Comparison of mean score of physiological parameters among neonates.

Table 5: Independent 't' Test Showing Post-test Level of Physiological Parameters Among Neonates on Oxygen Therapy in Intervention and Control Groups. (n = 60)

Test	Group	Mean	Standard Deviation	Mean Difference	't' Value	df	'p' Value	Significance
Post-test	Intervention group	2.13	1.22	-4.26	8.28	58	0.000	VHS***
	Control group	6.40	2.54					

*****p < 0.001 – Very Highly Significant (VHS)**

DISCUSSION:

The study results revealed that in the intervention group, the majority of neonates (63.3%) had moderate physiological parameter levels at pre-test, followed by 26.7% with mild and 10% with severe levels. After prone positioning, 86.7% improved to mild and 13.3% to normal levels, with no cases of moderate or severe. The mean score decreased from 7.17 ± 2.40 to 2.13 ± 1.22, and the paired t test ($t = 15.7$, $p < 0.001$) confirmed a very highly significant improvement.

The results further showed that in the control group, 63.3% of neonates were in the moderate category, 30% in mild, and 6.7% in severe during pre-test. In the post-test, 60% remained moderate and 40% mild, with little improvement. Comparison of post-test means between the groups indicated a significantly lower score in the intervention group (2.13 ± 1.22) than in the control group (6.40 ± 2.54). The independent t test ($t = 8.28$, $p < 0.001$) revealed a very highly significant difference, confirming the effectiveness of prone positioning.

The analysis also showed a statistically significant association was observed with mode of oxygen delivery in the intervention group ($\chi^2 = 4.61$, $p = 0.04$).

The findings are supported by Andrea Barbosa et al. (2014), who reported significant changes in heart rate and oxygen saturation in neonates receiving oxygen via hood and respiratory variations in those on mechanical ventilation, while neonates on CPAP remained stable. Similarly, Alice Jeba and Senthil Kumar (2022) revealed that prone positioning in preterm neonates significantly improved temperature, respiratory rate, and heart rate, highlighting its effectiveness as a simple non-pharmacological intervention in NICU care.

CONCLUSION:

The study concluded that prone positioning significantly improves the physiological parameters among neonates on oxygen therapy and should be considered an essential component of routine neonatal nursing care. It also concluded that there is a significant association between physiological parameters and clinical variables, particularly the mode of oxygen delivery, in the intervention group, while no association was observed with sociodemographic variables in either group.

RECOMMENDATION:

The study recommends that future research be conducted on a larger population to enhance the generalizability of findings. Longitudinal studies may be undertaken to evaluate the sustained effectiveness of nursing interventions, and comparative studies can explore the impact of various other interventions for neonates on oxygen therapy. Further, the effectiveness of prone positioning can be assessed in relation to additional outcomes such as gastrointestinal complications and temperature regulation. Qualitative studies may also provide deeper insights into problems associated with respiratory and physiological parameters. In addition, assessing the knowledge, skills, and attitudes of nursing staff regarding neonatal positioning and extending similar studies to older children could contribute to improving pediatric care practices.

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