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Effectiveness of Nesting and Swaddling on Sleep and Selected Physiological Parameters among Hospitalized Low Birth Weight Neonates in Selected Hospitals in West Bengal

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Abstract: ***Major challenges in first month after birth is maintenance of stable physiological parameters. Nesting & swaddling has a role in promotion of comfort and stabilization of physiological parameters. A study was undertaken to assess the Effectiveness of nesting and swaddling on sleep, heart rate, respiration & oxygen saturation among low birth weight neonates in NICU, Medical College & Hospital, Kolkata, WB. Clearance from institutional ethical committee was taken. Quasi experimental research design was adopted. From the population of LBW neonates, 60 samples (20 in each group) were selected by purposive sampling. Final data were collected from October to December 2019 using validated and reliable Record Analysis Proforma (r=1), Physical Assessment Proforma (r=1) & Modified Brazelton's Sleep Assessment Scale (r=0.95). After selecting neonates, initially baseline data was collected and then neonate was kept in nesting for two hours. During this time sleep pattern were observed and after completion of two hours physiological parameters were assessed. This intervention was continued for three consecutive days and data were collected twice a day for each neonates. In the second group, instead of nesting, swaddling was given and in control group routine hospital care was given. The result showed that there is no significant difference in physical parameters between nesting and swaddling group compared to control group except respiration (F= 3.55, P< 0.034). The result also showed that there is a very high significant difference in sleep pattern (P<0.001) among nesting and swaddling group compared to control group except 1st day ('t'= 1.9292, P<0.05). It can be concluded that both nesting and swaddling could significantly improve sleep, compared to control. The study has its implication in nursing practice for providing a safe environment for LBW neonates by maintaining good position. Based on this finding, similar study could be conducted using large sample for generalization.***

Keywords: nesting, swaddling, comfort, stabilization, sleep, heart rate, respiration, oxygen saturation, low birth weight neonates, NICU

1. Introduction

Low Birth Weight (LBW) continues to be a significant public health problem globally and is associated with a range of both short and long-term consequences. The World Health Organization was defined the Low Birth Weight as weight at birth less than 2500 gm. Low birth weight includes preterm neonates, small for gestational age neonates at term.

Worldwide, it is estimated that 15% to 20% of all births are LBW, representing more than 20 million births a year. The great majority of LBW births occur in low and middle-income countries.

In India infant mortality rate in low and middle-income countries was approximately 88/1000 live birth among those 28-death occurred in the early neonatal period (National Vital Statistics Reports).

Studies from other parts of West Bengal reported prevalence of LBW to be between 28% to 30%. In a study done by Dasgupta A & Basu R, the prevalence of LBW in Singur block of West Bengal was found to be 28.8%. LBW was significantly higher among rural study population.

Nursing and medical researchers have raised the public's awareness of the extreme physiological and neurobehavioral stress experienced by premature infants. There is a need to have a synthesis of "Art and Science" of neonatal care in order to provide holistic care to new-born babies. Neonates should be handled gently. Improper handling may lead to hypoxemia and sudden elevation of blood pressure with risk of development of intra-ventricular haemorrhage. Although it's impossible to achieve in-utero comfort levels and cushioning, all efforts should be made to provide babies with comfortable positioning

Nesting & Swaddling may promote comfort & sleep there by able to maintain stable physiological parameters.

2. Problem Statement

Effectiveness of nesting and swaddling on sleep and selected physiological parameters among hospitalized low birth weight neonates in selected hospitals in West Bengal.

3. Objectives of the study

1) To assess the effects of nesting & swaddling on sleep.
2) To assess the physiological parameters before and after nesting & swaddling in terms of
   - Heart rate
   - Respiration
   - Oxygen saturation

Key words:

1) Nesting

In case of nesting, nest like structure was created by a rolled baby sheet over which another baby sheet was placed and properly tucked with the rolled one, which made an oval shaped boundary. Then the baby was placed on that oval shaped boundary.

2) Swaddling

In case of swaddling, the blanket was folded into a triangular shape. Infants were positioned with the blanket so that elbows, hips, and knees flexed with hands near the face by wrapping one side of the blanket across the chest holding the hands in place. Pulling the bottom corner up towards the infant's face, and securing the blanket with the last corner pulled across the infant's chest again and around their back. The blanket was tight enough to keep extremities in place, but one finger will be able to place between the infant and the blanket.

3) **Sleep:** Sleep in terms of
- Extension of sleep
- Duration of sleep
- State of sleep
- Awakening of sleep.

4) **Physiological parameters**: In present study physiological parameters in terms of
- Heart rate
- Respiration
- O_2 saturation

4. Review of Literature

Literature related to Effect of nesting among Low Birth Weightneonate

An experimental study was conducted by Ms. Poulose R, Dr. (Mrs.) Babu M, Mrs. Rastogi S[1]to determine the effectiveness of "nesting" on posture discomfort and physiological parameters among 60 low birth weight infants in NICU of selected government hospital of Delhi. Pre-test Post-test control group design was used. During application of nesting among experimental group significant improvement in posture (t=12.64) was observed. Also during the nesting period there was significant reduction in the discomfort was observed in experimental group as compared to control group (t=10.65).During nesting infants were exhibit stable physiological parameters.

Literature related to Effect of swaddling among Low Birth Weightneonate

Edrak M, Paran M, Montaseri S, Nejad M R, MontaseriZ[12] was conducted a randomized clinical trial study among 50 premature infants to comparing the effects of Swaddled on body temperature and crying duration. The study result showed that the loss of temperature was less in swaddled bathed new-born compared with the conventionally-bathed new-born; which was statistically significant at 0.05 level of significance. Also the time of cry was significantly shorter in the experimental group than the control group.

Review of literature related to comparison of effect of nested versus swaddled position among Low Birth Weightneonate.

Abdeyazdan Z, Mohammadian-Ghahfarokhi M, Ghazavi Z, MohammadizadehM[6] was conduct a crossover clinical trial study among 42 preterm infants to assess the Effects of nesting and swaddling on the sleep duration. The study revealed that during nesting and swaddling period the mean score of TST (Total Sleep Time) & QST (Quiet Sleep Time) were significantly higher than control period in both groups ($P < 0.001$). During swaddling period the mean score of TST and QST were higher than nesting period but these difference were not significant ($P = 0.245$).

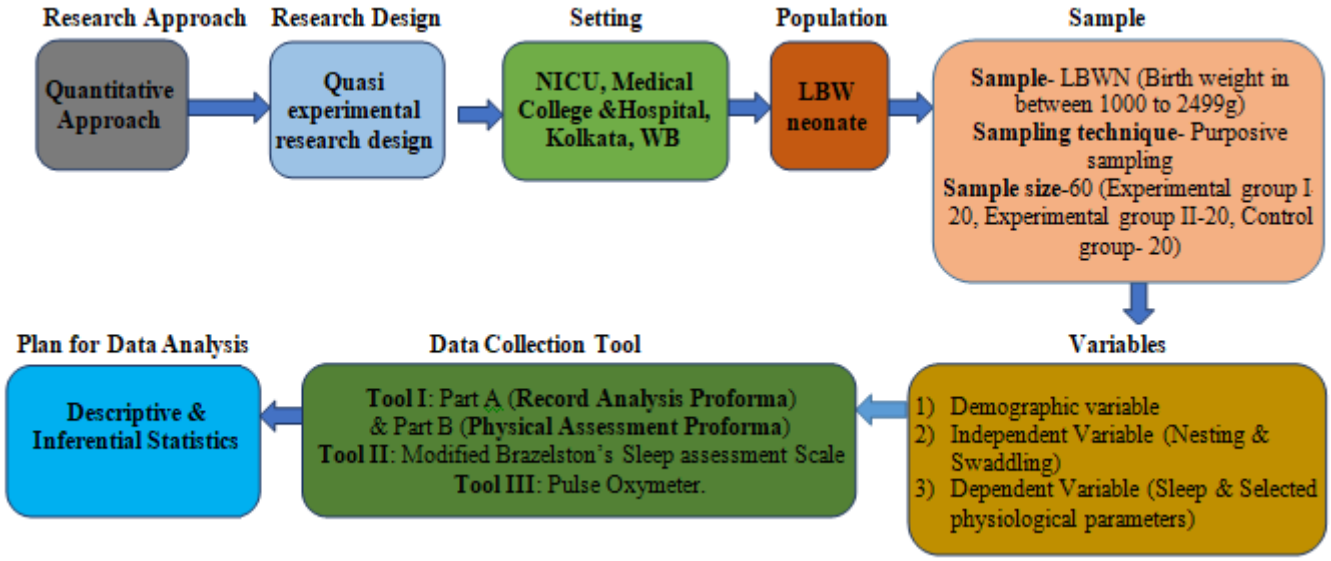

Figure 1: Schematic Diagram of Research Methodology

Group	Day 1				Day 2				Day 3			
	Pre-test	Intervention	After 2 hours	After 4 hours	Pre-test	Intervention	After 2 hours	After 4 hours	Pre-test	Intervention	After 2 hours	After 4 hours
Experimental group I	O_1	X_1	O_2 X_1	O_3	O_4	X_1	O_5 X_1	O_6	O_7	X_1	O_8 X_1	O_9
Experimental group II	O_{10}	X_2	O_{11} X_2	O_{12}	O_{13}	X_2	O_{14} X_2	O_{15}	O_{16}	X_2	O_{17} X_2	O_{18}
Control group	O_{19}	____	O_{20}	O_{21}	O_{22}	_____	O_{23}	O_{24}	O_{25}	_____	O_{26}	O_{27}

Exp_1
O_1, O_5 & O_7 – Pre-test of nesting group
X_1 – Nesting was given by investigator for two times per day on 1st day and next day onwards up to 3rd day.
O_2, O_3, O_5, O_6, O_8 & O_9 – Post test result of nesting group

Exp_2
O_{10}, O_{13} & O_{16} – Pre-test of swaddling group
X_2 – Swaddling was given by investigator for two times per day on 1st day and next day onwards up to 3rd day.
O_{11}, O_{12}, O_{14}, O_{15}, O_{17} & O_{18} – Post test result of swaddling group

Control
O_{19}, O_{22} & O_{25} – Pre-test of control group
X_1 – No intervention only routine hospital care
O_{20}, O_{21}, O_{23}, O_{24}, O_{26} & O_{27} – Post test result of control group

Figure 2: Schematic Diagram of Quasi Experimental Research Design

Table 1: Tools and Techniques of data collection

Variables	Tools	Techniques
1.Demographic Variables	Tool I: Part-A Record Analysis Proforma	Observation
2.Selected physiological parameters	Tool I: Part-B Physical Assessment Proforma	Assessment
3.Sleep	Tool II: Modified Brazelton's Sleep Assessment Scale	Observation
4.Heart rate & Oxygen saturation.	Tool III: Pulse Oxymeter	Observation

5. Final Data Collection Procedure

Final study was conducted at Medical College and Hospital, Kolkata from 22/10/18 to 30/11/18. Prior to data collection permission was taken from the head of the department of neonatology.Neonates were selected according to selection criteria. Informed consent was taken from mother of neonate. After selection of the neonate, initially the baseline data was collected. The neonate was kept in nesting for two hours. During this time sleep pattern were observed and after completion of two hours physiological parameters were assessed. This intervention was continued for three consecutive days and data were collected twice a day for each neonates. In the second group, instead of nesting, swaddling was given and in control group routine hospital care was given. The duration of assessment was around 10 minutes for each baby.Record analysis proforma was administered to collect the demographic data. Physical assessment proforma was administered to assess selected physiological parameters. Pulse oxymeter was administered to assess heart rate and oxygen saturation. Modified Brazelton's Sleep Assessment Scale was administered to assess sleep status of the neonate.

6. Analysis and Interpretation

Table 2: Showing physiological parameters of Nesting, Swaddling & Control group

Parameters	Day	Time	Nesting	Swaddling	Control	*F*	P
Heart Rate	Day 1	Before intervention	135.1 ±20.39	133.1±13.68	135±19.64	0.07	.935
		After 2 hrs	137 ±17.05	129.7±12.98	134.6±15.3	1.29	.280
		After 4 hrs	135.4±16.44	131.35±15.09	129.3±15.86	0.77	.467
	Day 2	Before intervention	131.55±15.7	129.4±15.74	135.4±23.7	0.52	.595
		After 2 hrs	137.1±15.72	132.7±12.99	133.85±17.8	0.42	.656
		After 4 hrs	139.5±12.72	133.09±11.9	133.84±16.9	1.17	.318
	Day 3	Before intervention	135.4±15.37	130.3±17.15	133.9±21.8	0.4	.671
		After 2 hrs	136±14.41	131.5±15.15	140.9±19.5	1.58	.214
		After 4 hrs	138.8±12.27	134.9±14.69	138.8±19.5	0.41	.664
Respiration	Day 1	Before intervention	39.45±9.37	42.7±10.14	40.45±9.79	0.58	.563
		After 2 hrs	39.75±9.37	43.95±8.23	39.05±8.55	2.23	.117
		After 4 hrs	38.15±6.99	42.6±8.91	40±9.09	1.42	.249
	Day 2	Before intervention	38.2±8.87	38.55±6.70	39.2±9.65	0,07	.931
		After 2 hrs	37.85±8.97	42.3±6.64	39.35±7.45	1.7	.190
		After 4 hrs	37.75±8.21	43.85±6.83	39.4±7.32	3.5*	.034
	Day 3	Before intervention	36.9±7.93	37.35±4.15	37.4±7.72	0.03	.968
		After 2 hrs	37.4±8.08	41.45±4.76	36.45±6.84	3.13	.051

		After 4 hrs	37.5±7.87	40.45±5.49	37.65±6.54	1.23	.301
Oxygen Saturation	Day 1	Before intervention	94.8±3.17	95.2±4.27	94.9±5.35	0.05	.955
		After 2 hrs	94.5±3.26	93.95±4.45	96.8±3.105	3.41	.039
		After 4 hrs	95.8±3.18	95.1±5.581	96.15±4.76	0.27	.765
	Day 2	Before intervention	94.25±3.44	95.55±3.91	94.35±5.08	0.59	.556
		After 2 hrs	95.7±3.43	95.6±3.33	94.78±4.4	.344	.71
		After 4 hrs	95.3±3.68	96.55±3.45	95.5±4.11	0.63	.532
	Day 3	Before intervention	95±3.17	93.9±4.61	95.55±4.14	0.87	.423
		After 2 hrs	95.8±3	95.95±3.3	94.3±4.54	1.23	.299
		After 4 hrs	96.1±2.73	97.85±2.45	94.85±3.73	4.96	.01

df=2; '*' significant at 0.05 level of significance. N- Nesting, S-Swaddling & C- Control group.
The result showed that there is no significant difference in physical parameters between nesting and swaddling group compared to control group except respiration (F=3.5, P< 0.034).

Section V
This section describes the effectiveness of nesting and swaddling on sleep. Hypotheses are following:

H_1- There is a significant difference in mean sleep score between experimental group and control group after providing nesting as evident from Modified Brazelton's Sleep Assessment Scale among Low Birth Weight Neonate at 0.05 level of significance.

H_{01}- There is no significant difference in mean sleep score between experimental group and control group after providing nesting as evident from Modified Brazelton's Sleep Assessment Scale among Low Birth Weight Neonate at 0.05 level of significance.

Table 3: Mean, Mean Difference, Standard Deviation, SE_{MD} and 't' value of mean sleep score between nesting and control group, $N_n+n_c=40$

Sleep Score → / Group ↓	Mean	SD	Mean difference	SE_{MD}	't' value
Nesting group	8.05	1.73	1.45	0.57	2.54^{**}
Control group	6.6	1.88			

df (38); p<0.05; * significant.

Data presented in table 7 showing that the mean sleep score of nesting group (8.05) is higher than the mean sleep score of control group (6.6) which is statistically significant, 't' value is 2.54 at df 38 and at 0.05 level of significance. So, here the mean difference is a true difference and not by chance. Hence null hypothesis is rejected and research hypothesis is accepted. It indicates that the nesting is effective in enhancing sleep of LBW neonates.

H_2- There is a significant difference in mean sleep score between experimental group and control group after providing swaddling as evident from Modified Brazelton's Sleep Assessment Scale among Low Birth Weight Neonate at 0.05 level of significance.

H_{02}- There is no significant difference in mean sleep score between experimental group and control group after providing swaddling as evident from Modified Brazelton's Sleep Assessment Scale among Low Birth Weight Neonate at 0.05 level of significance.

Table 4: Mean, Mean Difference, Standard Deviation, SE_{MD} and 't' value of mean sleep score between swaddling and control group, $N_s+n_c=40$

Sleep Score → / Group ↓	Mean	SD	Mean difference	SE_{MD}	't' value
Swaddling group	8.1	1.86	2.25	0.54	4.18^{***}
Control group	5.85	1.53			

df (38); p<0.05; * significant.

Data presented in table 8 showing that the mean sleep score of swaddling group (8.1) is higher than the mean sleep score of control group (5.85) which is statistically significant, 't' value is 4.18 at df 38 and at 0.05 level of significance. So, here the mean difference is a true difference and not by chance. Hence null hypothesis is rejected and research hypothesis is accepted. It indicates that the swaddling is effective in enhancing sleep of LBW neonates.

H_3- There is a significant difference in mean sleep score between two experimental group after providing nesting and swaddling as evident from Modified Brazelton's Sleep Assessment Scale among Low Birth Weight Neonate at 0.05 level of significance.

H_{03}- There is no significant difference in mean sleep score between two experimental group after providing nesting and swaddling as evident from Modified Brazelton's Sleep Assessment Scale among Low Birth Weight Neonate at 0.05 level of significance.

Table 5: Mean, Mean Difference, Standard Deviation, SE_{MD} and 't' value of mean sleep score between nesting and swaddling group, $N_n+n_s=40$

Sleep Score → / Group ↓	Mean	SD	Mean difference	SE_{MD}	't' value
Nesting group	6.95	2.04	-1.15	0.62	1.86
Swaddling group	8.1	1.86			

df (38); p<0.05; * significant.

Data presented in table 7 showing that the mean sleep score of nesting group is 6.95 and mean sleep score of swaddling group 8.1 which is not statistically significant, 't' value is 1.86 at df 38 and at 0.05 level of significance. So, the research hypothesis is rejected and null hypothesis is accepted.

Section VI
This section describes the effectiveness of nesting and swaddling on heart rate, respiratory rate and oxygen saturation. Hypotheses are following:

H_4- There is a significant difference in mean post test score of Herat rate between experimental groups and control group after providing nesting and swaddling as evident from Physical Assessment Proforma among Low Birth Weight Neonate at 0.05 level of significance.

H_{04}- There is no significant difference in mean post test score of Herat rate between experimental groups and control group after providing nesting and swaddling as evident from Physical Assessment Proforma among Low Birth Weight Neonate at 0.05 level of significance.

Table 6: Showing ANOVA of three groups in terms of Heart rate, $n_n+n_s+n_c=60$

Post test score of HR → / Group ↓	Mean	SD	*F*	P
Nesting group	138.8	12.27	0.41	.664
Swaddling group	134.9	14.69		
Control group	138.8	19.5		

df (2); p<0.05; * significant.

The data presented in the table 10 reveal that p value of heart rate is .664 which is not statistically significant among nesting, swaddling and control group at df(2) at 0.05 level of significance. So, the research hypothesis is rejected and null hypothesis is accepted.

H_5- There is a significant difference in mean post test score of Respiratory rate between experimental groups and control group after providing nesting and swaddling as evident from Physical Assessment Proforma among Low Birth Weight Neonate at 0.05 level of significance.

H_{05}- There is no significant difference in mean post test score of respiration between experimental groups and control group after providing nesting and swaddling as evident from Physical Assessment Proforma among Low Birth Weight Neonate at 0.05 level of significance.

Table 7: Showing ANOVA of three groups in terms of respiratory rate, $n_n+n_s+n_c=60$

Post test score of RR → / Group ↓	Mean	SD	*F*	P
Nesting group	37.5	7.87	1.226	.3009
Swaddling group	40.45	5.49		
Control group	37.65	6.54		

df (2); p<0.05; * significant.

The data presented in the table 11 reveal that p value of respiratory rate is .3009 which is not statistically significant among nesting, swaddling and control group at df(2) at 0.05 level of significance. So, the research hypothesis is rejected and null hypothesis is accepted.

H_6- There is a significant difference in mean post test score of oxygen saturation between experimental groups and control group after providing nesting and swaddling as evident from Physical Assessment Proforma among Low Birth Weight Neonate at 0.05 level of significance.

H_{06}- There is no significant difference in mean post test score of oxygen saturation between experimental groups and control group after providing nesting and swaddling as evident from Physical Assessment Proforma among Low Birth Weight Neonate at 0.05 level of significance.

Table 8: Showing ANOVA of three groups in terms of Oxygen saturation, $n_n+n_s+n_c=60$

Post test score of SpO_2 → / Group ↓	Mean	SD	*F*	P
Nesting group	96.1	2.73	4.96	.01
Swaddling group	97.85	2.45		
Control group	94.85	3.73		

df (2); p<0.05; * significant.

The data presented in the table 12 reveal that p value of oxygen saturation is .01 which is not statistically significant among nesting, swaddling and control group at df(2) at 0.05 level of significance. So, the research hypothesis is rejected and null hypothesis is accepted.

7. Summary of the Study

The study was based on assessing the effect of nesting and swaddling on sleep and physiological parameters among LBW neonates.

The study was quasi-experimental in nature. The main purpose of the study was to assess theEffectiveness of nesting and swaddling on sleep and selected physiological parameters among hospitalized low birth weight neonates in selected hospitals in West Bengal.

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