

Effectiveness of Tactile Stimulation on Neurobehavioral Development and the Physiological Parameters among Neonates in NICU

Anusha. L¹, Radhika. M²

¹Assistant Professor, Sahaya College of Nursing, Tirupati, Andhra Pradesh

²Associate Professor, Dept of Child Health Nursing, IGIMS-College of Nursing, Patna, Bihar

Corresponding Author: Radhika. M

DOI: <https://doi.org/10.52403/ijhsr.20220512>

ABSTRACT

Background of the study: High-risk infants hospitalized in Neonatal Intensive Care Unit (NICU) suffer from sensory deprivation which has an impact on normal brain development of the neonates. They are cared in NICU during the first few days or weeks of their life. Extra uterine environment poses risk to the neonates as they are very fragile to adapt to the changes in extra uterine environment with their immature body systems. Early sensory stimulation will enable the growth of the brain cells, will enhance the adaptive behaviour, and will help in the attainment of the normal growth and neuro behavioural maturity. A child's first emotional bonds are built through touch, which lays the foundation for future emotional and intellectual development. Touch alters oxytocin, which in turn, provides relaxation, encourages bonding between parent and child and lowers stress hormone levels.

Aim: The aim of the present study is to evaluate the beneficial effects of tactile stimulation on Neurobehavioral development and physiological parameters among neonates in NICU.

Methods: A Pre test-post test design was adopted to evaluate the effects of tactile stimulation on Neurobehavioral development and physiological parameters. A sample size of 50 neonates admitted in NICU were selected and 25 Neonates were assigned to Experimental group and 25 neonates to Control group by using stratified random sampling technique followed by simple random technique. Modified Brazelton's Neonatal Neuro Behavioural Assessment Scale (NNBAS) was used to assess the Neuro behavioral Development before and after providing tactile stimulation.

Data analysis: Data was analysed using descriptive statistics and inferential statistics according to the objectives and the hypothesis tested.

Results: revealed that there is a significant improvement in the neuro behavioural development and the physiological parameters of neonates in experimental group in NICU after providing tactile stimulation.

Conclusion: It is evident from the findings that the tactile stimulation has beneficial effects on neuro behavioural development and the physiological parameters among neonates in NICU.

Keywords: Neonates, NICU, Neuro behavioural development, Tactile stimulation, physiological parameters

INTRODUCTION

High-risk infants are newborn babies who are very fragile and are at risk to face the health problems than any normal babies of their age. Also, they are at high risk suffering from co-morbid conditions,

congenital anomalies and possible prenatal, natal, or postnatal complications¹

High-risk infants hospitalized in Neonatal Intensive Care Unit (NICU) suffer from sensory deprivation which has an impact on normal brain development of the neonates. They are cared in NICU during

the first few days or weeks of their life. Extra uterine environment poses risk to the neonates as they are very fragile to adapt to the changes in extra uterine environment with their immature body systems.²

NICU environment exposes the neonates to excessive noise, alarm sounds, bright lights which may affect the growth, development and neuro behaviour maturity of the high risk newborns.³The physiological parameters fluctuate due to the inappropriate and excessive noise produced in NICU especially in premature and who are low.³

Early sensory stimulation will enable the growth of the brain cells, will enhance the adaptive behaviour, and will help in the attainment of the normal growth and neuro behavioural maturity. A child's first emotional bonds are built through touch, which lays the foundation for future emotional and intellectual development. Touch alters oxytocin, which in turn, provides relaxation, encourages bonding between parent and child and lowers stress hormone levels. Touch causes vagal stimulation and improves sleep-awake state and motor activity, and enhances physiological responses and neuro behaviour maturity.⁴

After birth, providing various stimulation will help improving the sensory system to complete maturity. Stimulation by means of physical, sensory, emotional environments have important role in improving the development of the infant brain⁵

Need for the study

As many as 17 to 48 percent of preterm infants demonstrate neuro-motor abnormalities during infancy e.g., abnormal muscle tone or asymmetries (Alonso et al., 2000; Vohr et al., 2005). A thorough examination of a baby immediately after birth will help to recognize neurobehavioral developmental disorders early and to promote a better outcome.⁶

Skin is the largest sensory organ and the first to develop in utero. Touch is

essential for normal growth and development, communication and learning. Touch is the earliest sensation to develop during intrauterine period, which provides stimulation and interaction between the mother and baby. Touch enables the mother to have an intimate interaction between the mother/caregiver and infant.⁷

The neonates in NICU are exposed to a tremendous stressful environment, with its excessive sounds produced by alarm and other devices and bright lights. The extra uterine environment deprives the neonates of the warm protective environment and stimulation in utero.⁸

Neonates in NICU lack sensory stimulation when compared to the normal new born. Sensory stimulation is a paramount important intervention for the brain development and the neuro behavioural maturity of neonates.⁹

Neonatal nurses have a vital role in promoting overall health and development of high risk neonates by providing sensory care interventions. Hence, the researcher has undertaken the present study to evaluate the beneficial effects of tactile stimulation on neuro behaviour development and the physiological parameters.

Statement of the problem

“A study to evaluate the effectiveness of tactile stimulation on Neurobehavioral development and physiological parameters among neonates in NICU in selected Hospital, Nellore District.

Objectives

1. To assess the Neuro behavioural development and physiological parameters among neonates in NICU before providing tactile stimulation.
2. To evaluate the effectiveness of tactile stimulation on Neurobehavioral development and physiological parameters among neonates in NICU.
3. To associate the post test scores of neuro behavioural development of neonates with their socio demographic variables.

HYPOTHESES

Null hypothesis

H₀₁: There is no statistically significant difference on neurobehavioral development and the physiological parameters among neonates in NICU before and after providing the tactile stimulation

H₀₂: There is no statistically significant association between the effectiveness of tactile stimulation on neurobehavioral development among neonates and their selected socio-demographic variables.

METHODOLOGY

Research approach: Quantitative research approach

Research design: A Pre test -Post test design was adopted to evaluate the effectiveness of tactile stimulation. The neonates in experimental group were given tactile stimulation and the control group was given routine care.

Setting: The study was conducted in NICU in the selected hospital in Nellore District

Sample: Term and preterm babies, normal birth weight and low birth weight babies admitted in NICU and who fulfilled the inclusion criteria.

Sampling Technique: Probability stratified random sampling technique followed by simple random technique by means of lottery method.

Sample size: comprise of 50 neonates, in tactile stimulation group 25 neonates were allocated in (study) experimental group and 25 neonates in a control group.

Sampling Criteria

Inclusion criteria

The study includes neonates who are

1. Preterm, term babies, normal birth weight and low birth weight babies.
2. Both boy and girl babies were included.

Exclusion criteria

1. Babies of parents who are not willing to participate.
2. Acutely ill neonates, ventilated babies.

3. Extremely Low birth weight (< 1000 Gms) babies.

Variables

Independent variables: Tactile stimulation

Dependent variables: Neuro behavioural development of the neonates.

Tools and Techniques: The tool consists of baseline data on socio demographic variables and birth history and a Modified Brazelton's Neonatal Neuro Behavioral Assessment Scale (NNBAS) to assess the neuro behavioural development of the neonates in NICU before and after providing tactile stimulation.

Validity: Content validity of tool was obtained from various experts in paediatric nursing, maternity nursing and neonatologists.

Reliability: was established by using Alpha Cronbach's Coefficient and tool was found to be highly reliable.

Ethical Clearance: Ethical clearance Certificate was obtained from the Institutional Ethics Committee.

Procedures & protocol: Tactile stimulation was performed for each neonate in the study group by massaging neonate's skin, from a head-to-toe direction over the neonate's entire body surface at a rate of 12 strokes per minute and in the following sequence: The neonate was placed in prone position and rubbed in circular motion by warmed palm of hand for 10 minutes period (1 minute for each region) from the neonate's head and face to the neck, from the neck across the shoulder, from the shoulder to the hand of both arms, from the upper back to the waist, from the thigh to the foot of both legs (Sayed, Youssef, Hassanein and Mobarak, 2015)

Plan for Data Analysis

Descriptive statistics: Frequency and percentage distribution of socio demographic variables, Mean & Standard

Deviation of neuro behavioural development.

Inferential statistics: was done by using Paired t- test and independent t- test and Chi-square test.

RESULTS

Table -1 Frequency and percentage distribution of neonates based on age.

AGE	(n= 50)			
	Experimental group (n=25)		Control group (n=25)	
	f	%	f	%
a. < 7 Days	25	100	25	100
Total	25	100	25	100

Table-2: Frequency and percentage distribution of neonates based on gender.

Gender	(n=50)			
	Experimental group (n=25)		Control group (n=25)	
	f	%	f	%
a. Male	11	44	11	44
b. Female	14	56	14	56
Total	25	100	25	100

Table-3: Frequency and percentage distribution of neonates based on APGAR score at birth

APGAR score at 1 Mt	(n= 50)			
	Experimental group (n= 25)		Control group (n=25)	
	f	%	f	%
a. 4-6	18	72	9	36
b. 7-10	7	28	16	64
Total	25	100	25	100

Table-4: Frequency and percentage distribution of neonates based on birth weight of the child.

Birth weight of the child	(n= 50)			
	Experimental group (n=25)		Control group (n=25)	
	f	%	f	%
a. 1- 1.5 kg	12	48	4	16
b. 1.5- 2 kg	4	16	8	32
c. 2- 2.5 kg	6	24	13	52
d. >2.5 kg	3	12	-	-
Total	25	100	25	100

Table-5: Frequency and percentage distribution of neonates based on weeks of gestation

Weeks of gestation	(n=50)			
	Experimental group (n= 25)		Control group (n=25)	
	f	%	f	%
a. 30-34 wks	9	36	6	24
b. 34-37 wks	15	60	17	68
c. 38-40 wks	1	4	2	8
Total	25	100	25	100

Table No.6: Frequency and Percentage distribution of pre test and post test score of neurobehavioral development among neonates

Neuro behavioural development	GROUP – I Pre – test (n=50)				GROUP – I Post – test (n=50)			
	Experimental group (n=25)		Control group (n=25)		Experimental group (n=25)		Control group (n=25)	
	f	%	f	%	f	%	f	%
Delayed response-(1-35)	21	84	19	76	15	60	18	72
Some response-(36-70)	4	16	6	24	10	40	7	28
Total	25	100	25	100	25	100	25	100

Table: No.7: Effectiveness of tactile stimulation on neurobehavioral development of neonates (N=50)

Group	Test	Mean score of Neuro Behavioural Development	S.D	Paired 't' test
Experimental Group	Pre test	18.8	3.6	C= 4.40 T=3.74S*** p<0.001
	Post test	20.5	3.9	
Control Group	Pre test	16.2	3.5	C= 1.36 T= 1.71 NS <0.05
	Post test	19.2	3.7	

S*** - Very highly significant at p<0.001 NS - Non significant at p<0.05, df_(n-1)=24

Table-No. 8: Effectiveness of tactile stimulation on physiological parameters of neonates in Experimental Group (n=25)

Physiological parameters	Pre- test		Post test		Paired 't' test value
	Mean	S.D	Mean	S.D	
Temperature (F)	97.8	0.50	98.1	0.51	C= 2.17 T = 1.71 S* p<0.05
Pulse (beats /min)	142.6	10.8	138.6	9.1	C =4.96 T =3.74 S*** p<0.001
Respiration (breaths / min)	41.9	5.6	43.8	5.8	C = 0.95 T = 1.71 NS p<0.05
Weight (Kg)	1.7	0.30	1.6	0.28	C=0.44 T=1.71 NS p<0.05

S*- Significant at p<0.05, df_(n-1)=24,S*** very highly significant at p<0.001
NS- Non Significant at p<0.05

Table No. 9. Effectiveness of tactile stimulation on physiological parameters of neonates in control group (n=25)

Physiological parameters	Pre- test		Post test		Paired 't' test value
	Mean Score	S.D	Mean	S.D	
Temperature (F)	98.1	0.64	98.0	0.74	C= 0.94 T= 1.71 NS p<0.05
Pulse (beats /min)	139.3	9.2	142.5	10.8	C=3.32 T=2.49 S** p<0.01
Respiration (breaths / min)	46.2	7.2	43.5	5.06	C=2.06 T=1.71 S* p<0.05
Weight (Kg)	1.82	0.21	1.9	0.4	C= 1.15 T=1.71 NS p<0.05

S** - Highly Significant at p<0.01, df (n-1) =24
S* - Significant at p< 0.05, Non Significant at p<0.05

Table: No.10, Association between the Post Test score on Neuro Behavioral Development of neonates with their selected socio demographic variables in Experimental Group (n=25)

S.no	Socio - demographic variables	Delayed response		Some Response		Chi-square χ^2
		f	%	f	%	
1	Gender					C=2.54 T =3.84 NS (df=1) p<0.05
	a. Male	8	32	3	12	
	b. Female	7	28	7	28	
2	APGAR score at birth					C=4.36 T =3.84 S* (df=1) p<0.05
	a. 4-6	12	48	6	24	
	b. 7-10	3	12	4	16	
3	APGAR score at 5th min of birth					C=6.40 T =3.84 S* (df=1) p<0.05
	a. 4-6	1	4	3	12	
	b. 7-10	14	56	7	28	
4.	Birth weight of child					C= 2.43 T= 7.81 df- 3 NS p<0.05
	a. 1- 1.5 kgs	8	32	4	16	
	b. 1.5- 2kgs	1	4	3	12	
	c. 2.1-2.5kgs	4	16	2	8	
	d. > 2.5kgs	2	8	1	4	
5.	Weeks of gestation					C= 0.71 T= 5.99 NS df- 2 p<0.05
	a. 30-34 wks	6	24	3	12	
	b. 34-37 wks	8	32	7	28	
	c. 38-40 wks	1	4	-	-	

S* - Significant at p<0.05,
df= (r-1) (c-1) NS- Non Significant

Table. No.11. Association between the post test scores on Neuro Behavioural Development of neonates with their selected socio demographic variables in control group (n=25)

S.no	Socio - demographic variables	Delayed Response		Some Response		Chi-square χ^2
		f	%	f	%	
1	Gender					C=3.42 T =3.84 NS df=1 p<0.05
	a. Male	7	28	4	16	
	b. Female	11	44	3	12	
2	APGAR score at birth:-					C=4.17 T =3.84 S* (df=1) p<0.05
	a. 4-6	7	28	2	8	
	b. 7-10	11	44	5	20	
3	APGAR score at 5th min of birth					C=6.10 T =3.84 S* (df=1) p<0.05
	a. 4-6	1	4	-	-	
	b. 7-10	17	68	7	28	

Table no11: continued...						
4	Birth weight of child					C=7.40 T= 5.99 S* df=2 p<0.05
	a. a)1- 1.5 kgs	3	12	1	4	
	b. b)1.5- 2kgs	3	12	5	20	
	c. c)2.1-2.5kgs	12	48	1	4	
5	Weeks of gestation					C- 2.96 T-5.99 NS df-2 p<0.05
	a. 30-34 weeks	4	16	2	8	
	b. 34-37 weeks	12	48	5	20	
	c. 38-40 weeks	2	8	-	-	

S* - Significant at $p < 0.05$, $df = (r-1) (c-1)$, NS-Non Significant at $p < 0.05$

DISCUSSION

Findings related to effectiveness of tactile stimulation on neurobehavioral development among neonates in NICU.

The results of the study reveal that with regard to overall score of neuro behavioural development, during Pre - test 21 (84%) had delayed response and 4 (16%) had some response in experimental group whereas in Control group, 19 (76%) had delayed response and 6 (24%) had some response.

During Post Test, 15 (60%) babies had delayed response and 10 (40%) had some response in Experimental group whereas in Control Group, 18 (72%) had delayed response and 7 (28%) had some response.

In experimental group, the Pre Test mean score is 18.8 with SD of 3.6. The Post Test mean score is 20.5 with SD of 3.9. The calculated value of paired 't' test is 4.40 which is greater than the table value (3.74). This indicates that there is a statistically significant difference in score of neuro behavioural development of neonates in experimental group (at $p < 0.001$), so the null hypotheses (H_{01}) is rejected and the research hypotheses (H_1) is accepted.

In Comparison of mean and SD in Control group, the Pre test mean score is 16.2 with SD of 3.5. The Post Test mean score is 19.2 with SD of 3.7. The calculated value of Paired 't' test is 1.36 which is lesser than the Tab value (1.71) which indicates that there is no statistically significant difference at the level of $p < 0.05$. So the null hypotheses (H_{01}) is accepted. This indicates that tactile stimulation is effective in improving the neurobehavioral

development of neonates in the experimental group.

The findings are consistent with a study conducted to assess the impact of tactile stimulation on premature infants showed better performance after 5 days and on discharge, specifically in the areas of habituation behaviour than the premature infants who didn't receive such stimulation.¹⁰

Findings related to effectiveness of tactile stimulation on physiological parameters among neonates in NICU.

The results reveal that in comparison of Mean and Standard deviation of physiological parameters of the neonates in experimental group, there is a statistically significant difference between Pre- test and post mean Temperature and Pre- test and Post test mean the Heart Rate of the neonates at $p < 0.05$ and $p < 0.001$ respectively.¹¹

Association between the Post Test score on Neuro Behavioral Development of neonates with their selected socio demographic variables.

In association between the Post Test score on Neuro Behavioural Development of neonates with their selected socio demographic variables in experimental group, there is a statistically significant association with APGAR Score at 1 minute and 5th minute (at $p < 0.05$).

In association between the Post Test score and the socio demographic variables in Control Group, there is a statistically significant association with APGAR Score at 1 minute and 5th minute and birth weight of the baby (at $p < 0.05$).

The findings of the study are consistent with the results of a study conducted by K. Prasanna & Radhika on effectiveness of Oil Massage on Weight Gain among Preterm Babies which showed there was significant association between the effectiveness of oil massage on weight gain among preterm babies with their socio demographic variables APGAR score at 5th minute of birth.¹¹

Recommendations for Future Research

1. A similar study can be replicated on large sample size, in different settings among preterm neonates as the longitudinal study.
2. A study can be conducted to examine the combined effects of multi modal stimulation (auditory, visual and tactile stimulation) on a neurobehavioral development and physiological parameters.
3. A comparative study can be conducted on oil massage application on neurobehavioral development among low birth weight and premature neonates.

Limitations

1. The duration of the study was short period
2. Small sample size.
3. The study included all neonates admitted in NICU irrespective of gestational weeks at birth and birth weight.

CONCLUSION

The Findings of the study concludes that the tactile stimulation is effective in improving Neurobehavioral Development and the Physiological Parameters among neonates in NICU.

Acknowledgement: None

Conflict of Interest: There is no conflict of interest.

Source of Funding: None

Ethical Approval: Approved

REFERENCES

1. Park, K. (2009). Preventive and social medicine, (20th ed.). Jabalpur: Bhanot Publishers
2. Segen JC. Concise dictionary of modern medicine. New York: The McGraw-Hill Companies Inc.; 2002.
3. Ramachandran S, Dutta S. Early developmental care interventions of preterm very low birth weight infants. *Indian Pediatr* 2013; 50: 765-770
4. Ghai, O.P. (2007). *Essential pediatrics*, (6th ed.). New delhi: Jaypee brothers publishers.
5. Clark, D., Gambelunghe M., B. (2015): Sensory development. *Pediatr Clin North Am.* 62(2):367-84. doi:10.1016/j.pcl.2014.11.003.access:https://pubmed.ncbi.nlm.nih.gov/25836703/
6. Kent W, Tank A, Clarke M, et al. Excessive noise levels in the neonatal ICU: potential effects on auditory system development. *J Otolaryngol.* 2002;31:355.
7. Vickers A., Ohlsson A., Lacy J. & Horsley A. (2008): Massage for promoting growth and development of preterm and/or low birth-weight infants. [Cochrane review]. The Cochrane collaboration; 1-42. Wheeden A., Scafidi F., Field T., Ironson G., Valdeon C. & Bandstra E. (1993): Massage effect.
8. Vickers A., Ohlsson A., Lacy J. & Horsley A. (2004): Massage for promoting growth and development of preterm and/or low birth weight infants. *Cochrane Database Syst Rev.*; (2): CD000390. Available at: <http://www.ncbi.nlm.nih.gov/pubmed/15106151>.
9. Kulkarni A., Shankar K., Gupta P., Sharma H. & Agrawal R. (2010): Massage and touch therapy in neonates to be performed per day. *Indian Pediatrics* September; 17(47): 771-776. Available at: <http://www.ncbi.nlm.nih.gov/pubmed/21048258>.
10. Atyat Mohammed Hassan Sayed, Magda Mohamed E. Youssef, Farouk El-Sayed Hassanein, Dr. Amal Ahmed Mobarak., Impact of Tactile Stimulation on Neurobehavioral Development of Premature Infants in Assiut City, *Journal of Education and Practice* www.iiste.org ISSN 2222-1735 (Paper) ISSN 2222-288X (Online) Vol.6, No.8, 2015

11. K. Prasanna, Radhika M., Effectiveness of Oil Massage on Weight Gain and Selected Physiological Parameters among Preterm Babies in Selected Hospitals, International Journal of Science and Research (IJSR). 2015; 4(4).1137-1141

How to cite this article: Anusha. L, Radhika. M. Effectiveness of tactile stimulation on neurobehavioral development and the physiological parameters among neonates in NICU. *Int J Health Sci Res.* 2022; 12(5):90-97. DOI: <https://doi.org/10.52403/ijhsr.20220512>
