http:// ijp.mums.ac.ir
Original Article (Pages: 18287-18295)

Effects of Bedside Nurses' and Mothers' Training on the Positioning Score of Premature Infants Hospitalized in NICU: A Clinical Trial

* Habibeh Shahedi [1], Khadijeh Dehghani [2], Naiire Salmani [3]

[1] School of Nursing and Midwifery, Shahid Sadoughi University of Medical Sciences, Yazd, Iran.

[2] Research center for Nursing and Midwifery care, Shahid Sadoughi University of Medical Sciences, Yazd, Iran.

[3] Meybod Nursing School, Shahid Sadoughi University of Medical Sciences, Yazd, Iran.

Abstract

Background: Positioning of hospitalized premature neonates is important because they often suffer from hypotonia, which can affect their development. Keeping the baby in the right position is one of the duties of nurses, and on the other hand, parents' participation is one of the most effective ways to prevent injuries caused by the hospitalization of premature neonates. Therefore, the present study aimed to determine the effect of bedside nurses' and mothers' education on the positioning score of premature infants admitted to NICU (Neonatal Intensive Care Unit).

Methods: In this pre-post study, 41 nurses and 7 mothers of premature neonates hospitalized in the NICU of Shahid Sadoughi hospital, Yazd, Iran, from May to June 2022, were included. The infants' positioning score was recorded through the Infant Positioning Assessment Tool (IPAT) on three consecutive days during three stages. Then the nurses and mothers were subjected to an interactive training course, including two theoretical and practical parts for one week, and the positioning score of the infants was re-checked one week and one month after the training. The data were analyzed using Wilcoxon, Friedman, Bonferroni, and Kolmogorov-Smirnov post hoc tests in SPSS software version 24.

Results: The results of the present study showed that there was a significant difference among the mean positioning scores of the infants before the education (5.59 ± 2.82), one week after (9.28 ± 2.91), and one month after the education (9.86± 2.64) (P <0.001).

Conclusions: Training nurses and mothers can improve the positioning score of premature infants in NICU and provide them with better developmental care. To achieve the ideal level of support for premature infants and better neurodevelopment, it is necessary to continue training and monitoring nurses' performance in this area.

Key Words: Developmental Care, Mother, Nurse, Positioning, Premature Neonates, Training.

* Please cite this article as: Shahedi H, Dehghani K, Salmani N. Effects of Bedside Nurses' and Mothers' Training on the Positioning Score of Premature Infants Hospitalized in NICU: A Clinical Trial. Int J Pediatr 2023; 11 (10):18287-18295. DOI: **10.22038/ijp.2023.73849.5334**

Corresponding Author:

Habibeh Shahedi, Research center for Nursing and Midwifery care, Shahid Sadoughi University of Medical Sciences, Yazd, Iran. Email: dehghanish@ssu.ac.ir

Received date: jul.22,2023; Accepted date: Sep.26,2023

1- INTRODUCTION

The World Health Organization (WHO) has estimated the birth rate of premature infants (< 37 weeks) to be more than 0.1 of all newborns. Physically, many premature babies' organs are not fully developed (1) and they often lack musculoskeletal tone and tend to be in an extended position. This condition can affect infant development and skills such as feeding, communication and attachment with caregivers. Also, it can cause abnormal developmental movement patterns such as skeletal defects (2, 3). Preterm birth directly impacts cerebral development, posture, and motor control. Whereas premature infants are deprived of the development of physiologic flexion in the uterus (4), therefore, it is hard for these babies to get into positions that can provide the best condition during sleep and rest. So that without proper intervention, movement problems and developmental delays such as crawling, standing, walking, and fine motor skills such as hand-mouth cooperation may occur in the baby in the future (5). Being in the proper position can regulate the baby's sleep and wakefulness, improve cardiovascular functions, and help maintain the baby's energy (6).

Positioning of preterm infants is an effective intervention that addresses prematurity concerns and it can be considered a cost-effective intervention, especially in countries with a level 3 care system. It can also reduce the need for respiratory support, especially in developing countries where respiratory support technology is not always available (7).

Therefore, the position in which premature babies are placed in the Neonatal Intensive Care Unit (NICU) is very important, and positioning is considered as one of the important aspects of their supportive-evolutionary care (2, 8-10). Positioning intervention includes placing babies on prone, supine, and side-lying and using a containment position, which involves placing hands on the baby's head and around his legs to create comfort, or using restraints such as folded towels or some aids to prepare a nest (7).

During a work shift, the NICU nurses usually have to communicate with premature infants and change the baby's position about 4 times. If the baby stays in an unfavorable position for 3-4 hours, it causes pain and reduces the quality of sleep. Therefore, the care team in the NICU is responsible for maintaining the baby's balance, position, and movement (6).

Placing infants in the proper position is considered one of the aspects of developmental care and a part of the nurses' duties in the NICU. It seems that training NICU nurses in the infants' developmental status will have a significant effect on improving their clinical performance (1). However, along with training the nurses, training the mothers of premature infants admitted to the NICU should also be considered. Due to their physical, mental, physiological, and psychological problems, premature babies need basic and complex treatment and care. Nowadays, one of the best and most effective ways to prevent some difficulties and complications caused by the hospitalization of premature infants is to actively involve parents in taking care of babies. When a mother takes care of her premature baby, the sense of participation is strengthened; the participation of parents in taking care of the baby reduces the hospital length, hospitalization costs, and the possibility of hospital-acquired infection/nosocomial infection (11).

Parental involvement empowers them taking care of a premature baby to become competent in providing care and increases the feeling of attachment (12). Today, focusing on family-centered care for premature infants is more important than ever. However, the evidence indicates that

about 85% of mothers with premature infants hospitalized in the NICU have poor to moderate performance in the field of newborn care (13).

Therefore, considering the importance of premature infants' positioning in the NICU, some problems in the care of these babies, and the need for training nurses and mothers related to these babies, the present study aimed to determine the effects of bedside nurses' and mothers' education on positioning premature infants in the NICU.

2- MATERIALS AND METHODS

2-1. Design and participants

This pre-post experimental study was conducted on 41 nurses and 7 premature infants' mothers in the NICU of Shahid Sadoughi hospital, Yazd, Iran, from May to June 2022. Inclusion criteria for mothers were being literate, being present at the NICU for infant care, and not participating in similar programs. Mothers with addiction (drug abuse (, having intraventricular hemorrhages (grade≥2), congenital abnormalities in the abdomen or spine, and neuromuscular defects were excluded from the study. All NICU nurses were included in the research if they were satisfied with the research criteria and had no history of participating in similar programs.

2-1.1. Sample Size

Considering that every infant was observed three times a day for three consecutive days during one month (in three stages) and due to the discharge and death of the infants, access to them was limited, so the number of observations was considered as the sample size (14, 16).

The sample size was estimated to be a minimum of 60 observations, considering a standard deviation of 2.7, power of 80%, and the mean difference of at least 1.5 units before and after the intervention at a significant level of 0.05, based on the study by Masri et al. (14) (8 infants and 8 mothers). All the nurses who worked in Shahid Sadoughi hospital, Yazd, Iran at the time of this study (n=41) were included.

2-2. Procedure

In the second stage, four training sessions of two hours each were held for nurses and mothers. Nurses' training included two theoretical and practical parts. Each theoretical session was held for four hours through lectures and group discussions, questions and answers, slide shows, film, and the use of baby moulage for positioning. To ensure the participation of all nurses, they were divided into four groups and theoretical sessions were presented, separately, for each group. After the completion of the theory sessions, a practical session (for two hours) was held by the researcher inside the NICU to observe and practice the positioning in demonstration.

Similar to that of nurses, the mothers' training was held in two groups with a two-hour theory session in a simple and understandable language along with questions and answers and a two-hour practical session in the NICU and on their own baby's bed. Training mothers was done through lectures, slide shows, the film shows, and by the use of baby moulage for positioning. In addition to the theoretical and practical training, some posters related to positioning were designed by the researchers and installed in different parts of the NICU to be visible to mothers and nurses. Mothers and nurses performed the positioning procedures for premature infants one month after the intervention.

The initial evaluation was done at the end of the first week after the intervention, and during three consecutive days, each infant was observed for 9 times, and 72 positioning observations were recorded. Finally, one month after the intervention,

positioning of each infant was re-evaluated and recorded for 9 times during three consecutive days. During this period, one infant was excluded from the study due to death, and at this stage, 63 positioning observations were recorded.

2-3. Instruments

Data were collected through researcher-made forms, including the infants' demographic characteristics (sex, birth weight, gestational age, and chronological age), the mothers' (age, level of education, and history of having a premature infant) and the nurses' (age, education, and work experience in NICU), and the Infant Positioning Assessment Tool (IPAT). Coughlin et al. developed IPAT for assessing the positioning of the newborn (15); and it was later used in studies by other researchers (14, 16, 17). In Iran, Montaseri et al. translated this tool into Persian and then back into English. Several nursing experts confirmed its content validity. In addition, the reliability of the Infant Positioning Assessment Checklist was obtained on a pilot sample of 15 infants, and Cronbach's alpha was estimated as 0.93 (1). In this tool, six areas of the infant were evaluated in three positions: prone, supine, and side-lying; 1. head, 2. neck, 3. shoulders, 4. hands, 5. hips, 6. knees, wrists, and legs. A score of 0, 1, and 2 was assigned to each of the 6 investigated areas. Based on this tool, the possible scores ranged from 0 to 12, the ideal score was 12, and the acceptable scores were 9, 10, and 11.

2-4. Data Analysis

Statistical analyses were performed using SPSS software version 24.0 (USA, IL, Chicago, SPSS Inc.). The collected data were analyzed using descriptive statistics (Percentage, mean ±standard deviation) and the statistical tests of Wilcoxon, Friedman, Bonferroni, Kolmogorov-Smirnov post hoc test. A P-value less than 0.05 was considered statistically significant.

3- RESULTS

A total of 41 nurses and 8 mothers and their premature infants were included in the study, one infant was excluded due to death, and finally, the data related to seven infants, including 63 observations in three stages before, one week after, and one month after the intervention were compared with each other. Mean weight of the infants participating in this study was 1307.14 ± 486.42 gr and their chronological age was 9.33 ± 10.11 days. 57.14% of the infants were boys and 42.85% were girls. The mean age of the nurses and mothers was 32.68 ± 7.09 and 36.7143 ± 4.657, respectively. The education level of most of the nurses (97.56%) and mothers (71.43%) was bachelor's degree and diploma, respectively (**Table 1**). There was a significant difference between the mean infants' positioning score before (5.59 ±2.82), one week (9.28 ±2.91), and one month after the intervention (9.86 ±2.64) ($p<0.001$) (**Fig. 1**). **Table 2** shows the positioning scores of six organs separately based on the positioning tool in three stages of the study. The positioning scores were interpreted as follows: 2 = ideal, 1 = acceptable, and 0 = unfavorable. Before the intervention, the mean scores of hands, shoulders, and hips were unfavorable. However, they improved significantly one week and one month after the intervention and reached an acceptable level ($P<0.001$).

According to Bonferroni's post hoc test, the overall positioning scores of infants and each of the investigated components before the intervention and one week after the intervention and before the intervention and one month after the intervention were significantly different ($p<0.05$), but the scores between one week after the intervention and one month after the intervention did not differ significantly ($p>0.05$) (**Table 3**).

Table-1: Demographic characteristics of the study participants

Variables			Mean ± S.D. OR n (%)
Infants (n=7)	Weight (gr)		1307.14±486.42
	Chronological age (days)		9.33±10.11
	Age at birth (weeks)		30.57±1.93
	Gender	Boy	4 (57.14)
		Girl	3 (42.85)
Nurses (n=41)	Work history at NICU (months)		86.01±69.41
	Age (years)		32.68±7.09
	Education level of nurses	Bachelor's degree	40 (97.56)
		Master's degree	1 (2.44)
Mothers (n=7)	Age (years)		36.7143±4.657
	Job	Housewife	5 (71.43)
		Worker	1 (14.28)
		Employee	0 (0)
		Self-employed	1 (14.28)
	History of premature infant		2 (28.57)
	Educational level	High school	1 (14.28)
		Diploma	5 (71.43)
		Above diploma	1 (14.28)

Table-2: Comparison of the mean infants' positioning scores in each organ before and after the intervention

Organs	Before intervention	One week after intervention	One month after intervention	P-value*
Head	1.07±0.88	1.57±0.75	1.73±0.62	<0.0001
Neck	1.26±0.54	1.65±0.54	1.57±0.68	<0.001
Shoulders	0.82±0.58	1.42±0.73	1.57±0.64	<0.001
Hands	0.69±0.75	1.26±0.82	1.55±0.61	<0.001
Hip	0.85±0.85	1.65±0.62	1.63±0.60	<0.001
Knees, Ankles, Feet	1.22±0.58	1.71±0.52	1.79±0.40	<0.001

All data presented as Mean±S.D. *Kruskal–wallis test

Table-3: Pair-by-pair comparison of total infant positioning scores in organs in different stages

Organs	After a week-After a month	Before-After a month	Before-After a week
Total positioning score	0.999	0.000	0.000
Head	0.774	0.000	0.001
Neck	1.000	0.000	0.002
Shoulders	0.850	0.000	0.000
Hand	0.180	0.000	0.000
Pelvis	1.000	0.000	0.000
Knees, Ankles, Feet	1.000	0.000	0.000

All data presented as p-value. Bonferroni test (Post Hoc)

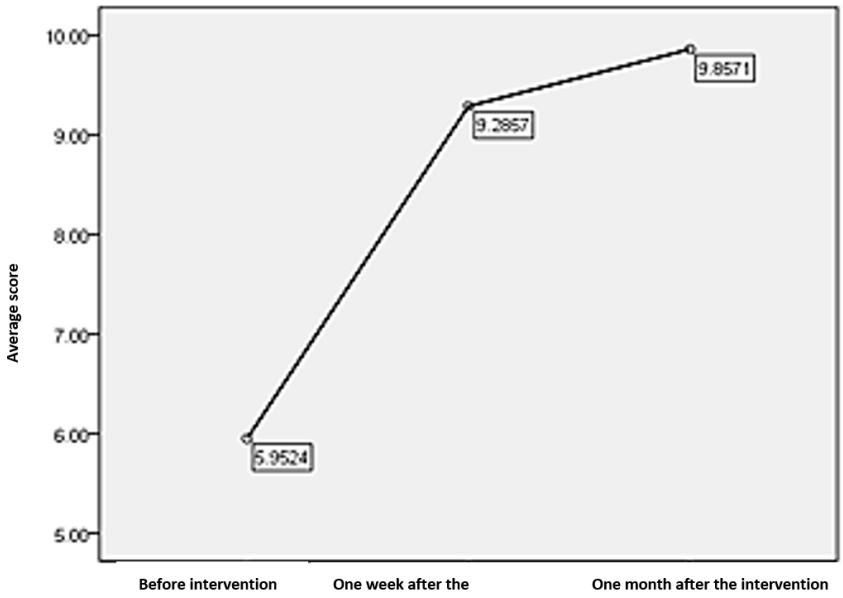

Fig. 1: Comparison of the mean positioning scores of premature infants before, one week after, and one month after the intervention (Friedman test)

4- DISCUSSION

According to the results, the positioning score of premature infants improved with education for nurses and mothers. There was only one comparable study with consistent findings. It was done by Upadhyay et al. (2021) and it examined the effects of a quality improvement program on infant positioning scores. Nurses and mothers had better scores after the educational intervention. The strength of their study was training the mothers and nurses together and using family-centered care to keep the plan going (18).

The effect of a structured education intervention on nurses and residents on NICU infants' positioning score was studied by Masri et al. in a study similar to this one (14). The positioning score significantly improved from (3.4±2.5) to (8.1±2.7) 18 months after the intervention. They did not train the mothers though and despite the improvement in the positioning score, the score obtained in the level needed to be corrected. While in the present study, the change in the positioning scores after the intervention was reported at an acceptable level. It seems that the difference between the methods of training in the present study and the aforementioned study led to this result. Moreover, in our study, posters were installed in NICU after the theoretical and practical training to help mothers and nurses remember the methods of infants positioning visually. However, Masri et al. (14) only held a training class without any reinforcement or repetition of what was learned and a long time after the intervention, an evaluation was done.

Charafeddine et al. conducted a study similar to ours in method but with different participants including nurses, assistants, fellowships, and therapists. The training program consisted of 15 theoretical sessions with practical demonstrations and the use of moulage to practice infant positioning. An online training course was also provided through PowerPoint and was available to the participants so that they could review the training materials if needed. In their study, the performance of the participants was continuously monitored. Support measures after holding the training course included questions and

answers, providing feedback, sending emails to teach additional tips, and sending puzzles that were completed in the field of infant positioning to increase knowledge. The assessment of infants' positioning status was done during three periods. Their results showed that the mean positioning score improved from (3.4 ± 2.5) to 6.3 and then to (7.3 ± 2.5), but it still did not reach the desired level. Still, it indicates the positive effect of training and post-training support on infants' positioning process (16). The common point of this study with our study is that the continuation of providing educational tips and follow-up to solve problems can be a step towards better effectiveness of training. Achieving better performance is not easy because it involves changing habits and behaviors.

In another study, nurses were trained based on the newborn positioning guide through lectures and practical methods. After one week, the effect of the intervention was investigated and the results showed that the positioning scores increased from 4.14 ± 1.02 to 10.17 ± 0.57 (2), which, in line with our findings, shows the effectiveness of the training in improving the infants' positioning scores. Likewise, in another study (2017), the performance of nurses in placing infants in developmental positions was investigated by an infant positioning assessment checklist. There was a significant difference between the performance scores of nurses before the training (5.84±0.03), the first week after the training (8.53±1.42), and two months after the training (8.71±1.16) ($P< 0.001$). Based on the findings of this research, a developmental training program for premature infants could positively improve the nurses' performance in NICU (1). Spilker et al. also investigated the effects of training on infants' positioning in their study. Their results showed that the mean score of infants' positioning improved from 8.39 ± 2.498 to 9.42 ± 2.283 (17). This study was similar to the present study in terms of observing an improvement in the positioning scores, but it is worth considering that a slight improvement was reported in the mentioned study and it may be due to the way of training, which was only through making educational materials available and no formal theoretical or practical training was used.

In the present study, in addition to making educational materials available to nurses, theoretical and practical pieces of training were also used to learn the correct positioning method. Moon et al. trained nurses through lectures, PowerPoint presentations, and educational videos and used moulage for practical practice. Evaluation of nurses' knowledge and performance showed improvement in the field of infant positioning (19). In our study, the mean positioning scores significantly increased in all body parts of the infants. This result is in line with that of Spilker et al. They reported that after training the nurses, the mean positioning scores of all body parts except the head increased, but the statistical difference was not presented (17).

4-1. Limitations of the study

This research was conducted on the NICU nurses who worked in one hospital, which leads to a limited generalizability. Carrying out further studies to identify the factors influencing and strengthening the performance of nurses and mothers on how to position premature infants can be helpful. It is also recommended to conduct studies with larger sample sizes and with a control group. It is suggested that further studies on a wider level be designed and conducted comparatively between nurses of different centers.

5- CONCLUSION

The present study can, further, emphasize the necessity of holding continuous retraining courses and educational workshops, along with installing posters related to the positioning

methods on NICU walls to help remember the training in practice. Mothers' and nurses' participation in providing the correct position for premature infants hospitalized in NICU, by the use of devices such as rolls and nests for proper positioning, is an effective way to prevent subsequent complications of unfavorable positioning. Though the results indicated that training nurses along with mothers can improve the positioning score of premature infants hospitalized in the NICU, but considering that the positioning score was at an acceptable level and remained at the same level one month after the intervention, it can be concluded that to achieve the ideal level of positioning, the continuation of training and monitoring of the performance of nurses are needed.

6- ETHICAL CONSIDERATIONS

The proposal of this study was approved by the Ethics Committee of Shahid Sadoughi University of Medical Sciences, Yazd, Iran (Code: IR.SSU.REC.1400.222) and was registered in the Iranian Registry of Clinical Trials (Code: IRCT20100411003679N3). Written informed consent was obtained from all nurses and mothers before participating in the study. All the principles of the Helsinki Declaration, including the confidentiality of the participants' information were considered.

7- ACKNOWLEDGMENTS

This article was extracted from a master's thesis in the field of neonatal special care, approved and funded by the School of Nursing and Midwifery, Shahid Sadoughi University of Medical Sciences, Yazd, Iran (No. 12083). Hereby, the researchers of this study were grateful to all the personnel, especially Ms. Ghafarian and Parnian Zamanieh, and the mothers who helped in this research.

8- CONFLICT OF INTEREST

None.

9- REFERENCES

1. Montaseri Z, Bakhshi F, Edraki M, Razavi Nejad SM, Haghpanah S. The Effect of Educating the Use of Developmental Positions of Premature Infants on the Clinical Performance of Neonatal Intensive Care Unit Nurses. J Babol Univ Med Sci. 2017; 20:69-73.

2. PS Soniya. Effect of guideline on positioning of neonates in the neonatal intensive care unit. Biomedical Sciences. 2019.

3. Zarem C, Crapnell T, Tiltges L, Madlinger L, Reynolds L, Lukas K, et al. Neonatal Nurses' and Therapists' Perceptions of Positioning for Preterm Infants in the Neonatal Intensive Care Unit. Neonatal Network. (2):110-6.

4. Hunter AJ. The use of clinical audit in successfully implementing a change of clinical practice in developmental positioning. CLINICAL PRACTICE. 2015; 11(5):159-5.

5. Network Lead Nurse. Wales Neonatal Network Guideline: Supportive Positioning Guideline. 2017; 5: 1-12.

6. Jesina DK. Comparison of Neonates' Positions in SnuggleUp™ Wraps Prior to and Following Education. All Regis University Theses. 2019; 944.

7. King C, Norton D. Does therapeutic positioning of preterm infants impact upon optimal health outcomes? A literature review. Journal of Neonatal Nursing. 2017; 23(5):218-22.

8. Lavallée A, Aita M, Côté J, Bell L, Luu TM. A guided participation nursing intervention to theraupeutic positioning and care (GP_Posit) for mothers of preterm infants: protocol of a pilot randomized controlled trial. Pilot Feasibility Study. 2020; 6:77.

9. Madlinger-Lewis L, Reynolds L, Zarem C, Crapnell T, Inder T, Pineda R. The effects of alternative positioning on

preterm infants in the neonatal intensive care unit: A randomized clinical trial. Research in Developmental Disabilities. 2014; 35(2):490-7.

10. Visscher MO, Lacina L, Casper T, Dixon M, Harmeyer J, Haberman B, et al. Conformational Positioning Improves Sleep in Premature Infants with Feeding Difficulties. The Journal of Pediatrics. 2015; 166(1):44-8.e1.

11. Ghasemi M, Dehdari T, Mohagheghi P, Gohari M, Zargrzadeh Z. Mothers' Performance on Caring for their Premature Infants: A Pilot Study. Iran Journal of Nursing. 2012; 25(79):24-33.

12. Øberg GK, Ustad T, Jørgensen L, Kaaresen PI, Labori C, Girolami GL. Parents' perceptions of administering a motor intervention with their preterm infant in the NICU. European Journal of Physiotherapy. 2019; 21(3):134-41.

13. Olson NW. Why Should Medical Care Be Family-Centered? Understanding Ethical Responsibilities for Patients' Family Members. Kennedy Inst Ethics J. 2019; 29(2):159-85.

14. Masri S, Ibrahim P, Badin D, Khalil S, Charafeddine L. Structured Educational Intervention Leads to Better Infant Positioning in the NICU. Neonatal Network. (2):70-7.

15. Coughlin M, Lohman MB, Gibbins S. Reliability and Effectiveness of an Infant Positioning Assessment Tool to Standardize Developmentally Supportive Positioning Practices in the Neonatal Intensive Care Unit. Newborn and Infant Nursing Reviews. 2010; 10(2):104-6.

16. Charafeddine L, Masri S, Ibrahim P, Badin D, Cheayto S, Tamim H. Targeted educational program improves infant positioning practice in the NICU. Int J Qual Health Care. 2018; 30(8):642-8.

17. Spilker A, Hill C, Rosenblum R. The effectiveness of a standardised positioning tool and bedside education on the developmental positioning proficiency of NICU nurses. Intensive Crit Care Nurs. 2016; 35:10-5.

18. Upadhyay J, Singh P, Digal KC, Shubham S, Grover R, Basu S. Developmentally Supportive Positioning Policy for Preterm Low Birth Weight Infants in a Tertiary Care Neonatal Unit: A Quality Improvement Initiative. Indian Pediatr. 2021; 58 (8):733-6.

19. Moon HJ, Cho KS, An MY, Son DW. Effects of a Neonatal Supportive Positioning Training Video Program for Preterm Infants on the Knowledge and Performance of Nurses in Neonatal Intensive Care Units. Asian Nursing Research. 2022; 16(1):25-34.