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Outcome of creating clustering nursing care and healing environment on premature infants' behavioural outcomes

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ABSTRACT

We conducted a quasi-experimental study in two neonatal intensive care units (NICUs) from January to July 2021, focusing on the effects of clustering nursing care and creating a healing environment on premature infants' behavioural outcomes. The study included 106 infants, with 53 in both the study and control groups. Significant improvements were observed in organisation state/sleep and responsiveness/interaction domains in the study group, along with shorter hospital stays and greater weight gain on discharge. These findings highlight the positive impact of targeted interventions on premature infants' developmental outcomes, emphasising the need for comprehensive care strategies in NICU settings.

Premature infants face heightened health risks and developmental hurdles despite medical advancements. The care environment significantly influences their outcomes, with traditional neonatal settings often lacking optimal conditions for their well-being. Neonatal intensive care units (NICUs) typically provide an artificial environment that can negatively impact the developing infant's brain.[1] Premature infants are particularly vulnerable to external stressors due to their underdeveloped physiological systems. Traditional NICU environments often fail to minimise these stressors, leading to adverse developmental outcomes.[2] This study is novel in its combined approach of clustering nursing care with the establishment of a healing environment. While previous research has focused on either clustering care or environmental modifications separately, our study integrates both strategies to provide a comprehensive intervention.

We conducted a quasi-experimental study in the NICU at two hospitals from January to July 2021, using an equivalent control group design with pretests and post-tests. A total of 106 premature infants were randomly assigned to either the study group or the control group, with 53 infants in each group. The sample size was determined considering an effect size of 0.51, a power of 90%, a confidence level of 95%, an alpha of 0.05 and a beta of 0.1, with an attrition rate of 10%. Inclusion criteria were premature infants with gestational ages between 30 and less than 37 weeks and birth weights ranging from 1000 to 2000 g. Exclusion criteria included major health problems such as respiratory distress, congenital heart issues, necrotising enterocolitis, septicaemia and those connected to mechanical ventilators. On-job training was conducted for nurses to implement clustering care and establish a healing environment. The study group received clustering nursing care, which involved performing five nursing procedures without interruption (diaper care, weighing, eye care, changing pulse oximetry and blood sampling), as well as a healing environment intervention focused on controlling light, noise, touch and improving smell. The control group received nursing care without these interventions. These interventions are now the standard of care in NICU units, but the study setting unit was not implementing them before this study.

The implementation of the plan was supervised by senior nursing staff and neonatal specialist through a multitiered approach to ensure adherence to the intervention protocols and maintain consistency in care. During the implementation of the study, some nursing staff initially resisted due to the increased workload and changes in routine care practices. This barrier was addressed by providing additional support and training sessions, highlighting the benefits of the intervention. Data collection was carried out by trained research assistants who were blinded to the group assignments to minimise bias. Outcome measures included neonatal characteristics, length of hospital stay, discharge weight and the Newborn Behavioural Observation Sheet score comprising 18 neurobehavioural observations categorised into four

Table 1 Distribution of premature infants according to their characteristics in study and control groups (n=53)

Premature characteristics	Study group N	%	Control group n	%	Test P value
Gestational age: (weeks)					
30 to <32	17	32.1	19	35.8	
32 to <34	21	39.6	20	37.7	
34 to 36	15	28.3	14	26.5	
Mean±SD	32.17±1.20		31.99±1.10		T-test. 1.890 >0.05
Gender					
Boy	22	41.5	19	35.8	χ2. 2.976
Girl	31	58.5	34	64.2	>0.05
Birth weight (grams)					
Mean±SD	1340±125.3		1366±170.12		T. test 1.253 >0.05
Length: (cm)					
Mean±SD	43.70±2.80		43.21±1.99		T. test 1.807 >0.05
Head circumference: (cm)					
Mean±SD	30.24±1.88		30.39±1,76		T. test 1.205 >0.05
Type of delivery					
Vaginal	40	75.5	36	67.9	χ2. 3.998
Caesarean section	13	24.5	17	32.1	<0.05*
Apgar score at					
1st min	8.1±0.97		8.34±0.78		T. test 1.056 >0.05
5th min	9.04±0.45		9.20±0.64		T. test. 1.12 >0.05

*significant <0.05

domains: organisation state/sleep, motor, responsiveness/interaction and autonomic.

The mean gestational age of infants in the study and control groups was 32.17±1.20 and 31.99±1.10 weeks, respectively. The mean birth weight of premature infants in the study and control groups was 1340±125.3 g and 1366±170.12 g, respectively (see table 1). Regarding total newborn behaviour observation, there was a statistically significant difference between the mean score levels for organisation state/sleep and responsiveness/interaction in the study and control groups ($p<0.05$). The mean length of hospital stay was 20.5±2.10 days in the study group and 26.21±4.07 days in the control group. The mean discharge weight among infants in the study group was 1790±90.65 g compared with 1650±76.3 g in the control group (see table 2).

The findings of this study underscore the significant impact of clustering nursing care and creating a healing environment on the behavioural outcomes of premature infants in NICU settings. The study group exhibited notable improvements in organisation state/sleep and responsiveness/interaction domains compared with the control group, suggesting that these interventions facilitate better neurobehavioural regulation and interaction skills. These results align with previous studies indicating that controlled care environments and structured nursing interventions can enhance the developmental outcomes of premature infants.[1] Additionally, current evidence suggests that developmental care significantly affects the mental and motor development of preterm infants[2] and improves early outcomes and physical development.[3] The study group experienced shorter hospital stays and greater weight gain on discharge, highlighting the potential of these interventions to expedite recovery and promote growth. The improved discharge weight and reduced length of hospital stay reflect enhanced overall health and developmental progress, emphasising the importance of a supportive care environment in the NICU. These results are consistent with other studies showing that developmental care can significantly

Table 2 Comparison of behavioural observation scores, discharge weight and length of hospital stay among premature infants in study and control groups

Items	Study Mean±SD	Control Mean±SD	T test	P value
Organisation state/sleep	12.41±1.98	9.64±1.25	6.021	<0.05*
Motor	10.49±2.13	9.84±1.77	2.057	>0.05
Responsiveness/interaction	11.09±1.84	9.98±1.59	7.231	<0.05*
Autonomic	4.40±0.63	4.12±0.34	2.105	>0.05
Discharge weight (grams)	1790±90.65	1650±76.3	12.077	<0.05*
Length of stay at hospital (days)	20.5±2.10	26.21±4.07	9.087	<0.05*

Behavioural observation domains (organisation state/sleep, motor, responsiveness/interaction and autonomic).
*significant <0.05

increase weight index in infants[4] and that light-darkness cycle interventions positively affect weight gain.[5] Continuous clustered nursing care can improve the physical growth of preterm infants.[6] Despite the positive outcomes, the study's small sample size is a limitation, suggesting that further research with larger sample sizes is necessary to confirm these findings and provide more robust data. However, the study's rigorous design, including the use of a control group and pretest and post-test measurements, comprehensive training, and supervision of nursing staff, and the use of blinded research assistants, ensures high adherence to protocols and minimises potential biases. In conclusion, implementing clustering nursing care and a healing environment significantly benefits the neurobehavioural development and overall health of premature infants, underscoring the need for NICU environments to incorporate such targeted interventions to improve patient outcomes. To sustain these important interventions in the NICU unit and ensure they become the standard of care, it is essential to incorporate continuous training programmes for nursing staff, regular supervision to maintain adherence to protocols and periodic evaluations to monitor outcomes.

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Ethics approval This study involves human participants and the study was conducted in accordance with the Declaration of Helsinki and approved by the Institutional Review Board the Research Ethics Committee at the Faculty of Nursing, Ain Shams University (N117. 20/12/2021). The researchers clarified the study's aim and objectives to the nurses and parents of the premature infants before starting. Written approval was obtained from the parents (mother or father) before including their infants in the study. The researchers assured confidentiality of collected data and that it would be used only for research purposes. The researchers ensured no harm would come to the study subjects. Participants gave informed consent to participate in the study before taking part.

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