

Research Paper

Promoting Developmental Outcomes of Premature Infants by Creating Opportunities for Parent Empowerment (COPE)



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ABSTRACT

Objectives: Premature neonates are at greater risk of developmental problems such as cerebral palsy, developmental delays, and hearing and vision problems. The challenge of healthcare professionals who support preterm neonates and their parents is not only ensuring neonates' survival but also optimizing infant development. Interventions to reduce adverse health outcomes are very important. The present study was focused on exploring the effect of the Creating Opportunities for Parent Empowerment (COPE) schedule on the developmental outcomes of premature infants

Methods: The randomization process was done using a randomized block design, and neonates were assigned randomly to the treatment (n=20) and control (n=20) groups. Neonates in two groups were matched in gestational age, birth height, head circumference at birth, birth weight, Apgar scores (1 min, 5 min), prematurity, and new Ballard score. So, there was not a significant difference between them at the baseline. In the intervention group, the parents received a COPE schedule in a set of CD's in conjunction with written instruction and supplemental activities (guidebook). COPE schedule was performed in 5 steps. In the control group, neonates received only routine services and interventions, and the research therapist performed no additional interventions. New Ballard examination was done in all neonates at the time of enrollment, followed by administration of Ages and Stages Questionnaire (ASQ) by an occupational therapist, who was double-blinded for the study, to any available parent (mostly mothers) at 6 months of corrected age.

Results: The results showed more maturity in "communication", "gross motor", "problem-solving", and "personal-social" in the intervention group, and the observed differences between the two groups in these outcomes were statistically significant (P<0.05).

Discussion: This educational-behavioral intervention program could promote mothers' knowledge about their neonates and improve the developmental aspects of premature infants during their first months of life.

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Highlights

- Parent training programs are effective in promoting the developmental aspect of preterm infants.
- The long-term application of parents empowering programs is more effective in decreasing sequelae (e.g. cognitive delays, neurodevelopmental and behavior problems) related to immaturity

Plain Language Summary

Premature infants are more at risk of developmental abnormalities. Literature reports dealing with the growth and development of premature infants reflect a poor prognosis for central nervous system growth. Sensitive parent training programs in NICU can help improve developmental outcomes in preterm infants.

1. Introduction

The modern era of neonatal care is characterized by significant technological advances in mechanical ventilation and medicinal therapies [1, 2]. Such advances have dramatically increased the survival rate for the youngest and smallest preterm infants [3, 4]. Approximately 90% of neonates born prematurely require highly specialized neonatal care. Although such care and technology save lives, medical and developmental sequelae (e.g., cognitive delays, neurodevelopmental and behavior problems) related to immaturity remain of concern [5]. The challenge of healthcare professionals who support preterm neonates and their parents is not only ensuring neonates' survival but also optimizing infant development [6].

The stressful environment that premature neonates face, negatively impacts brain development and neurobehavioral outcomes in the future [7]. Exposure to loud or sharp sounds and constant light are the sources of stress for preterm neonates that may lead to physiological and behavioral stress [8]. Infants demonstrate physiological and psychological stability during Neonatal Intensive Care Unit (NICU) hospitalization, a critical period for neurodevelopment when protected from excessive light and noise [9-12].

The preemies lack the muscle tone and strength to control normal posture and movements, so their extremities tend to lie extended rather than flexed. This long-term abnormal position can lead to abnormal posture and deformities with consequent delay in acquiring developmental motor skills and disturbs oral-motor abilities [13]. According to the literature, therapeutic positioning is a major early neurodevelopmental intervention in the NICU that promotes the normal position of newborns and supports neuromuscular development and behav-

ioral organization [11, 14, 15]. These high-risk infants should usually be followed up with developmental screening for early detection and start early intervention to decrease adverse outcomes.

Enabling participation in everyday occupations and life activities as a critical factor in an infant's development has become an important outcome for occupational therapy services [16]. Facilitation of mother-infant bonding is an important key in caring for at-risk infants, so healthcare professionals have emphasized family-centered care and parent training that support optimal brain development and provides various benefits to both mother and infant [17, 18].

Literature review shows that most studies on the effectiveness of developmental care are based on trials performed during the hospitalization period and do not have follow-ups. Many scientific studies have been performed about developmental care and parent training, but they concentrated on one strategy [19, 20].

Performance of training programs such as COPE (Creating Opportunities for Parent Empowerment) utilizes these strategies and interventions. COPE is a comprehensive educational program used for preterm neonates and their parents [21]. A review of previous studies reveals that the COPE program can decrease stress level that interferes with caring tasks. By increasing parents' knowledge and changing their opinions on preterm neonates, their parental roles will change [22, 23]. This study has concentrated on ways to improve the care and environment of the NICU for neonates and their parents through the use of developmental care programs. This study aims to empower mothers by gradually training and facilitating the responsibility for meeting every need of their infants; consequently, an empowered mother can promote developmental outcomes of premature infants.

2. Methods

The influence of the COPE program on developmental outcomes was analyzed through a randomized, double-blind clinical trial, which included a sample of 40 preterm infants. The criteria for including preterm neonates were 1) weight 1000 to 2500 g at birth, 2) GA lower than 37 weeks, 3) 5-minute Apgar score 7 and more, 4) no considerable brain ultrasound abnormalities (grade III or IV Intraventricular Hemorrhage [IVH]), 5) no neuromuscular disorders and congenital anomalies, and 6) hospitalization in NICU for at least 7 to 30 days. Neonates were excluded from the study if they had the disease or neonatal death during the study, or the parents tended to exclude their infants from the study for any reason and at any time despite their initial satisfaction.

The randomization process was done using a randomized block design, and neonates were assigned randomly to the intervention (n=20) and control (n=20) groups. Parents of infants in the intervention group received a COPE schedule in a set of CDs in conjunction with written instruction and supplemented activities (guidebook). COPE schedule was performed in 5 steps: step I, 2-4 days following the entrance of the infant to the NICU; step II, 2-4 days after implementing the first step; step III, 1-4 days before the infant leaves the NICU; step IV, about one week after discharge; and step V, about 2 months old of corrected age. Neonates in the control group received routine

services and interventions, and the research therapist performed no additional interventions.

Outcome measurements

A detailed history and new Ballard examination were made for all neonates at the time of enrollment, followed by administration of Ages and Stages Questionnaire (ASQ) by an occupational therapist, double-blinded for the study, to any of the available parents (mostly mothers) at 6 months of corrected age (Figure 1).

Statistical analysis

Data analysis was performed using the SPSS software v. 18. All values were tabulated as Mean±SD. The independent t test was used to analyze the difference between groups. The significance level for the statistical test was considered to be 0.05, and the confidence interval was 95%.

All ethical considerations were observed according to the Research Ethics Committee of Rehabilitation College of Iran University of Medical Sciences. This research was performed at the NICU of two University Hospitals in Tehran City, Iran, from March 2015 to February 2016. All parents gave their free and informed consent to participate in the study.

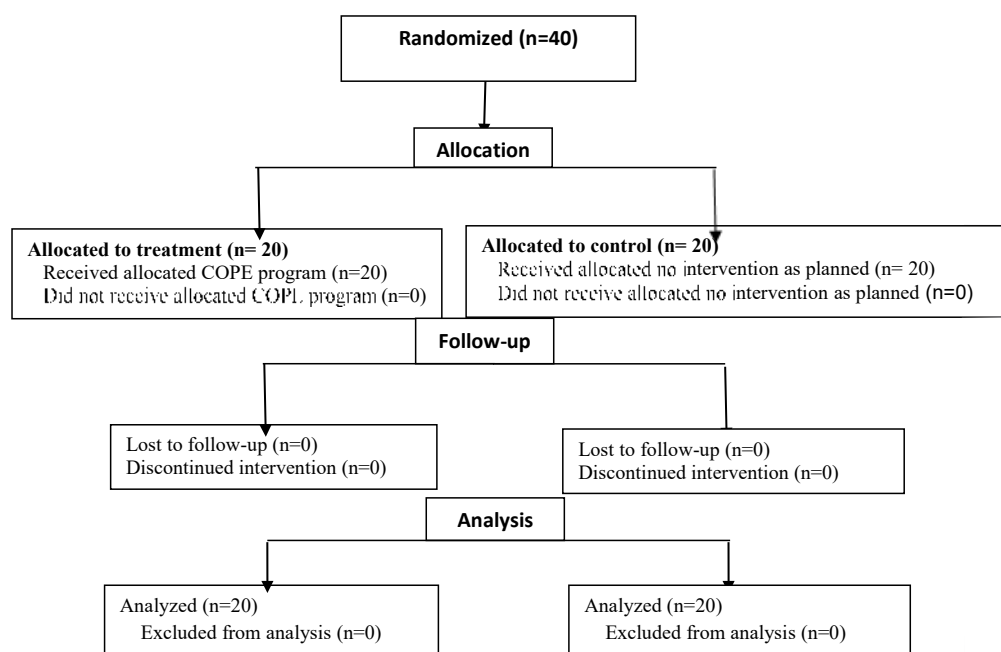


Figure 1. Flow diagram of the participants

3. Results

The Mean±SD gestational age of the neonates was 31.80±2.50 weeks in the control group; range: 26-36 weeks and 33.05±1.39 weeks in the intervention group; range: 32-35 weeks. As shown in Table 1, neonates in both groups were matched in terms of gestational age, birth weight, birth height, head circumference at birth, Apgar scores (1 min, 5 min), prematurity, and new Ballard score. So, there was no significant difference between them at the baseline. The results showed (Table 2) more maturity in “communication”, “gross motor”, “problem-solving”, and “personal-social” in the intervention group, and the differences between the 2 groups in these outcomes were significant ($P<0.05$).

4. Discussion

The present study investigated the developmental areas of premature infants during the first months of life using the ASQ scales. Many studies have been done

to investigate parent training about the development of their premature neonate. The Mother-Infant Transaction Program (MITP) is an intervention program designed to enhance parent sensitivity to their own hospitalized premature neonates. It uses tactile stimulation activities such as touch or skin-to-skin care [24]. The MITP highlights the transactional nature of development and, with its intervention program, attempts to sensitize the parents to their infant's cues, especially those that are a sign of stimulus overload, distress, and readiness for interaction [25]. In a trial of MITP, parents were trained to recognize and minimize stress responses in their preterm infants. At 6 months of corrected age, the infants in the intervention group scored better than the control group on the communication and symbolic behavior scales developmental profile infant-toddler checklist [26].

Another commonly used intervention is the Newborn Individualized Developmental Care and Assessment Program (NIDCAP). It is developmental-related supportive care and early intervention that starts quickly

Table 1. Demographic characteristics of the neonates at baseline

Variables	Mean±SD		P
	Control	Intervention	
Birth weight (g)	1602.1±458.78	1847±349.96	0.06
Head circumference (cm)	29.47±1.92	30.05±1.46	0.29
Birth height (cm)	42.30±3.90	43.05±3.63	0.53
1 min Apgar	8.45±0.75	8.20±0.76	0.30
5 min Apgar	9.50±0.68	9.30±0.80	0.40
Gestational age (wk)	31.80±2.50	33.05±1.39	0.06
New Ballard score	14.45±2.87	16.30±2.77	0.54

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Table 2. ASQ scores in the intervention and control groups (after study)

Parameters	Mean±SD		P
	Control	Intervention	
Communication	48.250±3.725	52.500±4.135	0.002
Gross motor	29.00±10.580	42.00±5.477	0.0001
Fine motor	48.750±4.552	50.750 ±3.354	0.122
Problem solving	43.250±4.722	51.00±5.525	0.0001
Personal social	47.00±6.766	52.250±4.722	0.007

ASQ: Ages and Stages Questionnaire

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after birth. The long-time effectiveness of NIDCAP in improving behavior and mother-child interaction has already been shown [27]. The Infant Behavioral Assessment and Intervention Program (IBAIP) is an intervention that delivers post-discharge and yields sustainable consequences on raising children's locomotion in routine activities [28]. However, benefits in behavior and cognition found at 6 months were not lasting through to preschool age [29, 30].

The latest systematic review has focused on the cognitive and motor skills of premature infants [31-33]. Spittle et al. [31] and Orton et al. [30], in their Cochrane review, mentioned that there are good consequences on cognitive development in preschool-age that were not lasting to school age. No motor maturity consequences were shown at any age. Vanderveen et al. [32] reviewed Randomized Controlled Trials (RCTs) or quasi-RCTs published up to 2008 that investigated early interventions on preterm infants and their parents. Interventions covered training sessions for parents, visiting infants at home, utilizing appropriate stimuli, and routine intervention in NICU. With meta-analysis, significant positive changes are seen in the intervention group in 12 months. At 24 months, positive changes have stayed for cognitive scores only. By ages 3 and 5 years, no significant changes have stayed.

The COPE intervention provides a unique approach to helping mother-preterm infant establishes positive interaction patterns. However, systematic reviews suggest that evidence for improved over-lasting developmental consequences is not conclusive [34, 35].

5. Conclusion

In conclusion, our study result is consistent with previous research and showed that interventions emphasizing parent-infant interactions and stress reduction might positively affect some fundamental development indicators for preterm infants. This finding is in line with the relevance development of preterm brain and stress confronted and with evidence of advancements in the early brain development after appropriate intervention in NICU.

Ethical Considerations

Compliance with ethical guidelines

This research has been registered at www.irct.ir (code: IRCT2015040521613N1) and approved by the Research Ethics Committee of Rehabilitation College of Iran Uni-

versity of Medical Sciences. After obtaining written consent from the parents, the participants were entered into the study protocol.

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Authors' contributions

Conceptualization and Supervision: Narges Shafaroodi, Reihaneh Askary Kachoosangy, and Mohammad Heidarzadeh; Methodology: Mostafa Qorbani, Narges Shafaroodi, and Reihaneh Askary Kachoosangy; Data collection: Seyede Zeinab Beheshti and Reihaneh Askary Kachoosangy; Data analysis: Mostafa Qorbani; Investigation, Writing-original draft, and Writing-review & editing: All authors.

Conflict of interest

The authors declared no conflict of interest.

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