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A Comparison between the Effects of Environmental and Behavioral Interventions on Sleep Cycle of Preterm Infants in NICU

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Abstract

Background: Due to the importance of sleep in brain development of infants, this study was designed to compare the effects of environmental and behavioral Interventions on sleep cycle of preterm infants in NICU.

Methods: In this prospective crossover clinical trial, 40 preterm infants with fetal age of 32 to 36 weeks hospitalized in NICU were selected. Infants were randomly divided into the two groups of environmental-behavioral intervention and behavioral -environmental intervention, based on the order of the performed interventions. The study included three courses of control, first intervention and second intervention each held for 2 hours. Sleep states were assessed by Prechtl sleeping and waking assessment tool.

Results: Mean of quiet sleep time in three different courses showed significant differences and in behavioral intervention course was more in comparison to the two other courses ($p<0.05$). Mean of active sleep time in the behavioral course was significantly less than that in other courses. But, there was no significant difference between the control and environmental courses.

Conclusion: Both behavioral and environmental interventions can increase total time of sleep and quiet sleep but behavioral intervention has more effect on quiet sleep. Therefore, infants sleep in NICU can be improved by behavioral interventions.

Introduction

Sleep is necessary for brain development (1,2,3). Adequate sleep is critical for the development of sensory system, hippocampus, pones, brain stem, midbrain, motor system, limbic, learning, long-term memory, temperature Adjustment, maintaining the capacity of adaption to changesand learning to respond to environmental experiences in infants (4,5,6,7). Short-term deprivation from sleeping in infants increases sympathice tone and also increases the possibility of obstructive apnea and affects pain perception (8,9). Infants in NICU face lots of stimulants that disturb their sleeping or decrease its length (10,11,12). Due to the importance of sleep in infants, in recent years, a number of studies have been done about the effective factors on sleeping. Bertelle et al. (2005) study showed that personal care (decrease light and noises, use of the head, back and feet supporters, swaddling clothes, non-nutritional sucking, grasping, decrease of stressful intervention of parents and kangaroo mother care) can increase the time of active and quiet sleep in preterm infants (13,14).

Although, in recent years, the developmental care in NICU has been considered around the world, in Iran, only some of these cares and in a limited form are done now (15). Based on studies in other countries, both behavioral and environmental interventions can cause comfort in infants (16,17), but we could not find any comparative study in literature review and decided to compare the effects of environmental and behavioral interventions on sleep cycle of infants with the aim of making effective changes to improve infants' sleep.

Methods

This study was a prospective clinical trial with crossover design. Sampling was done from 2016/07/22 to 2016/12/21 in Alzahra Educational-medical Center affiliated to Isfahan University of Medical Sciences. Sample size was estimated 40 infants. Inclusion criteria were fetal age of 32 to 24 weeks base on LMP or ultrasound report, neonatal age of 1-20 days, self-breathing without support, no congenital defect and no abnormal neurologic finding including intraventricular hemorrhage (more than grade 2), no use of addictive drugs by mother in pregnancy, no sedative therapy in the last 24 hours, no or limited kangaroo mother care due to mother unwilling or absence, no diarrhea, no infant re-hospitalization, APGAR score>4 and infant feeding every two hours. Exclusion criteria were to the necessity of doing special intervention during the study or parents refusal to continue the study. The sampling method was convenience. Each infant underwent no intervention course in the first day and in the second and third days, based on its assigned group, the infant received respectively either the behavioral and environmental interventions or environmental and behavioral interventions-for 2 hours. Infants' assessment was done between12 m.d to 20 p.m. Each course was started immediately after infant feeding. In environmental course, the environment light was being decreased by lowering the light and turning off the extra lamps and noises were being reduced by inserting earplugs in the infants' ears. In the behavioral intervention course, fetal position was being provided for infants by ward tools and any unnecessary manipulation was being avoided. Infants' sleeping state was assessed and recorded using Pertchl Scale. Finally, the total time of sleep and each sleep state in each course were calculated for two hours. Data were analyzed through SPSS18. Repeated measure covariance was used for comparing mean of the total time of sleep and each sleep state and independent t-test was used for comparing demographic variables.

Results

Overall, 40 infants (23 girls and 17 boys) divided into the two groups of environmental-behavioral and behavioral-environmental were assessed in 3 courses. From all, 62.5% of infants were in the incubator and 37.5% were in the cut. Infants' age was in the range of 1-28 days and birth weight ranged 1000-3515 gr. According to the independent t-test, mean of fetal age, infant age at the time of study and birth weight did not show any significant difference ($p> 0.05$).

Mean of total sleep times were 109 minutes in the no intervention (control) course and 114 minutes in both the environmental intervention and the behavioral intervention courses. Repeated measure covariance test showed no significant difference between the two groups in regard to the total time of sleep in control, environmental intervention and behavioral intervention courses ($p>0.05$)

Means of quiet sleep time were 64.3 minutes in the control course, 72.3 minutes in the environmental intervention course and 91.9 minutes in the behavioral intervention course. According to the results of LSD test, means of quiet sleep time in the behavioral and environmental intervention courses were significantly more than that in the control course ($p<0.05$).

Means of active sleep time were 44 minutes in the control course, 38.7 minutes in the environmental intervention course and 22 minutes in the behavioral intervention course and according to LSD test, mean of active sleep time in the behavioral intervention course was significantly less compared to other courses ($p<0.05$). But, there was no significant difference between the control course and the environmental course. ($p>0.05$)

Discussion

According to the obtained results, in both environmental and behavioral interventions courses, the total time of infants' sleep was more than that in the control course, but the difference between the environmental and behavioral interventions was not significant. Mean of quiet sleep time in the behavioral intervention course was significantly more than that in the environmental intervention course and in the environmental intervention course, it was significantly more than that in the control course. Mean of active sleep time was significantly less in the behavioral intervention course compared to two other courses, but there was no significant difference between the control and the environmental intervention courses. Bertelle et al. assessed preterm infants' sleeping by polysomnography in 2007 and showed that developmental care can increase total times of sleep and quiet sleep (13,14). The results of current study are in agreement with the results of the mentioned study.

Conclusion

Based on the results of this study, behavioral interventions including fetal position and reduction of infants' manipulation causes more quiet sleep; therefore, this intervention can be used to improve the sleep quality of hospitalized infants.

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