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Research Article

The Effect of Aromatherapy with Rose Water on the Deep Sleep Status of Premature Infants Admitted to NICU: A Randomized Clinical Trial Study

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Abstract

Introduction: Sleep, as a biological process, plays an essential role in brain development and infant development and its effects on the development of Sensory and brain system. Studies show different psychological effects of complementary medicine methods including aromatherapy on patients. This study was conducted with the aim of investigating the effect of aromatherapy with rose water on the deep sleep status of premature infants admitted to NICU.

Methods: This randomized clinical trial study was conducted on 64 infants hospitalized in PICU. In the intervention group and the control group of patients, two drops of rose water and distilled water were poured on gas and placed next to the babies' heads, respectively. ALS scale was used to assess the sleep status.

Results: Out of 66 infants in this study, 30 were female and 36 were male. The average gestational age of the infants was 32.5 ± 1.99 weeks. The results showed that the amount of deep sleep (type A and B) in the intervention group was significantly higher than the control group during and after the intervention (p=0.001).

Conclusions: Considering the positive impact of rose water in improve of sleep quality in premature babies; it can be used to improve sleeping condition of infants in hospitals, along with main treatment. ***ASEAN Journal of Psychiatry, Vol. 23 (10) January, 2023; 1-9.***

Keywords: Infant, Intensive Care Units, Aromatherapy, Sleep Quality, Complementary Medicine

Introduction

Sleep, as a biological process, plays an essential role in brain development and infant development [1]. Sufficient sleep and maintaining the sleep cycle in infants is very important because it affects the development of the sensory system, movement, learning, long term memory, and appropriate responses to environmental stimuli, temperature regulation and maintaining the balance of brain structures [2]. Side effects of lack of sleep and sleep cycle disorder in infants includes: Increase in sympathetic tonicity, risk of obstructive sleep apnea, decrease in pain threshold, decrease in brain mass, disturbance in the development of primary senses, disorders of alertness, increased sensitivity to diseases, disturbance in psycho-social development, cognitive defects and physiological disorders [3]. Studies have shown that the sleep of premature babies is significantly less comfortable than that of full term babies and they may suffer from sleep disorders and decrease the quality of sleep in the first and

second year of life [4]. Term infants spend 60% and pre term infants spend 70% of their time sleeping. The sleep cycle in babies up to the age of 6 months includes three stages of active, restful and uncertain sleep. A new born baby sleeps irregularly for 12 to 18 hours a day, and the sleep cycle lasts about 50 minutes. As the infant grows, the duration of active sleep decreases and restful sleep increases [5]. Active sleep affects the development of the sensory system both in the fetal period and in the new born period. QS plays an important role in the development of long term memory and learning ability. Maintaining the capacity to adapt to environmental changes, learning to respond to environmental experiences and coping with new needs is influenced by sleep stages [6]. Infants who need hospitalization in the intensive care unit are exposed to stimulating factors that disrupt the sleep cycle [7]. Since premature infants have an extremely vulnerable nervous system and spend the period of brain development in an environment outside the uterus, they are more affected by stimuli and are prone to such disorders [8]. The sense of smell is highly developed at birth. In this way, smell detection occurs between 28 and 29 weeks of pregnancy. The primary olfactory receptors appear in the eighth week of pregnancy and are fully developed by the end of the second trimester. The olfactory signal protein is expressed in the olfactory mucosa at 28 weeks of pregnancy and in the main olfactory bulb at 32-35 weeks of pregnancy [9]. One of the effective ways to reduce anxiety, stress, depression, insomnia, pain, fatigue and asthma is to use alternative medicine [10]. Aromatherapy is a type of alternative medicine that has been of interest to researchers as a new nursing care in recent years [11]. This treatment improves physical, emotional and spiritual health by using essential oils found in flowers, leaves, roots and stems of plants [12]. Compared to chemical substances, aromatherapy is a relatively effective treatment that does not accumulate in the body, but is discharged through the respiratory system, liver and kidney, and is non-invasive, which directly affects the brain [13]. Ros Damascena flower, which is known as rose flower in Iran, is one of the most important species of the rose family and the king of ornamental flowers. This flower is used as a perfume, medicine and flavouring in the food industry [14]. The scent of the rose with two elements, citronellol and phenethyl, has an antiseptic effect on the central nervous system, and as a result, it causes a hypnotic and relaxing effect. Rose is one of the most widely used medicinal plants recommended for the treatment of sleep disorders [15]. However, based on our search, the effect of the smell of rose on the sleep status of premature babies has not been investigated. Since the access to rose water is easy and inexpensive, this study was conducted with the aim of the effect of aromatherapy with rose water on the deep sleep status of premature babies hospitalized in the neonatal intensive care unit.

Material and Methods

Design and participants

This Randomized Clinical Trial (RCT) study was conducted on 64 premature infants admitted to the neonatal intensive care unit at Ali Ibn Abi Talib hospital in 2019 southwest of Iran. The CONSORT 2010 checklist was use to report the study [16]. The inclusion criteria included: The age of the baby between 30 and 37 weeks of gestation, having stable symptoms, without severe respiratory distress, jaundice and congenital abnormalities, no history of drug abuse by the mother, no use of narcotic and sedative drugs for the baby, as well as parental consent. In case of death, convulsions and changes in the clinical condition of the baby, they were excluded from the study. Sampling was done based on the available non-probability method and after the informed consent of the eligible

people. The selected samples were equally assigned to two groups by randomization method of permutation blocks. Also, in addition to randomization, in order to eliminate the possible effects of confounding variables, two groups were matched in terms of age and gender. The sample size was based on the purpose and study similar to Keyhanmehr, et al. 32 participants were selected in each group, a total of 64 participants [17].

Instrument

Demographic information form and sleep behaviour scale were used to collect data. The baby's demographic information form included personal information and information related to the baby (Including: Fetal age, sex, Apgar score in minutes of 1 and 5).

ALS sleep wake behaviour scale: In this instrument, six general sleep wake conditions are defined for premature babies, who include: deep sleep, light sleeps, sleepiness, calm wakefulness, active wakefulness, and crying, which are examined by the researcher in this study. Three sleeping positions. Each of these situations is defined based on its specific behavioural and physiological characteristics such as (breathing pattern, presence or absence of rapid eye movement, eyes open or closed, facial expressions, body movements, skin colour, mouth movements) [18]. Babies show each of these situations in two ways (a) and (b). In this tool, type A refers to the scattered and unorganized patterns of the baby's sleep and indicates that the baby has tension and stress, and level B is the level where the baby has an organized, strong and adjusted sleep. The validity of this tool has been approved in Iran by Rajaei, et al., [19].

Intervention

Infants were placed in a double-walled incubator. In the intervention group, two drops (0.1 cc) of Zahra organic rose water with 12 grades and in the control group, two drops of distilled water with a dropper and by a trained nurse were placed on a sterile pad at a distance of 30 cm from the baby's head in a double walled incubator. Became every new born was exposed to a sterile pad containing rose water or distilled water for 60 minutes. The sleep quality of the baby during 20 minutes during sleep and 20 minutes after placing the pad was determined at intervals of every two minutes according to the ALS tool by direct observation of the researcher and recorded in the table. All interventions were recorded by a video camera. In order to increase the validity of the data, the researcher watched the recorded video for a second time. Similar conditions were applied to the control and intervention groups. The study was conducted in two groups after feeding and routine nursing care at 3:00 PM to 5:00 PM to minimize confounding factors. During the study, the breathing rate and heart rate of the babies were controlled by a monitoring system to protect the patient. In the baseline measurements, all demographic data including sex, fetal age and Apgar score were collected (Figure 1)

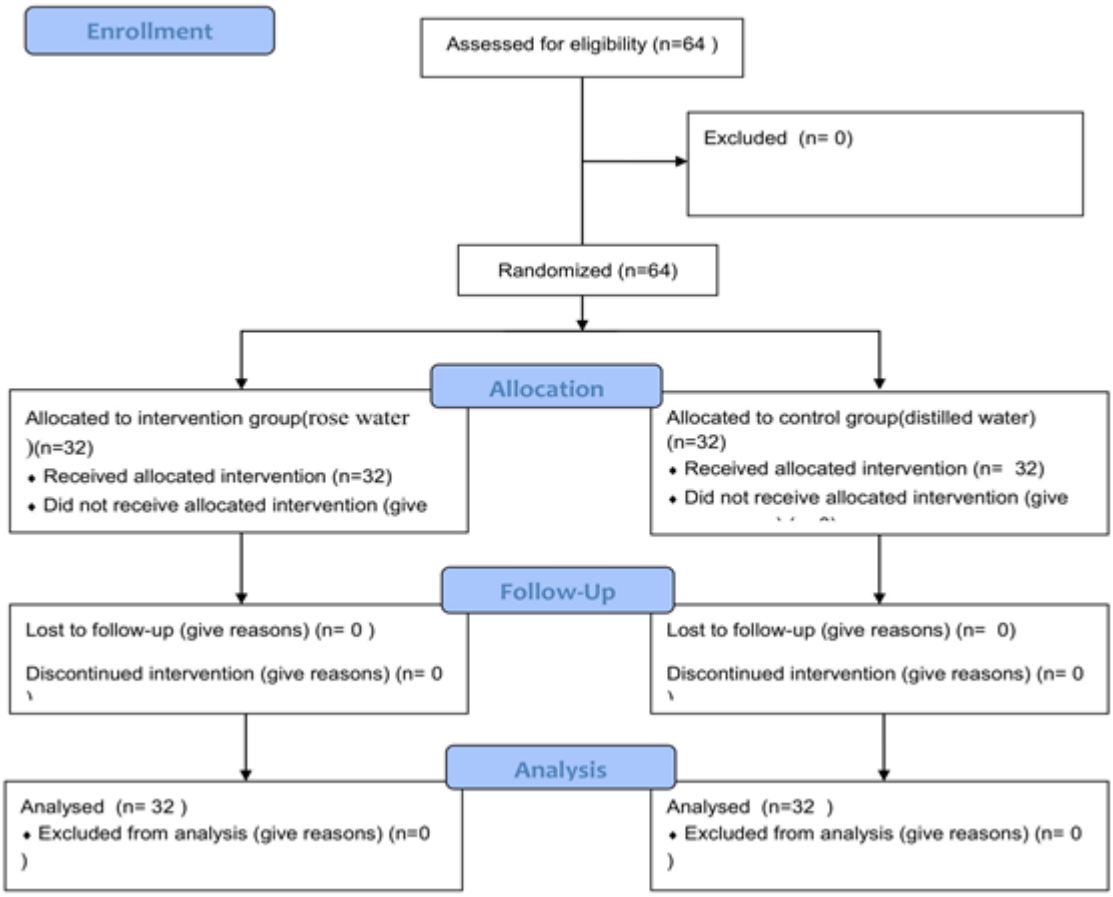

Figure 1. Consort 2010 flow diagram.

Ethical consideration

This study was approved by Institutional Review Board (IRB) (IR.ZAUMS.REC.1398.383) of Zahedan university of medical sciences. The study also was registered with the Iranian registry of clinical trials (www.irct.ir) with the registration number IRCT20171007036599 N4. Each participant was verbally provided with information regarding the study and the contents of the information sheet. An informative consent form and explanations that participation was voluntary and that they had the freedom to leave the study was completed by participants.

Data analysis

In order to compare the frequency, the average of 6 sleep states of premature babies in two groups, from Pearson's *chi-square* tests, independent t-test and according to the type of response variable (number of times of sleep types in different time intervals) and data repetition from generalized estimating equations known as GEE were used to fit Poisson's linear logarithm regression model and evaluate intervention effects. All statistical tests were performed in SPSS version 22.0 for windows (SPSS Inc., Chicago, IL, USA). Confidence interval of 95% and a significance level of P-value less than 0.05 was considered significant.

Results

Out of 66 infants in this study, 30 were female and 36 were male. The average gestational age of the infants was 32.59 ± 1.99 weeks. The results of Pearson's *chi-*

square test showed that the two groups have the same distribution in terms of gender (P=0.82) and also the results of the parametric t test for two independent groups showed that the two groups had the same mean Apgar score in terms of age (P=0.27). The first minute (P=0.22) and the fifth minute Apgar average (P=0.18) have no statistically significant difference. According to the information of deep sleep A, in the intervention group, during the first 20 minutes (Mean: 0.24 and 0.82: SD=the second 20 minutes), (Mean: 2.18 and 1.62: SD=the third 20 minutes), Mean: 1.44 and 1.62: SD=and deep sleep A in the control group in the first 20 minutes), (Mean: 0.66 and 0.94: SD=the second 20 minutes), (Mean: 0.22 and 0.61: SD=the third 20 minutes), (Mean: 0.41 and 1.19: SD=group effect was significant and time effect was insignificant). Due to the significance of the interaction between time and studied groups, the comparison of two groups was investigated separately at each time. Due to the large sample size (n<30) and also checking the graphs to compare the average deep sleep A between two groups, parametric t test was used for two independent groups at any time. Comparison of two groups at any given time in table and graph 1 shows that 40 and 60 minutes are significant. Deep sleep B in the intervention group during the first 20 minutes (Mean: 0.21 and 0.69: SD=the second 20 minutes), (Mean: 1.94 and 1.87: Deviation the third 20 minutes), (Mean: 0.82 and 1.64: Std. Deviation and deep sleep B in the control group in the first 20 minutes), (Mean: 0.22 and 0.79 SD the second 20 minutes), (Mean: 0.34 and 1.33 SD the third 20 minutes), (Mean: 0.13 and 0.4 SD) although the two groups did not have a statistically significant difference, the quality of their deep sleep (type B) differed significantly over time, and the interaction between time and group was also significant. Therefore, the effect of the intervention was examined separately at each time and as can be seen in the table and graph 2, the effect of group and time is not significant on its own, but the mutual effect of group and time is significant (Tables 1 and 2 and Figure 2)

Table 1. Determining and comparing the frequency of deep sleep (Type A) of premature infants, during 20 minutes before the intervention, during the intervention and after the intervention in two intervention and control groups.

Time	Group	Before intervention (First 20 minutes)	During intervention (Second 20 minutes)	After intervention (Third 20 minutes)	P-value
Intervention	Mean	0.24	2.18	1.44	0.22
	Median	0	2	1	
	SD	0.82	1.62	1.62	
Control	Mean	0.66	0.22	0.41	
	Median	0	0	0	
	SD	0.94	0.61	1.19	
P-value		0.06	<0.001	<0.004	

Table 2. Determining and comparing the frequency of deep sleep (Type B) quality of premature infants, during 20 minutes before the intervention, during the intervention and after the intervention in two intervention and control groups.

Time	Group	Before Intervention (first 20 minutes)	During Intervention (second 20 minutes)	After Intervention (third 20 minutes)	P-value
Intervention	Mean	0.21	1.94	0.82	<0.001
	Median	0	2	0	
	SD	0.69	1.87	1.64	
Control	Mean	0.22	0.34	0.13	
	Median	0	0	0	
	SD	0.79	1.33	0.49	
P-value		0.94	<0.001	0.02	

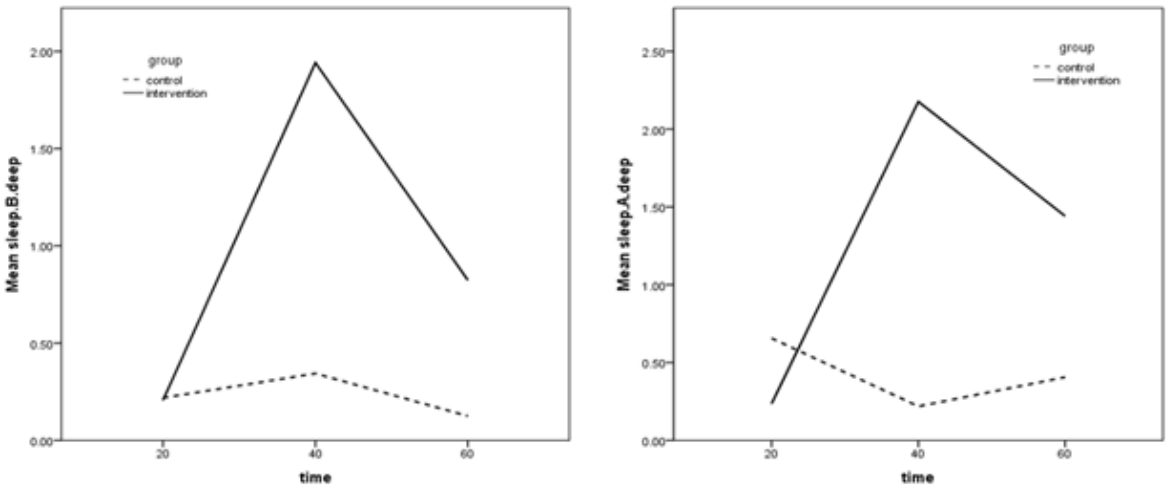

Figure 2. Comparing the time of different types of sleeps in the two groups.

Discussion

The results showed that the amount of deep sleep (type A and B) in the intervention group was significantly higher than the control group during and after the intervention. In general, the results showed that aromatherapy is effective on sleep quality, which was consistent with previous studies. Arbianingsih conducted a research aimed at the effect of lavender aromatherapy massage in reducing sleep disorders in infants and the results of the research showed the effectiveness of lavender aromatherapy massage in reducing sleep disorders in infants. In this research, sleep disorders in infants aged 6 to 12 months were investigated took [20].

The findings of Keyhanmehr's study on the effect of aromatherapy with rose oil on children's sleep quality showed that resistance to sleep, difficulty waking up in the morning, nightmares and waking up during the night in children were found by inhaling rose oil. In another study, which was conducted by Hajibagheri under the title of investigating the effect of aromatherapy with rose water on the sleep status of patients admitted to the intensive care unit, five areas of Pittsburgh's sleep quality index were examined. The results showed that the

scent of rose water can improve the sleep quality of patients admitted to the intensive care unit [21].

All the above studies point to the positive effect of aromatherapy as an alternative treatment on improving sleep quality. In these three studies, the effect of aromatherapy on duration, quality and sleep disorders in different age groups was investigated. In the second and third studies, rose water was used to improve sleep quality and disorders. We also used rose water as a relaxing scent in our study. In the study we conducted, we adopted the ELS tool and observed the behavioural and physiological characteristics of infants to evaluate their sleep status; Abd Yazdan, et al. showed that nesting and swaddling increases the total sleep time and peaceful sleep of premature babies admitted to the NICU [22].

Ameri, et al., showed in a study that placing the baby in the fetal position increased the percentage and average time of deep sleep, decreased the frequency and duration of light sleep, sleepiness, active wakefulness and crying in premature babies. In our study, similar to Ameri's study, the Els sleep and wake behaviour scale was used for premature babies, and we focused on the sleep of premature babies so that we could achieve more accurate results. Two studies conducted on children with autism showed that aromatherapy does not have a significant effect on their sleep quality.

There were limitations in our study. Many factors, including the sound and light of the environment, are effective on the sleep of the baby. It is suggested that this study be conducted in single person rooms, and in future studies, long follow up periods should be included to evaluate the continued effectiveness of the interventions.

Conclusion

The findings of the present study showed that smelling the scent of rose water in premature babies leads to an improvement in their sleep. Because rose water is easy to access, inexpensive, and its use has few side effects, and most importantly, it is accepted by parents and considering that sleep is very important for brain health and baby development. Therefore, it is suggested to improve the sleeping condition of infants in hospitals, along with treatment, using non-pharmacological methods such as aromatherapy with rose water.

Conflict of Interest

The authors declare no competing interests.

Ethics Approval

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee-of Iran and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards.

Informed Consent

Informed consent was obtained from all individual participants included in the study.

Data Availability Statement

The data that support the findings of this study are available from the corresponding author, upon reasonable request.

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