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Original Article

The Interventional Effect of Quiet Time Protocol on the Sleep Status of Premature Neonates Admitted to the NICU

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ABSTRACT

Background: Most infants born prematurely are admitted to the NICU for their survival, an environment that is rich in stressors that has non positive effect on the sleep and wakefulness condition. The goal of this study was evaluating the effect of the QTP intervention on the sleep status of premature neonates admitted to the NICU.

Methods: This study was semi-experimental and 62 premature babies hospitalized in NICU, who were selected by available sampling method. The tools used included demographic information questionnaire and Als sleep and wakefulness tool. Infants in two groups were evaluated in 3 stages. before, during and after the intervention in the evening shift from 15:00 to 17:00 for 60 minutes. The data was analyzed using SPSS software (version 22). A p value of less than 0.05 was considered statistically significant. The validity of the mentioned tool was investigated according to the content method according to the study of Rajaei in 2013 under the title of investigating the sleep-wakefulness of premature infants and its relationship with demographic characteristics, and the reliability of the tool was also investigated according to the same study.

Results: The chi-square test showed that the variable frequency of deep sleep (type A) before (P=1)and after (P=0.05) the intervention in the two groups did not have a statistically significant difference and just during the intervention has a statistically significant difference (P<0.001). Comparison of the distribution of the frequency of deep sleep (type B) before, during and after the intervention in 2 groups shows that before the intervention, deep sleep (type B) was not observed in the two groups. However, in the intervention group, 58.1% had deep sleep during the intervention and 6.5% after the intervention. The control group did not have deep sleep (type B) in these three time periods.

Conclusion: Considering the effectiveness of QTP in reducing environmental stimuli and improving sleep status, implementation of these items is recommended as a standard care to reduce stress, improve growth and development of preterm infants in the nicu.

Keywords: Neonatal intensive care unit, Premature neonates, Quiet time protocol, Sleep status

Introduction

Infancy is considered one of the Most significant developmental and growth course in a human Life.

One of the important indicators that its expansion has a particular Position in healthcare category is the supply, maintenance and promotion of the health level of infants. Premature laber is one of the challenges of infancy (1). The world health organization considers live infant who are born with an age younger than thirty-seventh week of gestation to be premature (2, 3). The most important cause of death in neonates without congenital anomalies is premature birth. About eight to ten percent of all births worldwide are preterm. Every year, about 15000000 premature births (about one in ten neonates) occur in the whole world, and its prevalence in developed and developing countries

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is 12% and 40%, respectively(4, 5). In the twenty first century, premature birth is responsible for more than $\frac{2}{3}$ of infant mortalities in developed countries. 12.5% of the 4 million neonates born in the united states yearly are premature. According to statistics, 10-12% of all pregnancies in Bulgaria end in premature birth (6, 7).

In Iran, premature birth has a high prevalence (5.14 to 6.4%) and the Iranian ministry of health, treatment and medical education has estimated its outbreak at 8%.(8). A high percentage of deaths, short-time and Long-time taxes in neonates occur due to premature neonates(9, 10). Psychic disturbance [autism, attention deficit hyperactivity, anxiety, depression], sensorimotor disturbance [vestibular imbalance, pain processing, deafness, CP], developmental delay (verbal, recognizing, sensorimotor development) threatens premature babies and their academic performance is also weaker compared to term babies for unknown reasons(11, 12, 13). This days, with the improvement in medical science and healthcare services, the survival rate of premature neonates needing to be hospitalized in the nicu has increased. (7, 9, 14). The setting of the neonatal intensive care unit is not similar to the mother's womb, but causes the neonate to be exposed to many sensorial stimulus (fuss, intense light and frequent nursing procedures) that can adversely affect on their developing brain and lead to long-time neurodevelopmental problems (15, 16).

The stimuli mentioned have a negative effect on the neonate's sleep. Feeble quality of sleep during fetal and neonatal period is associated with lifelong developmental taxes. early sleep is physiologically-vital and lays the groundwork for the organization of brain networks. Insufficient sleep can cause clinical problems for neurodevelopment in the future. Early in the life of a premature infant, brain development and sleep may be delayed(17). Medical procedures, fuss, light and routine care disturb the sleep of neonates, while quality sleep is one of the important components in the growth and development of premature neonates. Sleep has an essential role in the recovery, brain development and energy storage of premature neonates. Distinct sleep modes in human fetuses start from the 27th week of pregnancy and a complete sleep period is formed at the age of 25 to 30 fetal weeks(18). The sleep pattern of neonates is different from the adults and has three stages: active sleep, quiet sleep, and indeterminate sleep(19). Active sleep or sleep with rapid eye movement is the initial state of sleep and is characterized by rapid eye movements, scattered movements, irregular breathing and continuous electroencephalography pattern. Active sleep plays a significant role in sensory processing. quiet sleep or NON-REM sleep is characterized by the lack of rapid eye movement, lack of movement, breathing
With ordered templates and intermittent electroencephalography template. In this stage of sleep, following the increase in the secretion of hormones such as melatonin, growth hormones, dihydroepiandrosterone and hormones Sexuality, information processing, consolidation and consolidation of memory occur. Indistinct sleep is a state of sleep whose characteristics can't be grouped as active or quiet sleep. Transitional sleep or sleep-wake transition is also an indeterminate period of sleep that occurs at the beginning of sleep and between quiet sleep and active sleep (20, 21).

Considering the negative impact of environmental factors on the sleep quality of infants hospitalized in the NICU, the necessity of using the appropriate protocol to improve the sleep of these patients is emphasized. Quiet time protocol is an intervention in which medical personnel use non-invasive, uncomplicated, simple and low-cost methods to calm the environment in all dimensions so that patients have enough sleep(22, 23). The "quiet time protocol" or "quiet hour protocol" intervention is a specific course in each eight-hour shift in which light and sound are reduced as much as possible and bedside treatments are minimized. (24, 25). A protocol designed to achieve this goal and improve the environment includes minimizing noise by including separate room, educating unit's staff about the negative effects of noise, keeping staff quiet, minimizing patient manipulation, turning off alarm sounds, or adjusting them focus on vibration mode, or the use of visual warning systems, immediate response to the alarm, building the toilet away from the infant's bed and using plastic drawers instead of metal drawers(26). In the quiet time protocol, the source of the patient's environmental stressor should be identified in order to avoid exposure to it and increase adaptation to the environment. Quiet time protocol can improve nursing examinations, care activities and treatment methods to improve the patient's adaptation to the environment and improve their sleep quality(27).

Due to the increasing number of premature births and the long hospitalization of premature babies in neonatal intensive care units, safe,

affordable and effective care should be included in the agenda. In the meantime, it is necessary to reduce tension and stress in premature babies, because the repetition of tension and stress is associated with harmful effects on their neurodevelopment(9). Therefore, caregivers of neonates should pay attention to improving the sleep status of neonates. One of the interventions that can be effective in this field is the implementation of the quiet time protocol, which limits the two mentioned stimuli to some extent. This study should be carried out in parts of our country, especially the NICU department of Ali ibn abi talib Zahedan hospital, where more than one infant is placed on each bed, the sound level is higher than the standard, and the direct lights of the adjacent infant phototherapy department reach the infant's eyes. It shines and disturbs the infant's sleep, it is done to determine the effect of the intervention in Iran, and on the other hand, the intervention of the quiet time protocol is a harmless, easy, cheap, affordable and accessible intervention that is carried out by training nurses on It is done on it. The infant bed can be used in the special care of infants.Therefore, the present study was conducted with the aim of investigating the effect of the quiet time protocol intervention on the sleep status of premature neonates admitted to the intensive care unit of Ali ibn abitaleb hospital in Zahedan, Iran in 2022.

Methods

study area

The study was conducted at the neonatal intensive care unit of Ali ibn abi taleb hospital in Zahedan, Iran in 2022. An informed consent form was completed for the parents of infants participating in the study.

Study design and sampling procedure

The study design was a quasi-experimental Study, employing 2 groups (QTP intervention group and control group) involving 62 preterm neonates (Figure 1). The blinding of the study was also one-sided and based on the fact that the respected statistical consultant did not know

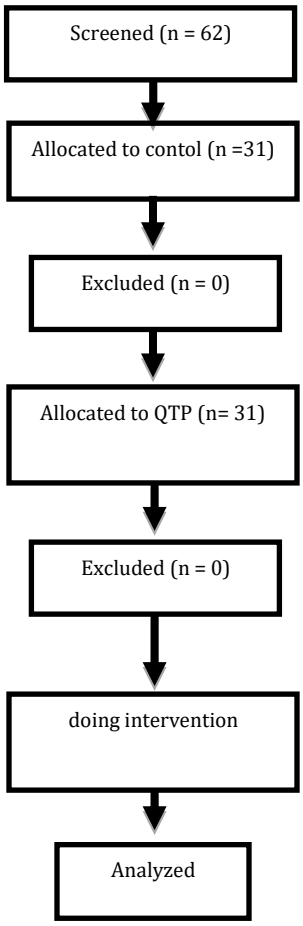

Figure 1. CONSORT diagram of the participants flow through each stage of the present research

about the samples of the Control and Intervention groups.

The inclusion criteria for this study include: 34-36 weeks of gestational-age, fixity of the physiological parameters of the neonate, no use of sedatives for the neonate, Apgar score between eight to ten, obtaining the written consent form of the neonate's parents, absence of congenital anomalies, low weight of the neonate (birth weight 1500 to 2499 grams), and breastfeeding of the neonate.

And exclusion criteria include: 1- neonate's seizures 2- neonates discharge 3- changes in the clinical condition of the neonates, such as: intubation, and hemodynamic disorder during the study (heart rate more than 180 or less than 100 times per minute, breathing more than 60 or less than 30 times per minute, and decrease in arterial blood oxygen saturation percentage less than 85).

The sample was determined by convenient sampling. The sample size was determined by this formula: $n = \frac{\left(Z_{1-\frac{\alpha}{2}}+Z_{1-\beta}\right)^2 (P_1(1-P_1)+(P_2(1-P_2)}{(P_1-P_2)^2}$

By placing the following values and using Ameri et al.'s study (28), the number of 31 neonates in each group (62 people in total) is required.

$$\beta = \frac{2}{10} \rightarrow Z_{1-\beta} = 0/85 \; \alpha = \frac{5}{100} \rightarrow Z_{1-\frac{\alpha}{2}} = 1/96$$

$$n = 31 \rightarrow 2n = 62 \; P_2 = 0/76 \; P_1 = 0/43$$

Quiet Time Protocole Intervention and data collection

The data collection tool included a researcher-made demographic information form (including: gestational age, gender, Apgar minutes 1 and 5, number of hospitalization days, weight, respiratory rate, heart rate, arterial blood oxygen saturation percentage of the neonate, average sound and light of the ward before, during and after the implementation of the intervention). The validity of this tool was investigated applying the content validity method. The reliability of the tool was evaluated by two people simultaneously with the equivalent reliability method. In this way, the arterial blood oxygen saturation percentage, breathing rate and heart rate of 10 babies were collected by two observers (researcher and trained nurse) separately from the monitor, and its reliability was obtained through the correlation coefficient test equal to 100%. To evaluate the reliability of the monitor, the reliability equivalent was used so that each time before the intervention, their accuracy was compared with another device. The Als sleep-awake behavior instrument was the second instrument used, and it defines 6 general states of sleep and wakefulness for preterm infants, which are: deep-sleep, light-sleep, sleepiness, slow-wakefulness, active-wakefulness, and crying. Two types of Deep-Sleep (A and B) Were examined in this study .

Each of these situations is defined based on its own behavioral and physiological characteristics such as (breathing regularity, presence or absence of rapid eye movement, eyes open or closed, pink manifestations, body movements, skin color, mouth movements, etc.) will be infants show each of these situations in two ways (a) and (b). In this tool, type A refers to scattered and unorganized sleep patterns of the infants and indicates that the infant has tension and stress, and level B is the level where the infant has an organized, strong and adjusted sleep(29, 30). In this tool, a table is designed that has 2 horizontal rows and 30 vertical columns. In the horizontal rows, there are 2 types of deep sleep, type A and type B, and the vertical columns show the duration of the study, which is included in the table with 2-minute intervals. The observer observes the infant's behavior every 2 minutes through the video taken of the infant and recognizes the type of situation and marks it. Als Heidelis suggests that it is better to use this tool before Before an intervention is done for the infant, the infant's behaviors are viewed and recorded for a maximum of 20 minutes, then the behaviors are viewed and recorded during the intervention, and after the intervention, the infant's behaviors are viewed and recorded again for at least 20 minute (28, 31). The mentioned tool is used for the observational evaluation of the infant's sleep behavior and does not have a scoring system. The validity of the mentioned tool was checked by the content method according to the study of Mrs. Rajaee in 2013 under the title of investigating sleep-wake of premature infants and its relationship with demographic characteristics with the cooperation of ten Faculty Members Of tehran university of medical sciences and the validity of the translation was checked by a specialist in neonates. In order to determine the scientific reliability of the tool, the researcher first received the necessary training to use this tool from the person who made the tool (Hedlis Als) through the Internet (28). The reliability of the mentioned tool was also checked according

to Rajaei's study (28) In order to determine the scientific reliability of the tool, the researcher first received the necessary training to use this tool from the person who made the tool (Hedlis Als) through the Internet. Then the researcher along with another person who had received the necessary training by the researcher, in the majority of a pilot study, used this tool to investigate the sleeping and waking behaviors of premature infants hospitalized in the neonatal care department. For the reliability of this plan, the pilot samples of this intervention were conducted by two trained nurses and with simultaneous observation to determine whether the result of the intervention is the same as the evaluation of two people. The results of Pearson's statistical test showed that the correlation coefficient between two observers was significant and equal to 78% (p=0.008).

At first, in order to familiarize the researcher with the project implementation process, a pilot study was conducted with 10 samples, but the information of these samples was not included in the main study. the researcher started collecting the data from the control group samples to reach the required number of the participants; afterwards, she collected the data of the samples of the intervention group.

In order to evaluate the deep sleep (type A and B) status of infants according to the Als tool, each studied infant was examined for a 60-minute shift during the evening shift from 15-17 hours when the ward was somewhat quiet. For the intervention group, before the start of the intervention, the personnel and the baby's companion were informed, drug therapy, diaper change, baby's necessary supplies and positioning of the baby in fetal position were done. Feeding of all studied infants was done at the same time interval until the implementation of the intervention. The camera was set to record the events. At the same time, the sound and light were measured by the mentioned software and its value was recorded every 20 minutes. Then the researcher washed his hands and connected the pulse oximetry to the baby's hand to evaluate the physiological indicators. In the pre-intervention phase, in the test group, the newborn was examined for 20 minutes (from 15:20-15:00) without the intervention of the quiet time protocol. During these 20 minutes, the researcher directly observed the baby every two minutes and recognized the type of sleep and wakefulness the baby was in and marked it in the table related to the tool. Then, in order to implement the intervention of the quiet time protocol, the baby was moved to a separate room and the researcher intervened (installing a sheet with the title 'Please close the door quietly' on the entrance door of the ward, reducing the lighting of the ward, reducing manipulation of the baby, reducing movements, reducing conversations , setting mobile phones to silent mode, setting the alarms of devices connected to the patient to a minimum level and turning off the ward computer if not needed (due to the noise caused by its fan), quick response to warnings, prohibition of moving the chair and drawing it at the nursing station, using the incubator cover) for 20 minutes (from 15:50-15:30) (32, 33). During this period of time, the researcher observed the infant's behavior every 2 minutes, as in the previous stage, and recorded the baby's conditions in the tool table. In the last stage, the baby was observed by the researcher in the incubator out of separate room (at the first location of infants) for 20 minutes (from 16:20-16:20) and his conditions were recorded every two minutes as in the previous stages. All the procedures performed for the intervention group were performed for the infants of the control group, with the difference that the intervention of the quiet time protocol was not performed for these infants. Then, the number of situations marked in the special table of the tool were added together, and the frequency of each situation was calculated during the three stages before, during, and after the intervention, and finally, they were compared in two groups. At the end, the researcher and the researcher's assistant interpreted and completed the questionnaire by watching the recorded video of the baby.

Statistical Analysis

Data were analyzed using descriptive and analytical statistics. In the descriptive statistics section, statistical indicators such as: number, percentage, mean and standard deviation were used. In the analytical statistics section, Chi-square test, repeated measures ANOVA, independent t-test and GEE were used. Bonferroni's post hoc test was also used for paired comparison of times. The significance level in this study was considered lower than 0.05. The SPSS software version 22 was used to analyze the data.

Ethical approval

This present study was approved by the ethics committee of zahedan university of medical sciences (code number of ethics: IR.ZAUMS. REC.1400.354).

Results

Table 1 reports the demographic characteristics of the participants and the results of the chi-square test and Independent sample t test. The results revealed that the two groups did not differ significantly in terms of demographic characteristics (P>0.05).

The results of chi-square test showed that the 2 groups before the intervention (P=1.00) and after the intervention (P=0.05) had not a statistically significant difference in terms of the frequency of deep sleep type, but during the intervention there was a statistically significant difference (P<0.001). The results of the comparison of the frequency distribution of deep sleep type B showed that before the intervention, deep sleep type B was not observed in the two groups. However, in the intervention group, 58.1% had deep sleep during the intervention and 6.5% after the intervention. The control group did not have deep sleep B type in these three time periods. In other words, the quiet time protocol intervention in the intervention group increased the frequency of deep sleep type A and B.

Table 1. Characteristics of the study population

Demographic variables		Groups		Statistical test
		Intervention (N=31) n(%)	Control (N=31) n(%)	
Gender	Male	18(58.1)	17(54.8)	0.79*
	Female	13(41.9)	14(45.2)	
Diagnosis	Prematurity	10(32.2)	5(16.1)	0.21*
	RDS	11(35.5)	15(48.4)	
	Sepsis	10(32.3)	11(35.5)	
Gestinational Age (week); mean(SD)		34.70(0.78)	34.83(0.86)	0.53**
Weight(Gram); mean(SD)		2043.22(320.44)	2081.77(298.76)	0.62**
Number of days of hospitalization; mean(SD)		2.51(2.07)	3.77(3.02)	0.14**
Apgar score one minute; mean(SD)		8.77(0.42)	8.22(0.42)	0.23**

* Chi-square test; ** Independent sample t test

The results of the independent t test showed that there was no significant difference between the two intervention and control groups in terms of type A (P=1.00) and type B (P=0.97) deep sleep status in the pre-intervention phase. Also, there was a significant difference between the two intervention groups in terms of deep sleep type A (P=0.03) and type B (P<0.001) during the intervention phase. So that the state of deep sleep in the intervention group was higher than the control group during the intervention. However, there was no significant difference between the two intervention and control groups in terms of type A (P=0.72) and type B (P=0.84) deep sleep status in the post-intervention phase (Table2).

Further, in order to investigate the change of deep sleep state over time, analysis of variance with repeated measurements was used. At first, the assumption of sphericity was evaluated based on Mochli's test. The results of Mochli's test showed that the assumption of sphericity of deep sleep type A and B is valid (P>0.05). The results of the Shapiro-Wilk test for the distribution of the research variables in the three stages of pre-test, post-test and follow-up showed that the research variables had a normal distribution (P>0.05).

The results of Table 3 show that the effect of the measurement time on the deep sleep status of A and B premature babies hospitalized in the intensive care unit is not significant (P>.05). The

Table 2. Comparison of two intervention and control groups in the before, during and after the intervention

Variable		Groups		Independent sample t test
		Intervention M±SD	Control M±SD	
deep sleep type A	Before Intervention	6.01 ± 1.93	6.01 ± 1.93	1.00
	During Intervention	6.99 ± 1.60	6.04 ± 1.94	0.03
	After Intervention	6.36 ± 3.48	6.11 ± 1.85	0.72
deep sleep type B	Before Intervention	4.19 ± 1.16	4.20 ± 1.85	0.97
	During Intervention	8.58 ± 2.20	4.22 ± 1.90	<.001
	After Intervention	4.12 ± 1.03	4.18 ± 1.39	0.84

Data were shown as mean ± standard deviation

Table 3. The results of analysis of variance with repeated measurements

Variable	Source	Mean square	F-Value	P-value	Partial eta squared
deep sleep type A	Time	18.58	1.16	.28	.03
	Time × group	18.58	1.16	.28	.04
	Group	219.37	2.89	.09	.11
deep sleep type B	Time	2.06	1.93	.16	.07
	Time × group	2.06	1.93	.16	.05
	Group	119.36	28.31	<.001	.25

effect of the group on the state of deep sleep A and B of premature babies hospitalized in the special care department is not significant (P>.05). Also, the interaction effect between time and group on the state of deep sleep B is significant (P<0.001). Therefore, it can be said that the difference in the average deep sleep state B in premature babies hospitalized in the intensive care unit at different times is different according to the group levels. However, the interaction effect between time and group on the state of deep sleep A is not significant (P>0.05).

In the following, pairwise comparisons of deep sleep status A and B of premature infants hospitalized in the intensive care unit at different times between the two control and intervention groups were investigated.

The results of Table 4 showed that, in the intervention group, there was a significant difference between the state of deep sleep A during and before the intervention (P=0.03), so that the scores were decreasing. However, no significant difference was observed between other stages (P>0.05). Also, in the intervention group, the results showed that there was a significant difference between the state of deep sleep B in the stage before and after the intervention (P<0.001), so that the scores during the intervention were lower than before and after the intervention. However, no significant difference was observed between other stages (P>0.05).

Table 4. Pairwise comparisons of deep sleep status A and B of premature infants admitted to the intensive care unit at different times between the two control and intervention groups

Variables	time	Intervention		Control	
		Mean different	P	Mean different	P
deep sleep type A	Before - During	-.98	.03	-.03	.92
	Before - After	-.35	.45	-.10	.73
	During - After	.63	.21	-.07	.81
deep sleep type B	Before - During	-4.39	<.001	-.02	.89
	Before - After	.07	.66	.02	.90
	During - After	4.46	<.001	.04	.77

Discussion

With the higher prevalence Of premature births in recent years, premature infant's hospitalization and the related complications have also increased. diverse researches have been done on investigating the effect of different interventions on the sleep of premature neonates. Therefore, in this study, we looked for a minimally invasive method with fewer side effects to improve these conditions. Based on the results of this research, the average duration of deep-sleep(type A and B) increased during the implementation of the intervention. The reason for the difference in the average duration of deep-sleep (type A and B) of premature babies after the implementation of the intervention can be related to the lack of sustainability of the intervention effect and the environmental conditions after the implementation of the intervention, which is consistent with a result of Ameri et al.'s study. This research was carried out in 2018 with the aim of investigating the effect of the fetal position on the sleep and wakefulness of preterm infants in nicu. The findings of This research showed that the highest percente and amount of sleep-time in the fetal position is related to deep-sleep (34). In addition, the findings obtained from this research are consistent with the results of the study by Bastani et al. This study was conducted with the aim of investigating the effect of kangaroo care on the sleep and wakefulness of premature babies in 2018. The findings of this research showed that kangaroo care increased the duration of deep sleep in premature infants (31). Considering that deep sleep has increased as in the present study, the results of the two studies are consistent. Abdehyazdan et al (2016) conducted a perusal with the goal of investigating the effect of nesting

and swaddling on the sleep duration of premature infants admitted to the neonatal intensive care unit. The findings of this research showed that both Swaddle and Nesting can significantly increase the duration of total sleep and the duration of quiet sleep (35).

The results of this study showed that the average duration of quiet sleep during the nesting and swaddling periods was significantly higher than the control period in both groups. The present study also showed that the average and frequency of deep sleep, which is equivalent to quiet sleep in Perchtel instrument, increased significantly during and after the intervention compared to before the intervention, and the two studies are consistent with each other in this regard. One of the reasons for the success of the quiet time protocol was placing babies in a separate room during the implementation of the intervention and teaching the staff and mothers about the care plan, which led to the reduction of environmental stimuli during the implementation of the intervention. Orsi et al. (2018) conducted a study with the aim of determininig the impact of quiet time on reducing sound levels and increasing total sleep time. The results of the study showed that total sleep time was highest during quiet time. Premature infants remained awake for longer following quiet times . There was also a reduction in sound level during quiet times compared with the other time frames. No statistically significant relationship was found between total sleep time and sound levels more than 24 hours (36).This research is consistent with the current study considering that it examined the duration of sleep and implementation of quiet time, but due to the use of polysomnograph to evaluate sleep status, the difference in the gestational age of the infants in the two studies, and the implementation of the quiet time protocol only by limiting the sound is not consistent with the present study. The lack of effect of the intervention on the sleep of premature infants can be due to the lack of light and manipulation control during the infant's sleep and the younger age of the infants compared to the present study.

Orsi et al. (2017) conducted a research with the aim of describing the total sleep time, stages of sleep and wakefulness of premature infants and their relationship with sound pressure levels, light, temperature, relative humidity and movement inside the incubator. The results showed that a significant relationship was found only between light levels and wakefulness, and environmental conditions and care provided to hospitalized premature infants had no effect on sleep, except for high light that increases rouse (37).

Considering that this research has examined the effect of light, sound and manipulation on the sleep duration and stages of premature babies, it is consistent with the present study, but in terms of humidity check and the findings that show that only a lot of light affects sleep and wakefulness, It is not consistent with this study, which may be due to the difference in the gestational age and weight of the infants in these two studies.

Limitations of the study

The limitations of this research can be mentioned as follows:

Lack of control of some environmental stimuli including the voices of nurses, loud noises caused by dragging objects on the floor during cleaning, transferring the infant despite the necessary training, crying of infants, the difficulty of transferring the infant to a separate room, and the lack of an EEG device to check the infant's sleep-awakening status.

Conclusion

The changes in the sleep status in both the control and intervention groups after the implementation of the quiet time intervention were not the same, and the changes in the intervention group were more than the control group. Considering that nurses are one of the most important and effective members of the health team, and training is one of the main duties of nurses at all levels of care, and the use of non-pharmacological methods is a priority, and QTP intervention has been able to have a positive effect on the sleep status of premature infants, this intervention can be used as a standard, accessible, effective and low-cost method that does not interfere with medical care.

Therefore, considering the effectiveness of QTP intervention in order to reduce stimuli and improve sleep status, it is recommended to implement these measures for premature infants in NICU.

Acknowledgments

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Conflicts of interest

There is no conflict of interest between the authors.

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