*The Effect of a Light-Dark Cycle on Premature Infants in the Neonatal Intensive Care Unit: A Randomized Controlled Study

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ABSTRACT

Purpose: To investigate potential differences in discharge time, feeding methods and amounts, daily weight gain, vital signs, pain, and comfort levels among preterm infants born at 28–32 weeks' gestation who were hospitalized in the neonatal intensive care unit during long-term follow-up while implementing a light-dark cycle.

Design and methods: This is a randomized controlled study conducted with the support of a day-night cycle in premature infants born at 28–32 weeks' gestation and admitted to the neonatal intensive care unit of a teaching and research hospital affiliated with the Ministry of Health. The study compared the follow-up results from hospitalization to discharge over a period of 8 weeks.

Results: 50% of premature infants admitted to the unit are multiple pregnancies. There was no significant difference in discharge weight, comfort level, pain level, vital signs of the infants included in the study ($p > 0.05$).The optimal development of infant feeding patterns was examined and it was observed that the study group had significantly improved before the control group in terms of the time to switch to full enteral feeding and oral feeding ($p < 0,05$).The daily weight gain of the babies was examined, it was seen that the weight gain was higher in the study group compared to the control group ($p < 0,05$). The mean duration of hospitalization was compared, it was seen that the babies in the study group were discharged significantly earlier ($p < 0,05$).

Conclusion: The study compared the long-term outcomes of premature babies hospitalized in neonatal intensive care and babies exposed to a light-dark cycle and regularly monitored in standard care. The results showed that the babies in the study group had higher daily weight gain and were discharged earlier than the control group. There were also no statistically significant differences in comfort and pain scores, vital signs or oxygen saturation between the study and control groups.

Practice implications: A light-dark cycle was found to be a feasible and promising intervention for infants at 28–32 weeks' gestation. It was a nurse-led management of care that could be integrated into the usual care of 28–32-week-old babies in neonatal units.

Introduction

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The Neonatal Intensive Care Unit (NICU) is different from the intrauterine environment for infants. At birth, babies enter an environment that is noisier, drier, colder, with bright and irregular light, and where they have difficulty moving due to the force of gravity (Sánchez-Sánchez et al., 2022).

The fact that the body systems of premature babies are not fully developed and that they are moving into an external environment that is not suitable for their development causes the babies to experience intense stress (Marzouk et al., 2019; Wong et al., 2022). It is thought that this stress and negative sensory experiences such as bright lights, noise and frequent interventions in the NICU negatively affect the development of cell migration, synaptogenesis, myelinization and organizational structures in the nervous system of premature infants and disrupt brain organization (Burke, 2018; Vandenberg, 2007). Therefore, in the NICU, direct light should be avoided for preterm infants, incubator covers should be used, light levels should be changed at certain times of the day to create a day-night cycle, and rapid eye movement (REM) sleep should be promoted in infants. In addition, the light levels used in the intensive care unit should be measured and it should be ensured that they are 300-580 lux during the day and 30 lux at night (Eras et al., 2013). Studies in the literature with a high level of evidence have shown that providing a light-dark cycle in the units contributes to growth and development of the newborn, hormonal regulation, regulation of the activity-rest cycle and improvement of vital signs (Sánchez-Sánchez et al, 2022; Van Gilst et al, 2023; Morag and Ohlsson, 2011).

Environmental regulation of neonatal intensive care units

Although the treatments offered in the NICU increase survival rates, the aim should be to reduce morbidity and developmental delay. In particular, the Newborn Individualized Developmental Care and Assessment Program (NIDCAP) has been developed and introduced to protect the neurodevelopmental development of premature babies (Chandebois et al., 2021). The program is primarily based on the 'Synactive Theory' developed by Heidelise Als. The theory provides a framework for understanding premature and sick babies, arguing that their responses and behaviours are specific to the individual baby. It emphasizes the importance of creating a stable environment to reduce stress and promote positive neurodevelopmental outcomes (Griffiths et al., 2019).

Individualized developmental care practices in NICUs include creating a healing environment (Altimier, 2015), protecting sleep, and ensuring sleep-wake cycles, applying developmentally supportive activities (non-nutritive sucking, kangaroo care, positioning, swaddling), concurrent intervention planning, and family centered care support (Allen, 2012; Williams et al., 2018). Studies have shown that premature babies who receive NIDCAP have shorter hospital stays, less chronic lung disease, less need for mechanical ventilation and more daily weight gain. (Aita et al., 2021; Moody et al., 2017; Sánchez-Sánchez et al, 2022).

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Circadian rhythm and preterm infants

The circadian system, a fundamental biological clock, plays a crucial role in regulating various physiological and behavioural processes in humans. While the development of the circadian system begins in utero, preterm infants often experience disruptions to this system due to their premature birth (Wong et al., 2022). The circadian system begins to develop early in gestation, with the suprachiasmatic nucleus (SCN) forming around 10-12 weeks of gestation. However, the maturation of the SCN and synchronization of circadian rhythms with external cues, such as light-dark cycles, continue throughout fetal development. Preterm birth disrupts this process, as infants are exposed to artificial light and environmental cues different from the intrauterine environment (Arimitsu et al., 2023).

Several factors influence the maturation of the circadian system in preterm infants, including gestational age, postnatal age, exposure to light, and the neonatal intensive care unit (NICU) environment (Lan et al., 2019; Wong et al.,2022). Infants born at earlier gestational ages may exhibit delayed development of circadian rhythms, while those born closer to term may have more established rhythms (Van Gilst et al., 2023). Additionally, the NICU environment, with its constant light and noise, can disrupt the entrainment of circadian rhythms in preterm infants. This includes implementing strategies to regulate light exposure, promote sleep-wake cycles, and minimize disruptions to infant care routines (Aita et al., 2021; Lan et al., 2019).

Therefore, the neonatal nurse is responsible for creating and maintaining an environment that manages the healing process. A professional nurse should focus on the psychological and physical environment for the patient, assess and plan for improved nutrition and comfort. Nursing interventions for patients should be aimed at environmental arrangements that benefit the patient, not the technology (Altimier, 2015; Cardin ve ark., 2015). With the increasing number of premature births and the knowledge that health problems in the neonatal period affect the whole life, the importance given to of the role and functions of neonatal nursing has also increased (Erdem et al., 2018). Based on the findings of the literature review, it was deemed necessary to conduct a study on this topic (Valizadeh et al., 2017; Sánchez-Sánchez et al., 2022; Marzouk et al., 2019; Van Gilst et al., 2023). It is believed that the day/night cycle is established in premature infants, and in this direction, supporting the circadian rhythm will support the growth and development of infants as

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well as their neurodevelopment. Additionally, it is thought that regulating the light-dark cycle may have a positive impact on the comfort, pain reduction, and stable monitoring of vital signs in infants.

The aim of this study was to determine whether there was a difference in discharge time, type and amount of feeding, daily weight gain, vital signs, pain and comfort in premature infants born at 28-32 weeks' gestation who were hospitalized in the Neonatal Intensive Care Unit in long-term follow-up by creating a light-dark cycle.

Methods

Design

This is a randomized controlled experimental trial to assess the differences between premature infants admitted to the neonatal intensive care unit on a light-dark cycle and those on routine care. The study was a randomized controlled parallel-group trial and in accordance with CONSORT 2022 Extension checklist criteria.

Participant

The population for this study included premature infants born at 28-32 weeks of gestation who were hospitalized in the Neonatal Intensive Care Unit (NICU) at Dr. Behçet Uz Children's Hospital. The NICU at this hospital is a Level 4 unit with a capacity of thirty beds. There are 15 nurses working in the clinic, including the head nurse in during the day, and 11 nurses on a shift. The total number of nurses working day and night is 52. The NIDCAP and family-centered care models are used by the nurses in the clinic. *Inclusion criteria*: The sample of the study consisted of 28-32 week preterm infants who were admitted to the hospital within the first 12 hours, who showed development appropriate for the week of birth and whose SNAPPE-II score was 0 points, who were excluded from the exclusion criteria, who were included in the study from the 4th to the 7th day of life (after the first 3 days), who were between the 10th and 90th percentile appropriate for gestational age. *Excluded criteria:* Not being between 28-32 weeks, having a congenital genetic-metabolic disease disease, undergoing surgery, the newborn's family is not willing to participate in the study, having a necrotizing enterocolitis, severe congenital malformations, neurodevelopmental problems, lung- development problems, inability to feed.

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Two infants included in the study were excluded from the study in the second week because they were diagnosed with genetic-metabolic disorders during follow-up.

Patient and public involvement statement

Patients or the public were not involved in the design, or conduct, or reporting, or dissemination plans of this trial.

Sample size calculation

The sample of the study; $\alpha = 0.05$, 80% power interval and an effect size of 0.7, 18 study group, 18 control group, a total of 36 patients were aimed to be reached. However, due to limitations and time constraints, a total of 30 patients were included with 15 patients each in the study and control groups. The study was conducted in the NICU of Dr. Behçet Uz Pediatrics and Surgery Training and Research Hospital. The study was conducted between July 2019 and December 2019 with infants enrolled in the study group and followed up in the control group.

Randomization and allocation concealment

Participants were randomized to the intervention group or control group in a ratio of 1:1 by block random grouping method using software-generated random numbers. The randomisation of the babies included in the study was carried out according to whether the last digits of the protocol numbers were odd or even

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Intervention

Study Group

Control group

To create a light-dark cycle, infants whose eyes were covered with an eye patch (phototherapy patch) between 8pm and 9pm to create darkness until 8am constituted the study group; infants monitored in a routine NICU environment constituted the control group. For ethical reasons, the incubator covers of the babies in the control group continued to be used information about the hospitalization of the infants was collected using the "Data Collection "Form for Descriptive Characteristics of Premature Infants" and information about the mothers was collected using the "Data Collection Form for Mothers".

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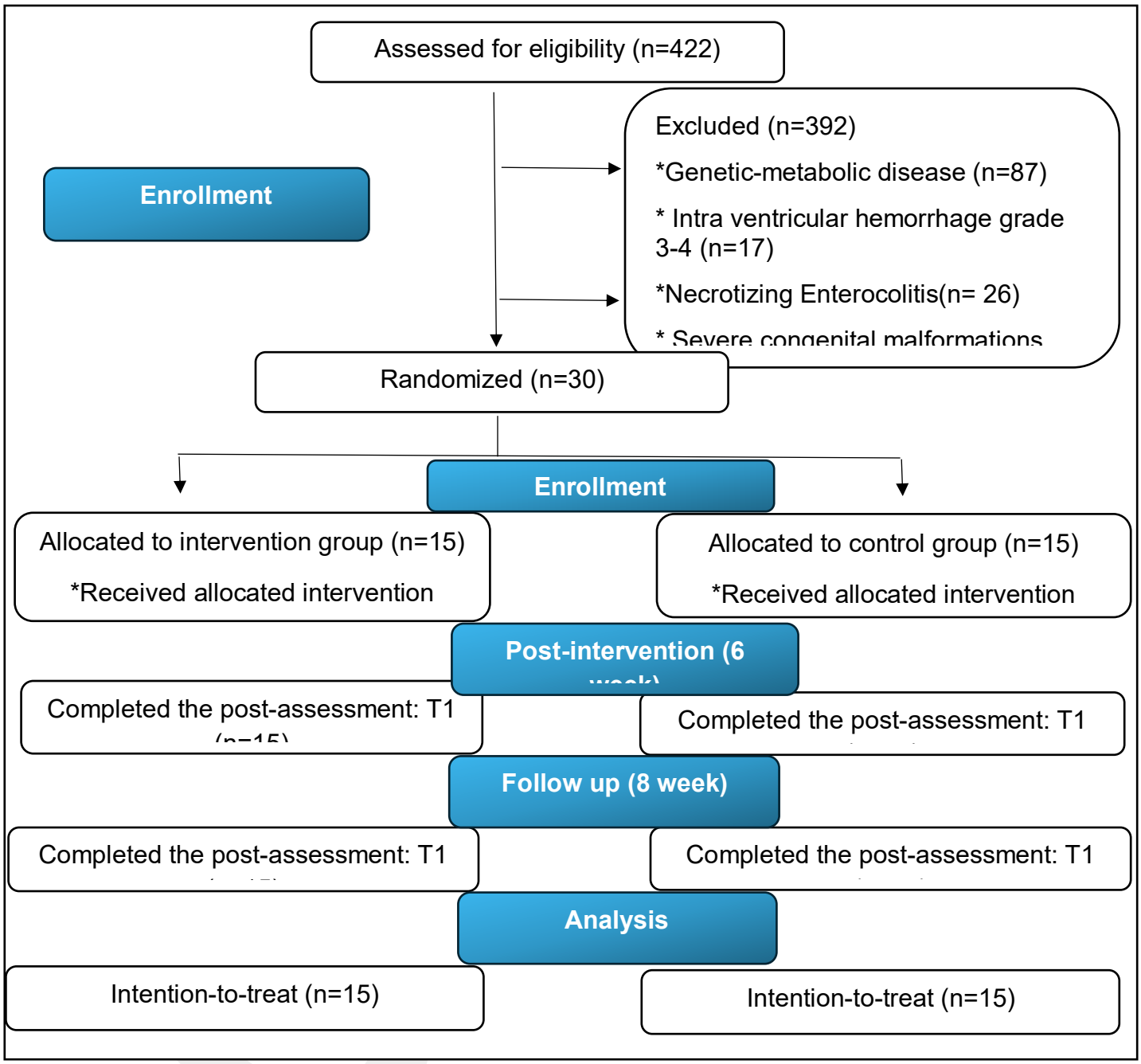

Fig. 1. CONSORT Flowchart of the study.

Outcomes and measurements

Primary outcomes

Evaluation Form for Physiological Measurement Results of Premature Infants: This is a form that records vital signs, oxygen saturation, weight, feeding type and amount, pain score and comfort

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score as a result of daily monitoring of the babies (Aita et al., 2021; Lan et al., 2019; Marzouk et al.,2019; Sánchez-Sánchez et al.,2022; Valizadeh et al., 2017; Van Gilst et al., 2023; Wong et al., 2022).

Behavior Scale for Neonatal Comfort: To measure the comfort level of babies, a Likert-type scale was utilized, comprising six parameters: alertness, calmness/agitation, respiratory response and crying, body movements, facial tension, and muscle tone. On the scale, a score of 6 signifies the state in which the infant is most comfortable, while a score of 30 represents the state in which the infant is most uncomfortable (cronbach alpha (α) = 0,85) (Kahraman et al., 2014).

Neonatal Infant Pain Scale (NIPS): The baby's face, crying, breathing pattern, extremities (arms and legs) and sleep/wake state are monitored in six categories. The lowest score is zero, the highest is 7, and intervention is planned at 3-4 points (Lawrence et al., 1993; Özçevik and Ocakcı, 2019)

Secondary outcome

Neonatal Acute Physiology Perinatal Extension II (SNAPPE II): Disease severity during hospitalization is a significant factor that impacts patient outcomes. Severity scores are specifically designed to predict the clinical condition of patients. Measuring the severity of illness is essential to facilitate a fair comparison of outcomes among different neonatal intensive care units (NICUs). The scoring system developed in 2001 is well-suited for application in the NICU and can be utilized for infants of all gestational ages. The higher the score of SNAPPE- II, the higher is the mortality risk of neonates. The power of SNAPPE II score to predict the neonatal mortality is evaluated by means of Receiver Operating Characteristics (ROC) curve. Optimal cut-off score to predict mortality is determined by visual inspection of the curve at a level that combined maximum sensitivity and optimal specificity (Muktan et al., 2019; Özcan et al, 2017; Yılmaz et al., 2011).

Data collection procedure. The vital signs, pain scores, comfort scores, nutritional status and weight of the babies monitored throughout the day were recorded using the Physiological Measurement Results Evaluation Form of Premature Babies, based on the daily observations of the nurses and doctors. The eyes of the babies in the study group were started to be closed at 4-7 days and continued until discharge. The Neonatal Infant Pain Scale (NIPS), which is routinely used in the clinic, was used to measure pain levels. The Neonatal Comfort Behavior Scale, which is suitable for neonates and for which permission was obtained from the relevant author, was used to measure comfort, and the comfort score was assessed once at 3 pm after closing the eyes at night. Light values measured in the Neonatal Intensive Care Unit: varied between 50-600 lux. The light intensity measured inside the incubator varied between 15 and 50 lux. An application downloaded to a mobile phone was used to measure the light intensity.

Data analysis. All data were collected and analyzed using the SPSS (Statistical Package for Social Sciences) program for Windows 22. The analysis process began with testing the assumptions

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necessary to determine which statistical tests (parametric or non-parametric) to employ. To assess the normality of the data distribution, Kolmogorov-Smirnov, kurtosis, skewness values, and histogram plots were employed. If the kurtosis and skewness values fell within the range of ±2.0 (George and Mallery, 2010), the data were considered to be normally distributed. The independent samples t-test was used for comparing two independent groups, while the paired samples t-test was employed to compare two dependent groups. The significance level of 0.05 was the threshold used to determine the statistical significance of the results.

Ethics approval. The research received approval from the Clinical Research Ethics Committee of the Turkish Ministry of Health, University of Health Sciences, Izmir Dr. Behçet Uz Children's Diseases and Surgery Training and Research Hospital, the institution where the study was conducted. The study was carried out within the neonatal intensive care unit of the same hospital.

Relevant permissions for the use of the Neonatal Comfort Behavior Scale were obtained from the respective researcher. Furthermore, the NIPS Pain Scale and SNAPPE-II Score forms used in the study are standard tools utilized in the Neonatal Intensive Care Unit at Dr. Behçet Uz Children's Hospital and have been officially approved by the hospital's quality department. The study was explained to the parents of the infants participating in both the study and control groups, and written informed consent was obtained from them.

Results

Participant characteristics

The characteristics of participants for both groups are reported in Table 1.

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Table 1
Descriptive characteristics of babies

Variable	Total		
	Control Group (n=15)	Intervention Group	
	$\bar{X}$ ± Ss	$\bar{X}$ ± Ss	
Week of Gestation at Birth (wk.)	31,4 ± 0,83	30,6 ± 1,3	
Height at Birth (cm.)	41,4 ± 2,64	39,50 ± 2,27	
Birth Weight (gr.)	1583,33 ± 230,46	1461 ± 224,14	
Head circumference at birth (cm.)	29,4 ± 1,137	6,4 ± 0,63	
Apgar Score 1. min	6,53 ± 0,92	73 ± 0,7	
Apgar Score 5. min	8,00 ± 0,767	73 ± 0,7	
SNAPPE-II Score	0	0	

Note. $\bar{X}$, statistical average; SD, standard deviation.

Table 1 shows that the babies in the study group were born at an average of 31.4 weeks of gestation, while those in the control group were born at an average of 30.6 weeks of gestation. The mean head circumference at birth was 29.4 (min= 28 - max= 31) cm, height was 41.40 (min= 38 - max= 46) cm and birth weight was 1583.33 (min= 1200 - max= 2100) gr. In the control group, the mean head circumference was 28.74 (min= 27-max= 30) cm, height was 39.5 (min= 36- max= 44) cm and birth weight was 1461 (min= 1165- max= 1800) grams. The mean Apgar scores of the study group at 1 and 5 minutes were 6.53 and 8.00. The mean Apgar scores of the control group at 1 and 5 minutes were 6.40 and 7.73. The SNAPPE-II scores of the study and control groups at the hospital admission examinations were found to be 0. The number of baby girls in the study group was 10, while the number of baby girls in the control group was 9. The number of baby boys in the study group was 5, and the number of baby boys in the control group was 6. Of the 30 infants included in the study and control groups, 57.8% were baby girls and 42.2% were baby boys.

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Primary outcomes

Weight and time of discharge of infants: Table 2 shows the comparison of daily weight gain, discharge weight and discharge time of the infants between the groups.

Table 2
Comparison of infant weight gain, discharge weight and discharge time

Variables	Total			
	Control Group (n=15)	Intervention Group (n=15)	t	p
	$\bar{X}$ ± Ss	$\bar{X}$ ± Ss		
Daily weight differences from birth to discharge	3,5 ± 0,92	7,34 ± 1,89	2,273	0,03
Discharged weight	2143 ± 199,8	2116 ± 221,4	-0,41	0,69
Duration of hospitalization	37,86 ± 7,91	25,46 ± 7,06	4,52	0,01

Note. $\bar{X}$, statistical average; SD, standard deviation; t. Independent and paired samples t-test. $p < 0.05$

Independent samples t-test was used to compare two independent groups and paired samples t-test was used to compare two dependent groups. There was no statistically significant difference in discharge weight between the study and control groups ($p>0.05$). It was observed that the differences in average daily weight gain from birth to discharge showed a statistically significant difference between the study and control groups ($p<0.05$). When comparing the averages, it was observed that the daily weight gain of the study group was higher than that of the control group. The length of hospital stay showed a statistically significant difference between the study and control groups ($p<0.05$). Comparing the means, it was observed that the babies in the study group were discharged earlier.

Premature nutrition. When Table 3 is examined, it was observed whether there was a difference between the groups in the time of starting feeding, the time of switching to full enteral feeding and the time of switching to oral feeding.

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Table 3
Comparison of infants' feeding initiation times, transition times to full enteral feeding and transition times to oral feeding

Variables	Total			
	Control Group (n=15)	Intervention Group (n=15)	t	p
	$\bar{X}$ ± **Ss**	$\bar{X}$ ± **Ss**		
Beginning Nutrition	2,8 ± 1,320	2,333 ± 0,617	-1,240	0,229
Total Enteral Nutrition	13,8 ± 7,627	8,466 ± 3,356	-2,479	0,023
Starting Oral Nutrition	37,86 ± 7,91	28,93 ± 11,00	4,257	0,001

Note. $\bar{X}$, statistical average; SD, standard deviation; t. Independent and paired samples t-test. $p < 0,05$

There was no statistically significant difference in the onset of feeding between the study and control groups ($p>0.05$). When comparing transition times to total enteral nutrition, a statistically significant difference was observed between the study and control groups. ($p<0.05$) The time of transition to total enteral nutrition was earlier in the study group ($\bar{X}$:8.46) than in the control group ($\bar{X}$:13.8). When comparing the time of initiation of oral feeding, a statistically significant difference was observed between the study and control groups ($p<0.05$). Comparing the means, the day of transition to oral feeding was lower in the study group ($\bar{X}$: 5.2) than in the control group ($\bar{X}$: 28.93).

Secondary outcome

Physiological characteristics of prematurity.

Table 4 shows the difference between the vital signs, oxygen saturation, pain and comfort levels recorded during the long-term follow-up of the infants in the study and control groups. No statistically significant difference was found between the study and control groups at long-term follow-up for comfort and pain level, systolic and diastolic blood pressure, fever, peak heart rate measured per minute, respiratory rate measured per minute, oxygen saturation ($p>0.05$). Independent samples t-test was used to compare two independent groups and paired samples t-test was used to compare two dependent groups.

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Table 4.

Comparison of infants' pain, comfort and physiological monitoring data between group

Variable	Total			
	Control Group (n=15)	Intervention Group (n=15)	t	p
	$\bar{X}$ ± Ss	$\bar{X}$ ± Ss		
Comfort level	8,2 ± 0,255	8,12 ± 0,314	-0,79	0,44
Pain level	0,697 ± 0,186	0,644 ± 0,156	-1,53	0,15
Systolic blood pressure	73,60 ± 2,981	73,04 ± 4,703	-0,35	0,73
Diastolic blood pressure	38,48 ± 3,379	40,82 ± 6,100	1,49	0,16
Fever	36,68 ± 0,042	36,70 ± 0,052	0,93	0,37
Peak heart rate	144,6 ± 4,548	144,9 ± 6,290	0,12	0,91
Respiration rate	51,68 ± 1,824	51,95 ± 1,497	0,46	0,65
Oxygen saturation	97,56 ± 0,343	97,88 ± 0,470	2,29	0,051

Note. $\bar{X}$, statistical average; SD, standard deviation; t. Independent and paired samples t-test. $p < 0,05$

Discussion

50% (15 patients) of the babies included in the study were followed up with a diagnosis of prematurity only. The remaining 40% (13 patients) were twins and triplets. Respiratory distress syndrome (RDS) was diagnosed in 44% of the premature babies in the study and control groups. Infection developed in 30% (9 premature infants) of the infants followed during hospitalisation. The proportion of mothers who received no antenatal steroids was 43%, while the proportion of

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mothers who received 2 doses of antenatal steroids was 33%. In a retrospective study by Özvarol et al. (2015), the rate of antenatal steroid administration was 43% and the rate of RDS diagnosis in hospitalised patients was 28.8% (Özvarol et al., 2015).

In the study, no statistically significant difference was found between the study and control groups in the long-term follow-up results for comfort and pain level, systolic and diastolic blood pressure, fever, peak heart rate measured per minute, respiratory rate measured per minute, oxygen saturation ($p > 0.05$).

In a randomized controlled study conducted in preterm infants (≤32 weeks), when the duration of restlessness and crying times during the day were compared in infants monitored under cyclic light and dim light, a significant decrease was observed in infants monitored under cyclic light. An increase in behavioral and motor activity was observed (Guyer ve ark., 2012). In a study conducted in Mexico, heart rate, oxygen saturation and melatonin levels in patients undergoing light-dark cycles and routine care (light environment) and found a difference in melatonin levels and oxygen saturation (Vásquez-Ruiz et al., 2014). Biological rhythm, particularly circadian rhythm, are recognized as a key mechanism for maintaining physiological function. However, little is known about the biological rhythm pattern in preterm infants hospitalized in the NICU. Nevertheless, a review of randomized controlled trials found in the existing literature suggests that implementing a light-dark cycle has a positive impact on factors like weight gain and cardiorespiratory function in preterm infants (Begum et al., 2006; Burke et al., 2018; Marzouk et al., 2019).

In this study, there was no statistically significant difference in discharge weight between the study and control groups. However, in the long-term follow-up of the study, it was observed that the differences in the mean daily weight gain from birth to discharge showed a statistically significant difference between the study and control groups, and when the averages were compared, it was found that the study group had a higher daily weight gain than the control group. Additionally, it was noted that infants in the study group were discharged earlier than those in the control group. This observation aligns with findings from randomized controlled trials reported in the literature. For instance, in studies conducted by Guyer et al. (2012), no significant differences were observed in the sleep behavior and daily weight gain rates between the infants in the study group and the control group (Guyer et al., 2012). In another randomized controlled study conducted by Sánchez-Sánchez et al. (2022), a light-dark cycle was implemented, and the results revealed that infants in the experimental group exhibited faster weight gain compared to infants in the control group. Additionally, their hospitalization period was shortened. This finding supports the potential benefits of maintaining a light-dark cycle in neonatal care (Sánchez-Sánchez et al., 2022). In a randomized controlled study conducted in Mexico monitored weight gain, discharge time, heart rate, oxygen saturation, nutrient intake and melatonin levels were monitored in patients who underwent a light-dark cycle and routine nursing care (light environment). It was found that

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infants on a light-dark cycle had faster weight gain and shorter hospital stays (Vásquez-Ruiz et al., 2014). In a study conducted in China, the control group was treated with a routine care model and the observation group was cared with using low noise and cyclic light. The duration of hospitalization was (41.79 ± 2.51) days in the study group and (45.32 ± 3.85) days in the control group. Body weight gain was (17.36 ± 2.94) g/day in the observation group and (13.48 ± 4.63) g/day in the control group (Chen et al., 2015).

In a study conducted by Kaneshi et al., (2016), with 21 infants in the study group and 21 infants in the control group, circadian rhythm was established at night in a dark environment for 3-4 hours at intervals of less than 15 minutes, and patients who received white and red light were continuously monitored from registration to discharge in terms of activity, night crying and body weight. There were no significant differences between the control and experimental groups in resting activity patterns, night crying or weight gain. Data suggest that nursing care at 3- to 4-hour intervals, when infants are exposed to light for <15 minutes, does not prevent infants from developing circadian resting activity patterns or proper body growth as long as infants are exposed to normal light-dark cycles (Kaneshi et al., 2016). Valizadeh et al. (2017) found in a randomized controlled study that the light-dark cycle improved the sleep quality of premature infants and it was recommended that nursing interventions to support the light-dark cycle specific to these infants should be made in clinics (Valizadeh et al., 2017).

In this study, nutritional onset did not show a statistically significant difference in the study and control groups. When the total enteral nutrition transition times were compared, a statistically significant difference was observed in the study and control groups and it was found that the total enteral nutrition transition times were lower in the study group compared to the control group. A statistically significant difference was observed in the study and control groups when the time of initiation of oral feeding was compared. In the literature, Chen et al. (2015) found that the incidence of dietary intolerance decreased significantly in the study group (Chen et al., 2015)

Practice implications

In line with the results of our study, in order to improve circadian rhythm in newborns older than twenty-eight weeks of gestation, there should be a standardized lighting arrangement that is suitable for the different developmental stages of infants and can provide different light levels at different times of the day.

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Limitations

A limitation of this study was that the small sample size from a single-center may have resulted in a relatively biased interpretation, which may limit the generalizability of the study results.

Conclusion

When premature infants born at 28-32 weeks of gestation who were hospitalized in the Neonatal Intensive Care Unit In our study, which was conducted to determine whether there is a difference in the discharge time, feeding patterns and amounts, daily weight gain, vital signs, and comfort levels of premature infants born at 28-32 weeks of gestation who were hospitalized in the neonatal intensive care unit, when they were monitored by creating a light and dark cycle, the babies in the study group compared to the babies in the control group. It was found that daily weight gain was higher, they were discharged earlier, they switched to enteral and oral feeding earlier and there was no statistically significant difference between the study and control groups in comfort and pain levels, vital signs and oxygen saturation levels. It is observed that the results of this study are also supported by literature studies.

The use of infants whose eyes were covered with an eye patch to create a light-dark cycle is an important strength of our study. However, there is a need for more studies in the literature on circadian support and light-dark cycle establishment in preterm infants. In future studies, the use of methods that allow 24-hour observation and measurement of sleep duration may provide informative results. There is also a need to educate the NICU team about sleep protection and support and to increase the importance of this issue.

Data availability statement

Data are available upon reasonable request.

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This study was presented as an oral presentation at the 2nd International Dr. Behçet Uz Children's Congress in March 2020.

Declaration of Competing Interest

None declared

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