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The Effect of Early-Initiated Half-Swaddling and Kangaroo Care Practices on Maternal Sleep Quality and Postpartum Depression in Term Infants: A Randomized Controlled Trial

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ABSTRACT

This study aimed to investigate the effects of half-swaddling and kangaroo care practices early initiated in mothers of term babies on maternal sleep quality and postpartum depression. This study was prospective, four-arm randomized controlled trial. This study was conducted in 136 mothers and term baby hospitalized in Trakya University Hospital between April 2023 and August 2024. Participants were randomly divided into four groups using computer program with 34 mothers in each group: control (A), half-swaddling (B), kangaroo care (C), half-swaddling, and kangaroo care (D). Starting, 1st, 2nd, 3rd, and 6th months, the data of all four groups were collected with the Questionnaire Form, Edinburgh Postpartum Depression Scale (EPDS), and Pittsburgh Sleep Quality Index (PSQI). Bonferroni and multiple linear regression (MLR) were used for advanced statistics. C and D groups had more positive effects on depression, while B and D groups had more positive effects on maternal sleep quality ($p < 0.001$). The combination of half-swaddling and kangaroo care practices early initiated in term babies has a significant effect on reducing the risk of postpartum depression, and half-swaddling practice has an important effect on improving maternal sleep quality.

Trial Registration: ClinicalTrials.gov: NCT06348316

1 | Introduction

Infants born between the 38th and 42nd weeks of pregnancy are classified as term infants (Oriji et al. 2021). The birth of a term infant marks the beginning of the postpartum period, a critical phase in a woman's life where psychological and physiological changes, which began during pregnancy, continue. During this period, women are more susceptible to the onset or recurrence of mental health disorders (Yin et al. 2021). Among these disorders, depression is particularly concerning as it poses a significant health risk for women (Yu et al. 2023). According to the World Health Organization (WHO) (2008), depression is defined as "a condition characterized by persistent sadness and a loss of interest in activities that one typically enjoys, lasting at least two weeks, and accompanied by an inability to carry out daily activities." In the postpartum period, there are three main types of depression that can manifest: postpartum blues, postpartum depression (PPD), and postpartum psychosis.

Postpartum blues, often referred to as baby blues, is a common condition that many mothers experience within the first week or even a few days after giving birth. This condition affects between 26% and 84% of new mothers (Tosto et al. 2023; Andela and Dewani 2023). Symptoms of postpartum blues include dysphoria, crying spells, mood swings, anxiety, insomnia, loss of appetite, and irritability (Baattaiah et al. 2023; Küçükkaya

Summary

- Half-swaddling and kangaroo care to new mothers of term babies positively affect, and the quality of postpartum sleep increases as the risk of postpartum depression decreases.
- Half-swaddling and kangaroo care interventions are cheap, easy, accessible, and practical.
- They are also safer than drug treatments and have no significant side effects.

et al. 2024). Although postpartum blues are typically mild and temporary, having this condition increases the risk of developing PPD (Panolan 2024). PPD is a more severe condition, affecting approximately 1 in 10 new mothers, and is much more intense than postpartum blues (Baattaiah et al. 2023). Women who have previously experienced PPD are 30% more likely to suffer from it again in subsequent pregnancies. PPD symptoms can include a range of negative emotions, such as guilt, fear, and an inability to care for the baby or oneself, along with severe mood swings, crying spells, irritability, and fatigue. These symptoms can vary from moderate to severe and may emerge immediately after birth or develop over time, potentially lasting up to a year postpartum (Alves et al. 2023; Xiao et al. 2023). Systematic reviews report that the global prevalence of PPD is between 14% and 18% (Liu et al. 2022; Shorey et al. 2018). Given its widespread occurrence, research on PPD has focused on identifying factors that contribute to its development and improving the health and quality of life for women during the postpartum period. PPD has been linked to various physical, physiological, and psychosocial risk factors (Leistikow and Smith 2024; Newman et al. 2023). Among these, sleep disturbances and poor sleep quality are recognized as significant contributors to the development of PPD, though this relationship is not yet fully understood.

Sleep is a fundamental physiological need for women, essential for restoring physical energy and agility through a complex physiological process. It is crucial for women's overall health, allowing them to rejuvenate, rest, and prepare for daily life (Chennaoui et al. 2021; Ramar et al. 2021). Sleep is more than just a cessation of wakefulness and a period of rest; it is a distinct state of consciousness that prepares the body for life by providing renewal (Pennicotte-Collier 2024). However, poor sleep quality is a growing concern for women in the postpartum period (Gessesse et al. 2022). One primary cause of sleep disturbances after childbirth is interacting with the baby throughout the night (Lin et al. 2022). Postpartum sleep disorders can lead to significant challenges for women, affecting their ability to perform daily tasks for several months following birth (Carroll et al. 2024; Sultan et al. 2023). Research by Christian et al. (2019) assessed the sleep quality of 133 nulliparous and multiparous African American and Caucasian women across all three trimesters of pregnancy and from 4 to 11 weeks postpartum, revealing low sleep quality throughout pregnancy and the early postpartum period for all participants. Another study by Okun et al. (2018) evaluated the relationship between sleep quality and symptoms of depression and anxiety during pregnancy and up to 6 months postpartum, finding that poor sleep quality was linked to increased symptoms of depression and anxiety at 6 months postpartum. Additionally, Lewis et al. (2018) examined changes in self-reported sleep patterns and depressive symptoms among American women at high risk for developing PPD from 6 weeks to 7 months postpartum. Their findings suggest that women at high risk for PPD are more likely to develop depressive symptoms later in the postpartum period if sleep problems persist. Although the literature has established a link between poor sleep quality and the risk of developing PPD, limited interventions address sleep quality in managing PPD (Baattaiah et al. 2023; Newman et al. 2023). Safe sleep practices, such as half-swaddling and kangaroo care (KC), have been recommended to improve maternal and infant sleep patterns and quality of sleep (Erkut and Yıldız 2017; Sobaihi et al. 2020; Cooijmans et al. 2022).

Kangaroo care is defined as the practice of early initiated and sustained skin-to-skin contact between mother and newborn (Cooijmans et al. 2022). Regularly, KC every day for a certain period of time positively affects the physiological, mental, social, and psychological development of the infant (Chen et al. 2022; Toprak and Erenel 2022). KB results in positive outcomes such as the positive progression of physical growth of the newborn, regulation of physiological parameters, increased oxygenation of cellular structures, support of immunity, regulation of the gastrointestinal system, reduction of the response to pain stimuli, active maintenance of the breastfeeding process, and positive contribution to the development of mother–infant bonding (Chen et al. 2022; Cooijmans et al. 2022). In the study conducted by El Sehmawy et al. (2023) in Egypt, where they examined the effects of skin-to-skin contact on postpartum psychological distress of mothers and their term newborns, a decrease in PPD and anxiety was determined, while an increase in maternal sleep quality was found. Rheinheimer et al. (2023), Cooijmans et al. (2022), and Bigelow et al. (2012) found that KC applied to term infants reduced maternal depression and anxiety.

Half-swaddling, in particular, has gained popularity in infant care as it helps maintain continuous sleep (Erkut and Yıldız 2017). Studies have shown that half-swaddling can effectively reduce the time it takes for newborns to fall asleep, decrease the frequency of spontaneous awakenings during sleep, and increase the overall sleep duration (Adachi et al. 2021; Erkut and Yıldız 2017). While half-swaddling and KC are essential for improving maternal sleep quality, their effects on PPD remain unclear. Due to the lack of national and international studies examining the impact of early-initiated half-swaddling and KC on maternal sleep quality and PPD in term infants, this study aims to investigate these effects.

1.1 | Research Questions

RQ1. *Does early-initiated half-swaddling in term infants affect maternal sleep quality?*

RQ2. *Does early-initiated half-swaddling in term infants influence postpartum depression?*

RQ3. *Does early-initiated kangaroo care in term infants affect maternal sleep quality?*

RQ4. *Does early-initiated kangaroo care in term infants influence postpartum depression?*

RQ5. *Does early-initiated half-swaddling and kangaroo care in term infants affect maternal sleep quality?*

RQ6. *Does early-initiated half-swaddling and kangaroo care in term infants influence postpartum depression?*

2 | Methods

2.1 | Study Design and Setting

This four-arm randomized controlled trial was conducted between April 2023 and August 2024 at the Maternity Clinic of the Health Research and Application Center, XXX University. The study involved 136 mothers who had given birth to full-term infants and were hospitalized in the maternity ward.

2.2 | Participants

A total of 136 mothers and their infants were required for the study to assess the impact of half-swaddling on maternal sleep quality. This calculation was based on clinical observations predicting a moderate effect size ($d = 0.5$) with a 5% margin of error and 80% power. The same sample size was calculated to be sufficient for evaluating the effects on PPD, the study's second primary outcome. Considering potential dropouts, more than 10% of the initially calculated sample size was recruited. All participants were residents of Edirne and were fluent in Turkish. Mothers who were admitted to the Maternity Clinic of the Health Research and Application Center at XXX University and had given birth to full-term infants were included in the study. Interventions targeting the mothers were initiated within the first 24 h postpartum, tailored to the specifics of the applied care methods.

From the beginning of the study, eligible mothers were enrolled based on the required sample size and adherence to the assignment group criteria. Before randomization, mothers of full-term infants were informed about the study, and those who agreed to participate provided written informed consent.

Mothers were excluded from the study if they were over 49 years old (due to the increased risk of pregnancy and labor), had preterm births (< 38 weeks), had twin pregnancies, smoked, consumed alcohol or stimulants, had a pre-pregnancy BMI > 35, worked night shifts, underwent infertility treatments, or had chronic illnesses (e.g., hypertension, diabetes mellitus). Exclusion criteria also included experiencing severe depression, anxiety, or stress, having any organic or non-organic illnesses that could cause cognitive impairment (e.g., delirium, dementia, intellectual disability), or having severe maternal complications. Infants were excluded if their birth weight was ≤ 2500 g, their APGAR score was < 7, they had severe neonatal complications, congenital malformations, or required hospitalization for more than 5 days.

2.3 | Randomization and Blinding

Mothers of full-term infants were randomly assigned to one of four study groups using a computer-generated random number generator and a four-dimensional permuted block strategy. The groups consisted of 34 mothers each: the control group (A), the group receiving only swaddling (B), the group receiving only KC (C), and the group receiving both swaddling and KC (D). Allocation concealment was employed to maintain randomization and ensure that the assignment of the next participant to a group was not predictable. Researchers actively and effectively communicated with participants to maintain the study process. Due to the nature of the interventions and the follow-up process, blinding was not feasible for the researchers administering the interventions. All outcomes in this study were measured using scales. Blinding was applied to the researcher responsible for randomization and the data analyst due to the study's intervention characteristics.

This study followed the CONSORT guidelines for reporting randomized controlled trials (Figure 1).

2.4 | Data Collection and Measurement

At the initial follow-up, all groups of mothers received preliminary information; for each of the four groups, personal characteristics, birth and infant-related features, and sleep-related data were recorded using a questionnaire. The mothers were informed that data would be collected using the Edinburgh Postnatal Depression Scale (EPDS) and the Pittsburgh Sleep Quality Index (PSQI) at baseline and during the 1st, 2nd, 3rd, and 6th month follow-ups. Additionally, they were notified that their sleep tracking over the last 24 h would be reassessed before each follow-up.

The baseline, 1st, and 3rd month follow-ups were conducted in the hospital during routine check-ups to monitor the baby's development. The 2nd and 6th month follow-ups were conducted via video calls as part of tele-nursing, allowing the observation of the infant's sleep patterns, swaddling, and KC applications in the home environment.

2.4.1 | Questionnaire

The questionnaire consisted of 53 questions divided into three main sections: personal characteristics of the mother, birth- and infant-related features, and sleep-related aspects (Küçükkaya 2022; Newman et al. 2023; Sultan et al. 2023).

2.4.2 | Pittsburgh Sleep Quality Index (PSQI)

The PSQI was developed by Buysse et al. 1989 to evaluate sleep quality and was validated for Turkish use by Ağargün et al. in 1996. The PSQI assesses sleep quality over the past month. It includes 18 items and 7 components (subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleeping medication, and daytime dysfunction). Each item is scored on a scale of 0–3, and the sum of the seven

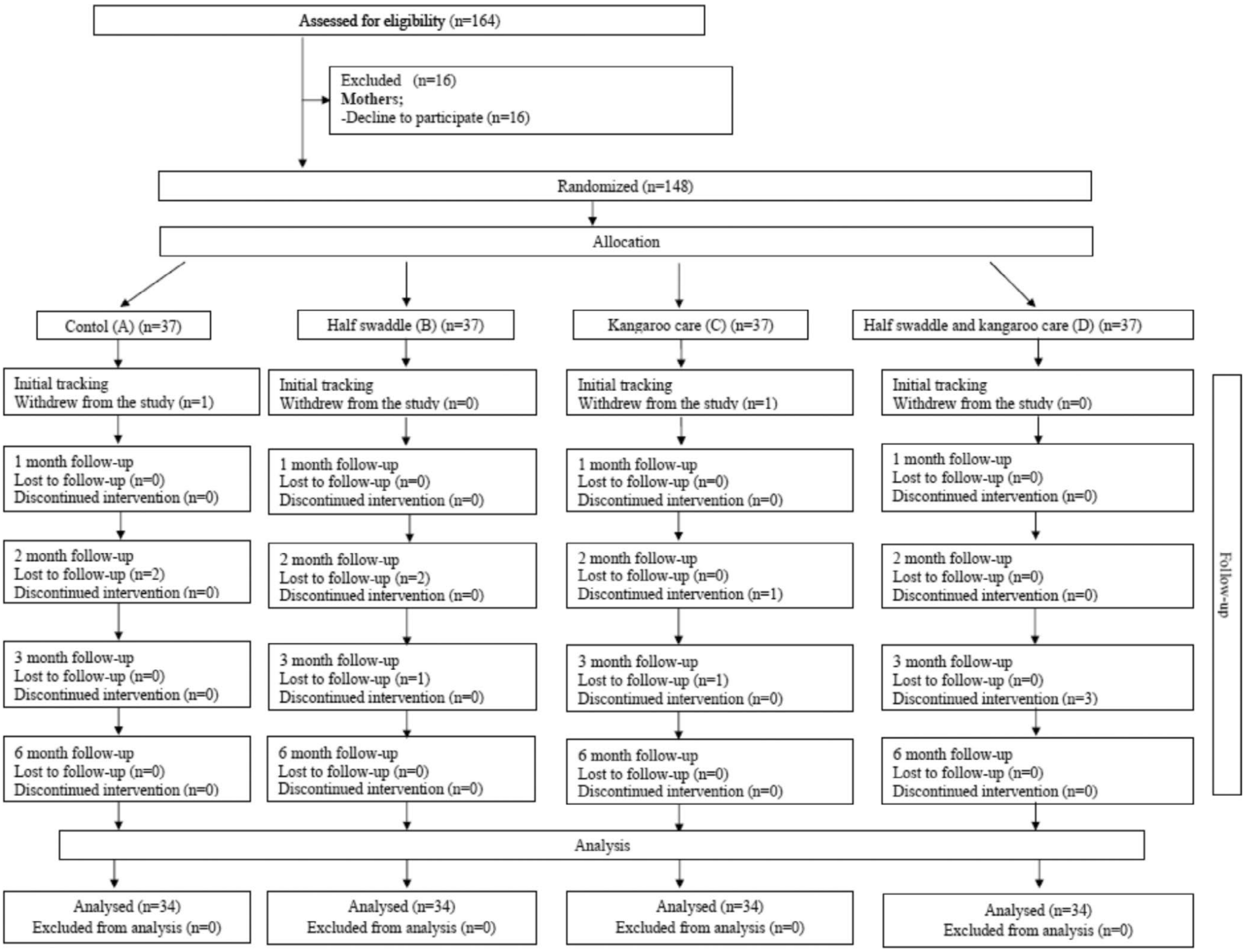

FIGURE 1 | Participant flow diagram according to consolidated standards of reporting trails.

component scores provides the total PSQI score, ranging from 0 to 21. Higher scores indicate poorer sleep quality. A total PSQI score of ≤ 5 indicates "good sleep," while a score > 5 indicates "poor sleep" (Ağargün et al. 1996). Cronbach's alpha value for the scale's reliability was reported as 0.80 (Ağargün et al. 1996). In this study, Cronbach's alpha values were 0.96 at baseline, 0.98 at 1 month, 0.99 at 2 months, 0.98 at 3 months, and 0.99 at 6 months.

2.4.3 | Edinburgh Postnatal Depression Scale (EPDS)

The EPDS was developed by Cox et al. (1987) to assess the level of depression in mothers during the postpartum period and was adapted into Turkish by Engindeniz in 1996. The scale consists of 10 items scored on a four-point Likert scale. The total score, obtained by summing the item scores, has a cutoff point of 13. Scores of 12 or below are considered to represent a low risk of PPD, while scores of 13 and above indicate a high risk. The minimum score on the scale is 0, and the maximum is 30 (Engindeniz et al. 1996). Cronbach's alpha value for the scale's reliability was reported as 0.79 (Engindeniz et al. 1996). In this study, Cronbach's alpha values were 0.99 at baseline, 0.99 at 1 month, 0.98 at 2 months, 0.99 at 3 months, and 0.99 at 6 months.

2.5 | Intervention

2.5.1 | Application of Half-Swaddling

In the half-swaddling intervention applied by mothers in groups B and D, a soft cloth or baby blanket was spread on a suitable surface, and the baby was placed in a supine position. Half-swaddling was done in a way that did not restrict the baby's arm and leg movements (Erkut and Yıldız 2017). From the beginning until the third month, swaddling was initiated 15 min before each nap during the day, and the swaddle was loosened 5 min after the baby fell asleep.

2.5.2 | Application of Kangaroo Care

Before performing intermittent KC with the mothers in groups C and D who had term infants, it was emphasized that the mothers should pay attention to their body hygiene. Mothers were asked to wear clean, comfortable clothing and avoid using jewelry, perfume, or deodorant. According to the guidelines published by the WHO in 2003, KC should initially be applied for 30 min. Therefore, KC was applied twice daily, in the morning and afternoon, for 30 min each session, starting from the first

24 h after the term baby's birth and continuing until 6 months of age (Darmstadt et al. 2023; WHO 2023). Mothers were asked to sit comfortably in a chair. The baby, dressed only in a diaper and hat, was placed face down and horizontally on the mother's bare chest. Then, the mother and baby were covered with a prewarmed, clean cloth. It was emphasized that the mother's hands and body should not be cold to avoid stimulating the baby's reflexes and increasing movement. The mother was instructed to hold and support the baby from the back and hips (Darmstadt et al. 2023; WHO 2023). For the mothers in group D who practiced both half-swaddling and KC, it was recommended to first apply KC within the first 60–90 min after the baby wakes up, followed by half-swaddling after the baby falls asleep. The second KC session takes place 60–90 min before the infant's nighttime sleep routine and is followed by half-swaddling.

2.6 | Outcome Assessment

The primary outcome was the effect of early-initiated half-swaddling and KC on maternal sleep quality at baseline, 3 months, and 6 months in mothers of term infants. For this purpose, the PSQI was administered to all four groups at baseline and at the 1st, 2nd, 3rd, and 6th months of the study, with data collected and recorded by the researcher during hospital or home visits.

The secondary outcome was the effect of early-initiated half-swaddling and KC on PPD at baseline, 3 months, and 6 months in mothers of term infants. For this purpose, the EPDS was administered to all four groups at baseline, at the 1st, 2nd, 3rd, and 6th months of the study, with data collected and recorded by the researcher during hospital or home visits.

2.7 | Statistical Analysis

The statistical analysis was conducted using SPSS Version 25 by a statistical consultant under blind conditions, with a p-value of <0.05 considered significant. Descriptive data were presented as frequency, percentage, mean, and standard deviation. Initially, the normality of the data was evaluated using the Kolmogorov–Smirnov test, and parametric tests were employed due to the normal distribution. For the normally distributed quantitative data in the intervention and control groups, repeated measure analysis of variance was applied for comparisons, and one-way analysis of variance was used for comparing more than two independent groups. If a significant difference was found, the Bonferroni test was used to identify the group responsible for the difference. For non-normally distributed quantitative data, the Friedman test was used for repeated measure comparisons, and the Kruskal–Wallis H test was employed for comparisons of more than two independent groups. Adjusted Bonferroni was applied when a significant difference was found. Differences in changes between measurements taken at baseline, 1 month, 2 months, 3 months, and 6 months were calculated, and the Kruskal–Wallis test was used to compare these differences between groups. The homogeneity of categorical variables was examined using chi-square analysis. Multiple linear regression analysis was applied to assess the impact of independent variables on dependent variables.

3 | Results

The distribution of the personal characteristics of the mothers who participated in the study is presented in Table 1. In group A, it has been determined that the average age of the mothers is 27.09 ± 4.32, 61.8% have secondary education or higher, 76.5% are not working, all are married, 91.2% belong to a nuclear family, 97.1% are of middle-income level, and 61.8% live in a city. In Group B, the mothers' average age is 26.56 ± 3.55, 61.8% have secondary education or higher, 79.4% do not work, all are married, 94.1% are from a nuclear family, 88.2% are of middle-income level, and 47.1% live in a city. In group C, the mothers' average age is 28.21 ± 3.98, 64.7% have secondary education or higher, 76.5% are not working, all are married, 91.2% belong to a nuclear family, 88.2% are of middle-income level, and 55.9% live in a city. In group D, the average age of the mothers is 27.82 ± 4.06, 64.7% have secondary education or higher, 76.5% are not working, all are married, 64.1% belong to a nuclear family, 91.2% are of middle-income level, and 50% live in a district. No statistically significant difference has been found among the personal characteristics of the mothers in the groups ($p > 0.05$).

The distribution of birth and baby-related characteristics of the mothers participating in the study is presented in Table 2. In group A, the number of pregnancies was found to be 1.55 ± 0.50, the duration of labor was 4.94 ± 1.01 days, and the gestational week was 38.09 ± 0.75. It was determined that 85.3% of the mothers wanted the pregnancy, 91.2% had cesarean deliveries, and all breastfed their newborns. In group B, the number of pregnancies was 1.41 ± 0.50, the duration of labor was 4.62 ± 1.10 days, and the gestational week was 37.76 ± 1.42. It was found that 94.1% of the mothers wanted the pregnancy, 91.2% had cesarean deliveries, and all breastfed their newborns. In group C, the number of pregnancies was 1.41 ± 0.50, the duration of labor was 4.85 ± 1.02 days, and the gestational week was 38.06 ± 0.78. It was determined that 91.2% of the mothers wanted the pregnancy, 94.1% had cesarean deliveries, and all breastfed their newborns. In group D, the number of pregnancies was 1.47 ± 0.61, the duration of labor was 4.65 ± 1.10 days, and the gestational week was 38.20 ± 0.77. It was found that 85.3% of the mothers wanted the pregnancy, 91.2% had cesarean deliveries, and all breastfed their newborns. No statistically significant differences were found between the groups regarding birth and baby-related characteristics ($p > 0.05$).

The distribution of sleep-related characteristics of the mothers participating in the study is presented in Table 3. In group A, it was determined that the number of awakenings during sleep was 3.71 ± 0.76, the daytime sleep duration was 1.21 ± 0.43 h, and the time to fall back asleep after waking was 12.40 ± 6.31 min. It was found that all mothers woke up during sleep, 64.7% did not fall back asleep immediately, all were breastfeeding, and 47.1% experienced sleep disturbances due to incision pain. Additionally, 61.8% preferred the left-side sleeping position, and all found the temperature and air quality of the sleeping environment suitable. Furthermore, 61.8% reported that their partners did not take over baby care to allow them to sleep after delivery, 94.1% had the baby's bed in the same room as theirs, and 11.8% slept in the same bed as the baby. In group B, the number of awakenings during sleep was 3.66 ± 0.73, the daytime sleep duration was 1.31 ± 0.48 h, and the time to fall back asleep after waking

TABLE 1 | Distribution of mothers participating in the study according to their personal characteristics ($n = 136$).

Variables		A group		B group		C group		D group		Test value	*p*
		$\overline{X}$	SD	$\overline{X}$	SD	$\overline{X}$	SD	$\overline{X}$	SD		
Age (year)		27.09	4.32	26.56	3.55	28.21	3.98	27.82	4.06	1.163	0.326^{F}
Body mass index (BMI)		28.14	3.99	27.37	3.32	29.38	4.46	27.99	4.54	1.415	0.241^{F}
Spouse age (year)		33.44	6.27	32.15	7.10	34.62	7.37	34.06	7.78	0.749	0.525^{F}
Smoking quantity (days)		1.29	0.58	1.18	0.39	1.09	0.29	1.09	0.29	0.196	0.024^{F}
Variables		***n***	**%**	***n***	**%**	***n***	**%**	***n***	**%**	**Test value**	***p***
Education Status	Primary education and below	13	38.2	13	38.2	12	35.3	12	35.3	0.988	0.751^{X}
	Secondary education and above	21	61.8	21	61.8	22	64.7	22	64.7		
Working Status	Not Working	26	76.5	27	79.4	26	76.5	26	76.5	0.989	0.927^{X}
	Working	8	23.5	7	20.6	8	23.5	8	23.5		
Marital Status	Married	34	100	34	100	34	100	34	100	—	—
	Single	0	0	0	0	0	0	0	0		
Family Type	Nuclear	31	91.2	32	94.1	31	91.2	32	94.1	0.934	0.770^{X}
	Extended	3	8.8	2	5.9	3	8.8	2	5.9		
Spouse Education Status	Primary education and below	5	14.7	4	11.8	5	14.7	4	11.8	0.968	0.822^{X}
	Secondary education and above	29	85.3	30	88.2	29	85.3	30	88.2		
Spouse Employment Status	Not Working	34	100	34	100	34	100	34	100	—	—
	Working	0	0	0	0	0	0	0	0		
Income Status	Income Less Expenses	1	2.9	2	5.9	2	5.9	1	2.9	0.826	0.440^{X}
	Income Equals Expenses	33	97.1	30	88.2	30	88.2	31	91.2		
	Income Exceeds Expenses	0	0	2	5.9	2	5.9	2	5.9		
Place of Residence	Province	21	61.8	16	47.1	19	55.9	15	44.1	0.517	0.212^{X}
	District	13	38.2	15	44.1	14	41.2	17	50.0		
	Village	0	0	3	8.8	1	2.9	2	5.9		
Daily Regular Walking, Exercise Status	No	18	52.9	20	58.8	23	67.6	20	58.8	0.669	0.484^{X}
	Yes	16	47.1	14	41.2	11	32.4	14	41.2		

Abbreviations: F, one-way analysis of variance; X^2: Chi-square analysis.

was 17.80 ± 11.55 min. All mothers woke up during sleep, 73.5% did not fall back asleep immediately, all were breastfeeding, and 44.1% experienced sleep disturbances due to incision pain. Additionally, 67.6% preferred the left-side sleeping position, all found the temperature and air quality of the sleeping environment suitable, 70.06% reported that their partners did not take

TABLE 2 | Distribution of mothers participating in the study according to birth- and baby-related characteristics ($n = 136$).

		A group		B group		C group		D group			
Variables		$\overline{X}$	SD	$\overline{X}$	SD	**Variables**	$\overline{X}$	SD	$\overline{X}$		**A group**
Gravida		1.55	0.50	1.41	0.50	1.41	0.50	1.47	0.61	0.581	0.629^{F}
APGAR 1 min		9.74	0.45	9.68	0.47	9.65	0.48	9.65	0.49	0.262	0.852^{F}
APGAR 5 min		10.00	0.00	10.00	0.00	10.00	0.00	10.00	0.00	—	—
How many days is the baby now		4.94	1.01	4.62	1.10	4.85	1.02	4.65	1.10	0.752	0.523^{F}
Gestational week		38.09	0.75	37.76	1.42	38.06	0.78	38.20	0.77	1.270	0.287^{F}
Variables		***n***	**%**	***n***	**%**	***n***	**%**	***n***	**%**	**Test Değeri**	***p***
Gravida	1.00	15	44.1	20	58.8	20	58.8	20	58.8	0.581	0.629^{H}
	2.00	19	55.9	14	41.2	14	41.2	12	35.3		
	3.00	0	0	0	0	0	0	2	5.9		
Desired pregnancy	No	5	14.7	2	5.9	3	8.8	5	14.7	0.568	0.903^{X}
	Yes	29	85.3	32	94.1	31	91.2	29	85.3		
Delivery method	Vaginal	3	8.8	3	8.8	2	5.9	3	8.8	0.961	0.889^{X}
	C/S	31	91.2	31	91.2	32	94.1	31	91.2		
Baby gender	Female	13	38.2	20	58.8	18	52.9	22	64.7	0.152	0.055^{X}
	Male	21	61.8	14	41.2	16	47.1	12	35.3		
Breastfeeding status	No	0	0	0	0	0	0	0	0	—	—
	Yes	34	100	34	100	34	100	34	100		
Breastfeeding problem status	No	11	32.4	12	35.3	11	32.4	13	38.2	0.949	0.688^{X}
	Yes	23	67.6	22	64.7	23	67.6	21	61.8		
Bottle feeding problem status	No	23	67.6	22	64.7	23	67.6	21	61.8	—	—
	Yes	11	32.4	12	35.3	11	32.4	13	38.2		
Urinary problem status	No	19	55.9	18	52.9	19	55.9	17	50.0	0.999	0.912^{X}
	Yes	4	11.8	4	11.8	4	11.8	4	11.8		
Defecation problem status	No	19	55.9	18	52.9	19	55.9	18	52.9	0.987	0.785^{X}
	Yes	4	11.8	4	11.8	4	11.8	3	8.8		
Urrest problem status	No	2	5.9	2	5.9	2	5.9	2	5.9	1.000	0.941^{X}
	Yes	21	61.8	20	58.8	21	61.8	19	55.9		
Gas pain problem status	No	1	2.9	1	2.9	1	2.9	1	2.9	1.000	0.959^{X}
	Yes	22	64.7	21	61.8	22	64.7	20	58.8		

Abbreviations: F, one-way analysis of variance; H, Kruskal–Wallis H test; X^2, Chi-square analysis.

over baby care to allow them to sleep after delivery, 94.1% had the baby's bed in the same room as theirs, and 17.6% slept in the same bed as the baby. In group C, the number of awakenings during sleep was 3.71 ± 0.72, the daytime sleep duration was 1.15 ± 0.38 h, and the time to fall back asleep after waking was 18.60 ± 8.36 min. All mothers woke up during sleep, 73.5% did not fall back asleep immediately, 97.1% were breastfeeding, and 44.1% experienced sleep disturbances due to incision pain. Additionally, 70.6% preferred the left-side sleeping position; all found the temperature and air quality of the sleeping environment suitable; 64.7% reported that their partners did not take over baby care to allow them to sleep after delivery; 94.1% had the baby's bed in the same room as theirs; and 8.8% slept in the same bed as the baby. In group D, the number of awakenings during sleep was 3.62 ± 0.70, the daytime sleep duration was 1.30 ± 0.47 h, and the time to fall back asleep after waking was 16.60 ± 8.26 min. All mothers woke up during sleep, 97.1% were breastfeeding, and 44.1% experienced sleep disturbances due to incision pain. Additionally, 82.4% preferred the left-side sleeping position, and all found the temperature and air quality

TABLE 3 | Distribution of mothers participating in the study according to their sleep-related characteristics ($n = 136$).

Variables		A group		B group		C group		D group		Variables	A group
		$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	$\bar{X}$	SD	$\bar{X}$		
Number of times you wake up while sleeping		3.71	0.76	3.66	0.73	3.71	0.72	3.62	0.70	0.112	0.953^{F}
Daytime sleep duration (hours)		1.21	0.43	1.31	0.48	1.15	0.38	1.30	0.47	0.420	0.739^{F}
Time it takes to fall asleep immediately after waking up (min)		12.40	6.31	17.80	11.55	18.60	8.36	16.60	8.26	2.444	0.069^{F}
Caffeine consumption before going to bed at night (cups)		1.13	0.35	1.00	0.00	1.43	0.53	1.17	0.41	1.320	0.293^{F}
Variables		***n***	**%**	***n***	**%**	***n***	**%**	***n***	**%**	**Test Değeri**	***p***
Waking up while sleeping	No	0	0	0	0	0	0	0	0	—	—
	Yes	34	100	34	100	34	100	34	100		
The ability to fall asleep again immediately after waking up	No	22	64.7	25	73.5	25	73.5	25	73.5	0.808	0.447^{H}
	Yes	12	35.3	9	26.5	9	26.5	9	26.5		
Daytime sleeping	No	17	50.0	18	52.9	21	61.8	14	41.2	0.400	0.646^{H}
	Yes	17	50.0	16	47.1	13	38.2	20	58.8		
The ability to interrupt night sleep	No	0	0	0	0	0	0	0	0	—	—
	Yes	34	100	34	100	34	100	34	100		
Reasons for interrupting night sleep	Gas pain	2	5.9	8	23.5	7	20.6	9	26.5	0.993	0.818^{X}
	Unexplained crying	4	11.8	10	29.4	8	23.5	5	14.7		
	Breastfeeding	34	100	34	100	33	97.1	33	97.1		
	Incision pain	16	47.1	15	44.1	15	44.1	15	44.1		
The ability to fall asleep immediately after going to bed	No	21	61.8	22	64.7	22	64.7	22	64.7	0.992	0.811^{H}
	Yes	13	38.2	12	35.3	12	35.3	12	35.3		
Consuming caffeinated beverages (coffee, tea, etc.)	No	12	35.3	17	50.0	16	47.1	10	29.4	0.262	0.586^{H}
	Yes	22	64.7	17	50.0	18	52.9	24	70.6		
Consuming caffeinated beverages (coffee, tea, etc.) before going to bed (after 18:00).	No	26	76.5	29	85.3	27	79.4	28	82.4	0.813	0.698^{H}
	Yes	8	23.5	5	14.7	7	20.6	6	17.6		
The noise level in the sleeping environment is suitable for an ideal sleep	No	4	11.8	5	14.7	1	2.9	4	11.8	0.413	0.615^{H}
	Yes	30	88.2	29	85.3	33	97.1	30	88.2		
Sleeping position	On your back	5	14.7	4	11.8	2	5.9	2	5.9	0.329	0.336^{X}
	On your stomach	4	11.8	0	0	2	5.9	2	5.9		
	Left side	21	61.8	23	67.6	24	70.6	28	82.4		
	Right side	4	11.8	7	20.6	6	17.6	2	5.9		

(Continues)

TABLE 3 | (Continued)

Variables		n	%	n	%	n	%	n	%	Test Değeri	p
The temperature of the sleeping environment is suitable for an ideal sleep	No	0	0	0	0	0	0	0	0	—	—
	Yes	34	100	34	100	34	100	34	100		
The air of the sleeping environment is suitable for an ideal sleep	No	0	0	0	0	0	0	0	0	—	—
	Yes	34	100	34	100	34	100	34	100		
The bed is suitable for an ideal sleep	No	1	2.9	1	2.9	3	8.8	2	5.9	0.647	0.387[H]
	Yes	33	97.1	33	97.1	31	91.2	32	94.1		
The pillow is suitable	No	6	17.6	3	8.8	4	11.8	3	8.8	0.637	0.343[H]
	Yes	28	82.4	31	91.2	30	88.2	31	91.2		
The lighting of the sleeping environment is suitable	No	3	8.8	4	11.8	4	11.8	4	11.8	0.973	0.714[H]
	Yes	31	91.2	30	88.2	30	88.2	30	88.2		
The time you look at your mobile phone shortens your sleep time	No	31	91.2	29	85.3	31	91.2	32	94.1	0.656	0.516[H]
	Yes	3	8.8	5	14.7	3	8.8	2	5.9		
The situation of your spouse taking care of the baby for sleep during the postpartum period	No	21	61.8	24	70.6	22	64.7	24	70.6	0.826	0.570[H]
	Yes	13	38.2	10	29.4	12	35.3	10	29.4		
The situation of your relatives taking care of the baby for sleep during the postpartum period	No	11	32.4	10	29.4	9	26.5	6	17.6	0.549	0.166[H]
	Yes	23	67.6	24	70.6	25	73.5	28	82.4		
The situation of the baby's bed being in your bedroom	No	2	5.9	2	5.9	2	5.9	6	17.6	0.223	0.106[H]
	Yes	32	94.1	32	94.1	32	94.1	28	82.4		
The situation of the baby sleeping in the same bed with you	No	30	88.2	28	82.4	31	91.2	31	91.2	0.637	0.477[H]
	Yes	4	11.8	6	17.6	3	8.8	3	8.8		

Abbreviations: F, one-way analysis of variance; H, Kruskal–Wallis H test; X^2, Chi-square analysis.

of the sleeping environment suitable. Moreover, 70.6% reported that their partners did not take over baby care to allow them to sleep after delivery, 82.4% had the baby's bed in the same room as theirs, and 8.8% slept in the same bed as the baby. No statistically significant differences were found among the groups regarding sleep-related characteristics ($p > 0.05$).

The total and subscale scores of the EPDS and PSQI for the mothers participating in the study and the differences between these scores are shown in Table 4 and Figure 2. In group A, the mean EPDS total score was 15.74 ± 8.80 at baseline, 15.74 ± 8.80 at the first month, 19.26 ± 7.04 at the second month, 20.41 ± 6.27 at the third month, and 16.50 ± 6.18 at the sixth month. The mean PSQI total score was 12.77 ± 2.82 at baseline, 13.54 ± 3.61 at the first month, 12.18 ± 3.06 at the second month, 9.12 ± 3.40 at the third month, and 11.02 ± 3.88 at the sixth month. It was found that the changes in the EPDS and PSQI mean scores within the control group were statistically significant ($p < 0.001$). In group B, the mean EPDS total score was 15.11 ± 8.46 at baseline, 12.38 ± 6.79 at the first month, 9.29 ± 5.55 at the second month, 8.50 ± 4.99 at the third month, and 5.56 ± 4.38 at the sixth month. The mean PSQI total score was 10.21 ± 4.50 at baseline, 8.87 ± 4.07 at the first month, 4.72 ± 2.36 at the second month, 1.57 ± 1.19 at the third month, and 1.23 ± 1.45 at the sixth month. It was found that the changes in the EPDS and PSQI mean scores within the swaddling group were statistically significant ($p < 0.001$). In group C, the mean EPDS total score was 15.47 ± 8.43 at baseline, 12.03 ± 6.33 at the first month, 7.59 ± 5.86 at the second month, 5.21 ± 4.89 at the third month, and 3.59 ± 4.35 at the sixth month. The mean PSQI total score was 10.81 ± 4.08 at baseline, 10.69 ± 4.02 at the first month, 9.57 ± 1.49 at the second month, 8.18 ± 2.22 at the third

TABLE 4 | Descriptive statistics of the scales used in the study ($n = 136$).

Scale and sub-dimensions		A group[a] $\bar{X} \pm SD$	B group[b] $\bar{X} \pm SD$	C group[c] $\bar{X} \pm SD$	D group[d] $\bar{X} \pm SD$	Test/p
Edinburgh postpartum depression scale	Starting[a]	15.74 ± 8.80	15.11 ± 8.46	15.47 ± 8.43	14.53 ± 8.19	0.129/0.943
	1 month[b]	17.74 ± 7.74	12.38 ± 6.79	12.03 ± 6.33	8.29 ± 7.01	10.512/**0.000** ***a < b. a < c. a < d***
	2 months[c]	19.26 ± 7.04	9.29 ± 5.55	7.59 ± 5.86	3.91 ± 4.68	42.875/**0.000** ***a < b < d. a < c***
	3 months[d]	20.41 ± 6.27	8.50 ± 4.99	5.21 ± 4.89	2.15 ± 3.53	86.368/**0.000** ***a < b < d. a < b < c***
	6 months[e]	16.50 ± 6.18	5.56 ± 4.38	3.59 ± 4.35	0.94 ± 2.64	76.285/**0.000** ***a < b < d. a < c***
Test/p		272.190/**0.000** ***a < b < c < d***	128.407/0.**000** ***a < b < c < d < e***	105.294/0.**000** ***a < b < c < d < e***	65.026/0.**000** ***a < b < c < d < e***	—
Pittsburgh sleep quality Index	Starting[a]	12. 77 ± 2.82	10.21 ± 4.50	10.81 ± 4.08	11.07 ± 4.07	2. 656/0.051
	1 month[b]	13.54 ± 3.61	8.87 ± 4.07	10.69 ± 4.02	9.61 ± 3.55	9.782/**0.000** ***a < b. a < c. a < d***
	2 months[c]	12.18 ± 3.06	4.72 ± 2.36	9.57 ± 1.49	2.92 ± 2.23	112.108/**0.000** ***a < b < c < d***
	3 months[d]	9.12 ± 3.40	1.57 ± 1.19	8.18 ± 2.22	1.48 ± 0.90	124. 558/**0.000** ***a < b. c < b. a < d. c < d***
	6 months[e]	11.02 ± 3.88	1.23 ± 1.45	5.75 ± 3.35	1.01 ± 0.78	104.279/**0.000** ***a < b. a < c. a < d. c < b. c < d***
Test/p		819.578/0.**000** ***d < e < a < b***	211.651/0.**000** ***a < b < c < d < e***	1009.456/0.**000** ***a < d < e***	297.506/0.**000** ***a < b < c < d < e***	—
Subjective sleep quality	Starting[a]	0.18 ± 0.46	0.09 ± 0.38	0.03 ± 0.17	0.06 ± 0.34	1.096/0.353
	1 month[b]	0.26 ± 0.51	0.03 ± 0.17	0.03 ± 0.17	0.03 ± 0.17	5.388/**0.002** ***a < b. a < c. a < d***
	2 months[c]	0.26 ± 0.57	0.00 ± 0.00	0.00 ± 0.00	0.03 ± 0.17	6.365/**0.000** ***a < b. a < c. a < d***
	3 months[d]	0.24 ± 0.43	0.00 ± 0.00	0.00 ± 0.00	0.03 ± 0.17	8.170/**0.000** ***a < b. a < c. a < d***
	6 months[e]	0.24 ± 0.50	0.00 ± 0.00	0.00 ± 0.00	1.51 ± 0.84	6.372/**0.000** ***a < b. a < c. a < d***
Test/p		9.302/0.124	1.630/0.211	1.000/0.325	1.000/0.310	
Sleep disorder	Starting[a]	1.90 ± 0.75	1.57 ± 0.83	1.56 ± 0.83	1.51 ± 0.83	1.645/0.182
	1 month[b]	2.09 ± 0.83	1.57 ± 0.83	1.56 ± 0.83	0.01 ± 0.03	3.652/**0.014** ***a < d***
	2 months[c]	0.97 ± 0.56	0.09 ± 0.17	0.80 ± 0.30	0.01 ± 0.03	75.789/**0.000** ***a < b. a < d. b < d. c < d***
	3 months[d]	0.97 ± 0.56	0.09 ± 0.17	0.80 ± 0.29	0.01 ± 0.03	75.789/**0.000** ***a < b. a < d. c < b. c < d***
	6 months[e]	0.62 ± 0.43	0.02 ± 0.11	0.50 ± 0.38	0.00 ± 0.00	40.626/**0.000** ***a < b. a < d. c < b. c < d***
Test/p		228.939/0.**000** ***a < b < c < e***	128.533/**0.000** ***a < c < e***	241.313/0.**000** ***a < c < e***	109.076/0.**000** ***a < c < e***	—
Use of sleeping pills	Starting[a]	1.82 ± 1.24	1.29 ± 1.31	1.62 ± 1.32	1.79 ± 1.20	1.242/0.297
	1 month[b]	2.09 ± 1.19	1.32 ± 1.30	1.62 ± 1.32	1.79 ± 1.20	2.217/0.089
	2 months[c]	2.09 ± 0.97	0.88 ± 0.77	1.38 ± 0.60	0.12 ± 0.41	45.603/**0.000** ***a < c < d < b***
	3 months[d]	1.32 ± 0.73	0.03 ± 0.17	1.15 ± 0.50	0.00 ± 0.00	84.447/**0.000** ***a < b < d. c < b < d***
	6 months[e]	0.97 ± 0.72	0.03 ± 0.17	0.85 ± 0.70	0.00 ± 0.00	35.516/**0.000** ***a < b < d. c < b < d***

(Continues)

TABLE 4 | (Continued)

Scale and sub-dimensions		A group[a] $\bar{X}\pm$SD	B group[b] $\bar{X}\pm$SD	C group[c] $\bar{X}\pm$SD	D group[d] $\bar{X}\pm$SD	Test/*p*
Test/*p*		238.920/0.**000** ***a<d, a<e***	49.276/0.**000** ***a<d. a<e***	165.984/0.**000** ***a<e***	71.650/0.**000** ***a<c<d. a<c<e***	—
Daytime dysfunction	Starting[a]	2.32 ± 0.73	1.96 ± 1.02	2.10 ± 0.93	1.96 ± 1.07	1.146/0.333
	1 month[b]	2.53 ± 0.74	1.44 ± 0.83	2.07 ± 0.91	1.35 ± 0.81	15.443/**0.000** ***a<b<d. c<b<d***
	2 months[c]	2.40 ± 0.65	1.04 ± 0.76	1.88 ± 0.28	0.31 ± 0.46	89.312/**0.000** ***a<b<d. c<b<d***
	3 months[d]	1.46 ± 0.78	0.07 ± 0.22	1.50 ± 0.55	0.00 ± 0.00	99.606/**0.000** ***a<b<d. c<b<d***
	6 months[e]	1.32 ± 0.86	0.04 ± 0.26	0.93 ± 0.74	0.00 ± 0.00	43.392/**0.000** ***a<b<d. c<b<d***
Test/*p*		439.198/0.**000** ***a<c<d<e***	150.071/0.**000** ***a<b<c<d<e***	710.237/0.**000** ***a<d<e***	117.916/0.**000** ***a<b<c<d<e***	—
Sleep latency	Starting[a]	1.24 ± 0.40	1.22 ± 0.72	1.24 ± 0.67	1.27 ± 0.73	3.224/0.456
	1 month[b]	1.60 ± 0.38	1.07 ± 0.64	1.21 ± 0.66	0.90 ± 0.62	8.801/**0.000** ***a<b. a<c. a<d***
	2 months[c]	1.63 ± 0.43	0.68 ± 0.59	1.29 ± 0.48	0.25 ± 0.37	57.678/**0.000** ***a<b. a<d. c<b. c<d***
	3 months[d]	1.07 ± 0.55	0.09 ± 0.26	1.21 ± 0.62	0.00 ± 0.00	72.992/**0.000** ***a<b<d. c<b<d***
	6 months[e]	1.07 ± 0.70	0.06 ± 0.27	0.82 ± 0.75	0.01 ± 0.09	34.790/**0.000** ***a<c<d. a<c<b***
Test/*p*		717.088/**0.000** ***a<d, a<e***	112.394/0.**000** ***a<b<c<d<e***	348.086/0.**000** ***a<e***	81.701/0.**000** ***a<b<c<e<d***	—
Sleep duration	Starting[a]	2.38 ± 0.85	1.91 ± 0.87	2.06 ± 0.87	2.21 ± 0.73	1.975/0.121
	1 month[b]	2.35 ± 0.85	1.35 ± 0.73	2.03 ± 0.90	1.56 ± 0.82	10.110/**0.000** ***a<c<d. a<c<b***
	2 months[c]	2.41 ± 0.66	0.68 ± 0.59	2.06 ± 0.42	0.88 ± 0.69	69.992/**0.000** ***a<c<d<b***
	3 months[d]	2.12 ± 0.59	0.18 ± 0.39	1.85 ± 0.44	0.41 ± 0.50	141.182/**0.000** ***a<d<b***
	6 months[e]	1.76 ± 0.82	0.03 ± 0.17	1.32 ± 0.84	0.21 ± 0.41	61.683/**0.000** ***a<d<b***
Test/*p*		629.067/0.**000** ***c<a<b<d<e***	139.560/0.**000** ***a<b<c<d<e***	575.618/0.**000** ***a<c<b<d<e***	218.056/0.**000** ***a<b<c<d<e***	—
Habitual sleep efficiency	Starting[a]	2.32 ± 0.65	2.18 ± 0.87	2.21 ± 0.77	2.27 ± 0.71	2.709/0.126
	1 month[b]	2.62 ± 0.65	2.09 ± 0.90	2.18 ± 0.72	2.47 ± 0.71	3.716/**0.013** ***a<b***
	2 months[c]	2.41 ± 0.66	1.35 ± 0.69	2.15 ± 0.61	1.32 ± 0.77	22.336/**0.000** ***a<c<d. a<c<b***
	3 months[d]	1.94 ± 0.78	1.12 ± 0.48	1.68 ± 0.81	1.03 ± 0.58	14.494/**0.000** ***a<c<d. a<c<b***
	6 months[e]	1.62 ± 0.82	0.76 ± 0.43	1.32 ± 0.68	0.76 ± 0.55	15.084/**0.000** ***a<b. c<b. a<d. c<d***
Test/*p*		735.500/0.**000** ***a<d, a<e***	425.000/0.**000** ***a<c<d<e***	604.785/0.**000** ***a<d, a<e***	520.923/0.**000** ***a<c<d<e***	—

Note: Bold indicates statistically significant values ($p < .05$).

month, and 5.75 ± 3.35 at the sixth month. It was found that the changes in the EPDS and PSQI mean scores within the KC group were statistically significant ($p < 0.001$). In group D, the mean EPDS total score was 14.53 ± 8.19 at baseline, 8.29 ± 7.01 at the first month, 3.91 ± 4.68 at the second month, 2.15 ± 3.53 at the third month, and 0.94 ± 2.64 at the sixth month. The mean PSQI total score was 11.07 ± 4.07 at baseline, 9.61 ± 3.55 at the first month, 2.92 ± 2.23 at the second month, 1.48 ± 0.90 at the third month, and 1.01 ± 0.78 at the sixth month. It was found that the changes in the EPDS and PSQI mean scores within the swaddling and KC group were statistically significant ($p < 0.001$).

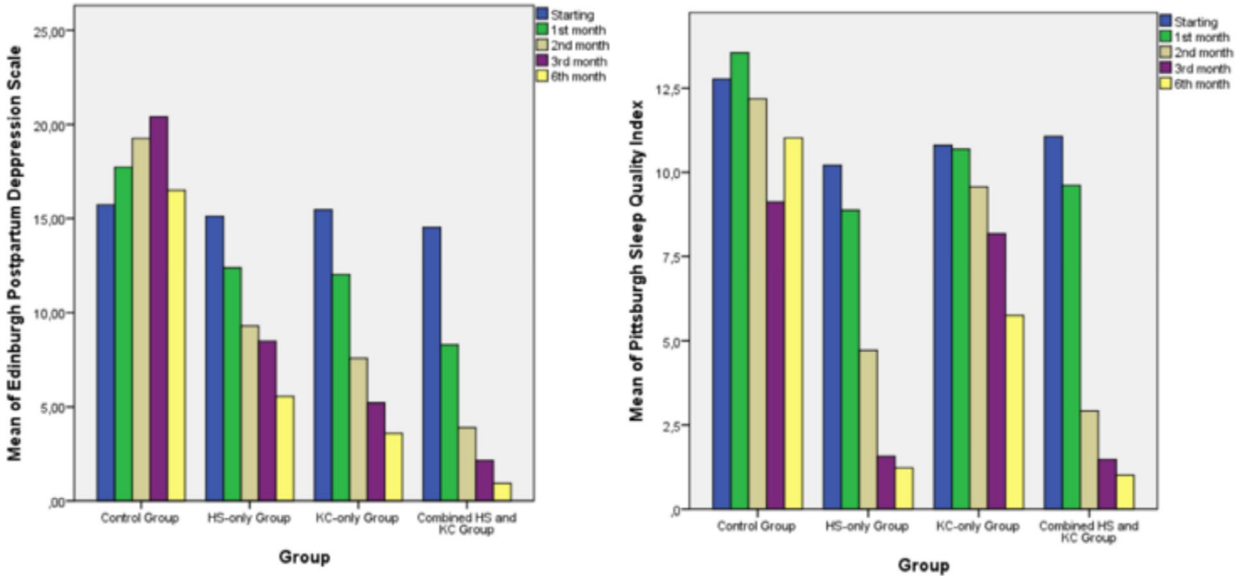

FIGURE 2 | Change in PSQI and EPDI results at starting, 1st, 2nd, 3rd, and 6th months ($n = 136$).

TABLE 5 | Regression analysis of postpartum depression and sleep quality predicting half-swaddle and kangaroo care.

Variables 6th month	β	Standardized β	F	p
Constant	3.252	—	77.127	0.000
Edinburgh postpartum depression scale	−0.014	−0.063		
Pittsburgh sleep quality index	−0.103	−0.683		

Note: R: 0.733, $R^2 = 0.537$; Adjust $R^2 = 0.530$. The value of Durbin Watson was 1.048, suggesting the independence of these variables.

When examining the differences in total and subscale scores of the EPDS and PSQI between groups, no statistically significant difference was found in the initial EPDS total score. However, it was observed that the mean EPDS total scores in groups B–D were higher compared to that in group A ($p < 0.001$). Among the intervention groups, particularly in the KC groups (C and D), the mean EPDS scores at the 1st, 2nd, 3rd, and 6th months were higher compared to that in group B ($p < 0.001$). Similarly, while there was no statistically significant difference in the initial PSQI total and subscale scores between the groups, it was found that the mean PSQI total scores in groups B–D at the 1st, 2nd, 3rd, and 6th months were higher compared to the that in the control group ($p < 0.001$). Among the intervention groups, particularly in the half-swaddling groups (B and D), the mean PSQI total scores were higher compared to that in group C ($p < 0.001$).

The effect of swaddling and KC on PPD and sleep quality is shown in Table 5. Multiple linear regression analysis was used to investigate the existing effect. As seen in Table 5, half-swaddling and KC significantly predicted PPD and sleep quality ($p < 0.001$). It was found that swaddling and KC together explained 53% of the total variance in PPD and sleep quality. This model was statistically proven to be significant ($p = 0.000$).

4 | Discussion

The aim of this study was to determine the effects of early-initiated half-swaddling and KC on maternal sleep quality and PPD in mothers of term infants. Previous studies have demonstrated the impact of KC on PPD (Cooijmans et al. 2022; El Sehmawy et al. 2023). However, there has been no research examining the effects of half-swaddling on PPD and maternal sleep quality.

The results of this study showed that the average PPD scores in the intervention groups were significantly lower than those in the control group. Among the intervention groups, the group that combined swaddling and KC had lower PPD levels compared to the other intervention groups. Additionally, this study demonstrated that half-swaddling and KC reduced the levels and severity of PPD in mothers. In an observational study by Cho and Jeong (2021), which examined the relationship between the mother–infant contact time and PPD and changes in the mother–infant attachment in mothers staying in postpartum care centers, it was determined that KC was effective in reducing PPD among mothers receiving care in postpartum care centers. In meta-analysis by Mendoza-Aucaruri et al. (2025) investigating the effects of skin-to-skin contact on mental health outcomes in parents of term babies, it was found that skin-to-skin contact applied to mothers with term babies reduced PPD and anxiety in the short term. In a study by Norholt (2020) examining the biological and psychological effects of the mother–infant skin-to-skin contact and carrying full-term babies, it was found that skin-to-skin contact, which is a part of KC, reduces PPD. Bigelow and Power (2020), in their study evaluating the short- and long-term effects of KC on term babies and mothers, found that mothers who received skin-to-skin contact reported fewer depressive symptoms in the first weeks after birth. In Küçükkaya's (2022) study on the effects of early-initiated half-swaddling and KC on breastfeeding, mother–infant bonding, maternal sleep quality, and PPD in preterm infants, it was found that half-swaddling and KMC reduced PPD, with a more pronounced reduction in depressive symptoms and greater positive effects on maternal mental health when both interventions were applied together. A review by Moberg et al. (2020) concluded that KMC could be used as a non-pharmacological method to prevent or reduce the risk of PPD. The findings of our study are consistent with the results of studies involving KMC. However, since there is no previous research related to swaddling, this study contributes a new perspective to the literature by suggesting that swaddling, when used with term infants, could be an effective method for reducing PPD.

The disruption of sleep during the postpartum period (due to sleep restriction or the presence of sleep disorders) can lead to significant adverse outcomes that affect both the mother and the baby (González-Mesa et al. 2019; Warland et al. 2018). Therefore, it is crucial to properly understand the effects of disrupted sleep and poor maternal sleep quality during pregnancy and postpartum to provide better care for both the mother and baby. The results of the present study indicate that the average sleep quality scores in the intervention groups were significantly higher than those in the control group. Among the intervention groups, half-swaddling significantly improved maternal sleep quality compared to the other groups. In a study by Kamandani et al. (2024) that examined the effect of kangaroo mother care, taught through role-playing, on the mother–infant bonding and sleep quality among mothers of preterm infants, it was found that the sleep quality was higher in the group that received KC compared to the group that did not. Similarly, in a study by Chen et al. (2022) on the effect of kangaroo mother care on the psychological stress response and sleep quality of mothers with preterm infants in the neonatal intensive care unit, it was found that items such as insomnia level, night awakenings, total sleep duration, overall sleep quality, daytime mood, and daytime physical function were higher in the experimental group compared to those in the control group. In Küçükkaya's (2022) study, it was found that half-swaddling and KC improved maternal sleep quality, particularly half-swaddling group by increasing the duration of sleep, reducing the time taken to fall asleep, and having a more positive impact on the overall sleep quality. Our findings are consistent with studies examining KC. Additionally, since no prior research has been found specifically addressing half-swaddling concerning maternal sleep quality, the present study contributes high-level evidence to the literature, demonstrating that half-swaddling can effectively improve maternal sleep quality during the sleep process of term infants.

PPD is a condition where mothers perceive the threat of stressors in their cognitive and evaluative processes under certain environmental and social stimuli, leading to changes in psychological and physiological functions (Wang et al. 2020). When childbirth occurs, the lack of awareness of the emotional variability experienced, along with various other factors, increases psychological pressure on mothers, making them more prone to negative psychological stress responses such as PPD. If these pressures are not resolved in a timely manner, various degrees of sleep problems arise, affecting the mother's postnatal recovery and future family care. Sleep quality and psychological state are closely interconnected (Marthinsen et al. 2018). Suppose a mother does not get adequate rest and sleep. In that case, she may lack the energy necessary to carry out daily activities and continue breastfeeding her baby, which in turn deteriorates her psychological state and further reduces her sleep quality (Yang et al. 2021). Poor sleep quality can also lead to endocrine disruptions in the body, causing greater emotional fluctuations, which in turn affect sleep, creating a vicious cycle (Feng and Zhang 2024; Weber et al. 2022). In this context, the present study found that half-swaddling and KC have positive effects on PPD and maternal sleep quality, improving both. In a study by Chen et al. (2022), KC improved maternal sleep quality by reducing psychological stress, positively impacting both psychological well-being and sleep quality.

4.1 | Limitations

This study has several limitations. First, there are limitations related to the diverse variables and perceptions of the mothers' backgrounds included in the study. Each mother with a term infant is unique, and due to different social experiences and backgrounds, they possess varying levels of psychological resilience and responses to depression. Additionally, the study is constrained by its location, time, and staffing resources, as only XXXX University Health Research and Application Center was selected as the research site. These constraints created specific limitations in determining and selecting the sample size. The study sample consisted mainly of mothers who gave birth by cesarean section because it was conducted in a tertiary university hospital, and therefore it is thought that the results may differ from those who gave birth spontaneously vaginally.

5 | Conclusion and Recommendations

The application of KC and half-swaddling initiated early in life contributes to reducing the risk of PPD and improving maternal sleep quality. Our findings support the hypotheses that early-initiated half-swaddling and KC in term infants enhance maternal sleep quality and reduce PPD. The more effective the mother's close and direct contact with the term infant and the half-swaddling application during the baby's sleep process, the greater the buffering effect on PPD and maternal sleep quality.

Based on these results, it is recommended that gynecology and obstetrics nurses should obtain information about PPD and maternal sleep quality in the postpartum follow-up process within the scope of care processes and provide training and counseling to mothers who give birth to term babies about half-swaddling and early initiation of KC. In particular, it is suggested that obstetrics and gynecology nurses should provide in-service trainings to encourage these practices, establish protocols for swaddling and KC, and conduct studies on these practices in different populations at a high level of evidence.

5.1 | Relevance for Clinical Practice

Based on the findings of this study, obstetrics and gynecology nurses can collaborate with a multidisciplinary approach to improve the mother's sleep quality and reduce PPD by using the data obtained from mothers in postpartum care guidelines and reflecting the KC and half-swaddling practices in the postpartum period into nursing processes, and this approach can be used to develop the term baby, mother, family, and social structure in a healthy way.

Author Contributions

Burcu Küçükkaya: conceptualization, methodology, data curation, supervision, writing – review and editing, writing – original draft, investigation, validation, visualization, formal analysis. **Tülay Cihangir Öztürk:** investigation, data curation. **Gonca Erginler:** data curation, investigation. **Mehtap Temiz:** investigation, writing – original draft, methodology. **Özge Erçel:** data curation, investigation.

Disclosure

This study will be presented as an oral presentation at the 5th International 6th National Congress on Postpartum Care, which will be held in Mersin, Türkiye, between October 17 and 20, 2024.

Ethics Statement

Ethical approval for conducting the study was granted by the Non-Interventional Scientific Research Ethics Committee of the Faculty of Medicine at Trakya University under decision number TÜTF-GOBAEK 2023/45. Additionally, written institutional permission was secured from the Chief Physician's Office to carry out the study within the Obstetrics Clinic and Maternity Ward of the Trakya University Health Research and Application Center. Prior to participation, detailed information was provided to all prospective mothers, and written informed consent was obtained from those who agreed to participate in the study. This thorough process ensured that all ethical guidelines and regulations were adhered to, safeguarding the rights and well-being of the participants.

Conflicts of Interest

The authors declare no conflicts of interest.

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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