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Can postpartum depression be prevented with care provided to primiparae using Levine's Conservation Model?: A single-blind randomized controlled trial

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Abstract

The aim of the researchers of this study was to investigate the effectiveness of care given in line with Levine's conservation model in reducing the risk of postpartum depression. There were 56 participants in the experimental group and 56 participants in the control group. To reduce postpartum depression, a nursing care program was created by examining the theoretical structure of Levine's Conservation Model. Seven home visits were paid and a nursing care program was implemented. The first four home visits were paid once a week and the remaining three home visits were paid every 15 days. The women were given trainings on different subjects during each home visits. All the trainings were given in accordance with each conservation model. During the fourth home visit, the researcher who was a Pilates instructor taught the puerperae how to do Pilates exercises by demonstrating the exercises. It was determined that in the puerperae in the experimental group, sleep quality improved, that their postpartum fatigue decreased and energy increased, and that their risk of developing postpartum depression decreased. Holistic care given based on Levine's Conservation model improves symptoms of insomnia, fatigue and depression in postpartum women. Levine's Conservation model can be used in routine care to reduce physical, psychological and social problems experienced by women in the postpartum period.

Highlights

• Nursing interventions can prevent the risk of developing postpartum depression by detecting women with postpartum depressive symptoms in the early period.
• Holistic nursing care given for 3 months under the guidance of Levine's Conservation Model reduced the risk of developing depression by eliminating the insomnia and fatigue of the puerperal women.
• Training on breastfeeding, hygiene, nutrition and pilates exercises given to women with postpartum depressive symptoms and keeping a diary relieved women psychologically.

Keywords Levine's conservation model · Fatigue · Sleep · Postpartum depression · Postpartum care

Introduction

Postpartum period is a difficult process in which women, especially first-time mothers, experience role transitions, and this process makes them highly susceptible to psychiatric diseases (Fellmeth et al., 2019). During the postpartum period, women are twice as likely to become depressed compared to other periods of their lives (Shorey et al., 2018). Postpartum depression (PPD) including symptoms such as anxiety, sadness, inability to enjoy life, fatigue is a mood disorder that occurs seven days after delivery (Liu et al., 2020; Shorey et al., 2018). The prevalence of PPD

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varies from 3% to 23.1% (Liu et al., 2020; Shorey et al., 2018; Vázquez & Míguez, 2019). In Turkey where the present study was conducted, the prevalence of PPD is 23.8% (Özcan et al., 2017). PPD can persist for a long time if it is not diagnosed and treated on time (Kotz et al., 2021). Untreated PPD negatively affects not only the mother and the newborn baby but also other members of the family (Poreddi et al., 2020). The cognitive, behavioral, social, emotional development and physical health of the baby are impaired because of PPD (Hairston et al., 2016).

Suicide due to postpartum depression is the second most common cause of maternal deaths in developed countries (Chin et al., 2022). The awareness of personal and social responsibility of mothers with postpartum depression is lower than is that of the mothers without depression (Sangsawang et al., 2022). Depressed mothers often neglect their babies, often have difficulty establishing bond with them, and have a lower tolerance for their babies, which not only disrupts mother-infant attachment but also decreases breastfeeding or leads to the cessation of breastfeeding (Shorey et al., 2018). Therefore, the child's cognitive, behavioral, social, emotional development and physical health deteriorate (Hairston et al., 2016). In addition, depression experienced by the mother during the postpartum period poses a very strong risk for the development of depression in the father (Hairston et al., 2016; Luecken et al., 2016), which leads to an increase in intra-familial conflicts in marriage by deteriorating communication between the spouses, and causing them to experience disappointment and to isolate themselves (Luecken et al., 2016). Early diagnosis and management of postpartum depression in the mother, and prevention before it occurs are very important for the health of the mother, father and child, and for the establishment of a healthy family environment (Shorey et al., 2018). The healthier the families that make up the society are, the healthier the society we live in is.

Although postpartum depression is a very serious problem, very few women seek help from health professionals for depressive symptoms they suffer (Branquinho et al., 2019). The most important reason for not seeking help is the concern for being stigmatized (Wilson et al., 2019). In order for women to undergo treatment without worrying about stigma (Wilson et al., 2019), interventions for postpartum fatigue and insomnia can be performed because there is a strong relationship between postpartum depression, and fatigue and insomnia. Fatigue- and insomnia-related interventions performed to treat postpartum depression may be a more appropriate way to treat women, which prevents them from being stigmatized (Curry et al., 2019). It has been determined that nurses providing care in the postpartum period should routinely women's depressive symptoms in order to diagnose postpartum depression early (Dlamini et al., 2019). A person receiving a score of 12 or more from the Edinburgh Postpartum Depression Scale (EPDS), which is widely used in Turkey and other countries of the world to screen for postpartum depression, should undergo an intervention for depression (Liu et al., 2020; Vázquez & Míguez, 2019). Unfortunately, EPDS is not routinely administered in many countries, and thus women are not adequately screened (Bränn et al., 2021). Moreover, effective nursing interventions cannot be applied to those who have been determined to have a high EPDS score after screening (Jin et al., 2020). In fact, mothers with postpartum depression expect to receive support from health professionals, especially from nurses (Holopainen & Hakulinen, 2019). There is no nursing intervention to prevent postpartum depression in Turkey. Turkey's health system does not focus on maternal fatigue, insomnia, nutrition, physical recovery and emotional conditions, depression. In Turkey, the Health Ministry's guidelines require mothers to be screened for postpartum depression risk after childbirth and referred to a psychiatrist (Celen et al., 2018). Other than that, there is no intervention. Nursing care can be given to women at risk of postpartum depression, which can reduce the risk of depression. Adapting nursing care to a nurse model also improves the quality of care and ensures holistic care. In a previous study in which Roy's adaptation model was used, it was determined that it could relieve postpartum depression and improve sleep quality (Wang & Li, 2021). Levine's conservation model has previously been used in postpartum care, improving women's quality of life and improving their sleep (Ozcan & Eryilmaz, 2021). It was also used to improve the quality of sexual life in the postpartum period (Evcili et al., 2020); however, it was not used to prevent the risk of developing postpartum depression.

Levine conservation model

Levine's conservation model (LCM) is a very suitable nursing model in the care to be given to reduce postpartum depression because LCM focuses on the provision of holistic care to the individual and ensures that the individual is well by evaluating him or her from every aspect. LCM has the following three main components: conservation, adaptation and integrity (Levine, 1988). According to the conservation component, which is the essence of the model, the person's energy, and structural, personal and social integrity must be protected (Levine, 1989). In the postpartum period, mothers face many problems (Ozcan & Eryilmaz, 2021). To deal with these problems, a model that provides comprehensive care should be used. LCM is a suitable nursing model for evaluating women's postpartum energies, fatigue, insomnia, dietary regimes, body healing, emotional status,

and social relationships (Ozcan & Eryilmaz, 2021). LCM model can be applied to anyone who suffers, has depressive symptoms, and needs help from a nurse (Kaur & Raman, 2019). Women with postpartum depression also need a lot of help. Thanks to this model, the integrity of depressed women can be preserved. Thus, their adaptation to motherhood is facilitated, and postpartum depression is prevented before it harms other members of the family.

The aim of the researchers of this study was to investigate the effectiveness of care given in line with Levine's conservation model in reducing the risk of postpartum depression. To achieve this aim, the researchers used all the components of Levine's conservation model, gave care to women with postpartum depression accordingly, and investigated the effect of this care on reducing postpartum depression.

Hypotheses of the research

$H_{0:}$ Care provided in accordance with the the protection of energy, and structural, personal and social integrity subcomponents of Levine's Conservation Model does not lead to a change in the fatigue, sleep quality and postpartum depression symptoms of women in the experimental group compared to women in the control group.

H_1: Care provided in accordance with the energy conservation subcomponent of Levine's conservation model increases sleep quality by decreasing the fatigue of women in the experimental group compared to women in the control group.

H_2: Care provided in accordance with the protection of energy, and structural, personal and social integrity subcomponents of Levine's Conservation Model decreases the symptoms of postpartum depression by increasing the well-being of women in the experimental group compared to women in the control group.

Methods

Study design

The research is a single blind pretest-posttest randomized controlled experimental study. An informed written consent form was obtained from all the puerperae who met the inclusion criteria and agreed to participate in the study. The design and reporting of the study was prepared in accordance with the Consolidated Standards of Reporting Trials (CONSORT) guidelines (Schulz et al., 2011).

Participants

One hundred twenty primiparous puerperae who gave birth vaginally in two hospitals in a provincial center in eastern Turkey between July 2019 and April 2020 were included in the study and monitored. The inclusion criteria were as follows: (1) being in the age range of 18–35 years; (2) being a primipara, (3) being able to read and understand Turkish, (4) having given birth to a full-term baby vaginally, (5) not having had a risky situation during pregnancy and delivery because experiencing a risky situation can negatively affect interventions, (6) getting a score of 12 or more from the Edinburgh Postpartum Depression Scale (EPDS) since the cut-off point of the EPDS scale is 12, (7) having a hemoglobin value of at least 10.0 mg/dl (Women whose hemoglobin value was low were not included because hemoglobin value may affect fatigue and depression), and (8) having no current or past history of psychiatric illness.

Sample size

The minimum sample size was calculated as 120 people (60 in the experimental group, 60 in the control group) using the G*Power 3.1.9.7 program (effect size d: 0.5, power: 80%; $\alpha = 0.05$) (Özcan et al., 2017). In the present study, eight women were excluded: because of them, three moved to another city, three was unable to communicate, and two withdrew from the study willingly (Fig. 1). In the final analysis, 112 women were included.

Randomization

Primiparous puerperae were called and invited to the hospital on the seventh day after giving birth. The VAS-F and the EPDS were administered by a midwife who worked in the clinic besides the researchers when the puerperae presented to the hospital. The puerperae whose scores were appropriate, and who met the inclusion criteria and agreed to participate in the study were enrolled in the study based on their arrival time. The randomization applied to the participants was performed by the midwife working in the clinic. This was performed to reduce bias. Simple randomization was performed by the statistician using the https://www.randomizer.org/ program on the computer. A sealed envelope method was used in randomization; half of the women were randomly assigned to the experimental group ($n = 56$) and the other half to the control group ($n = 56$). The puerperae did not know which group they were in when they were assigned into the experimental and control groups. Pretests were given to the puerperae assigned by the researcher into the experimental and control groups. The puerperae were then subjected to interventions performed in whatever

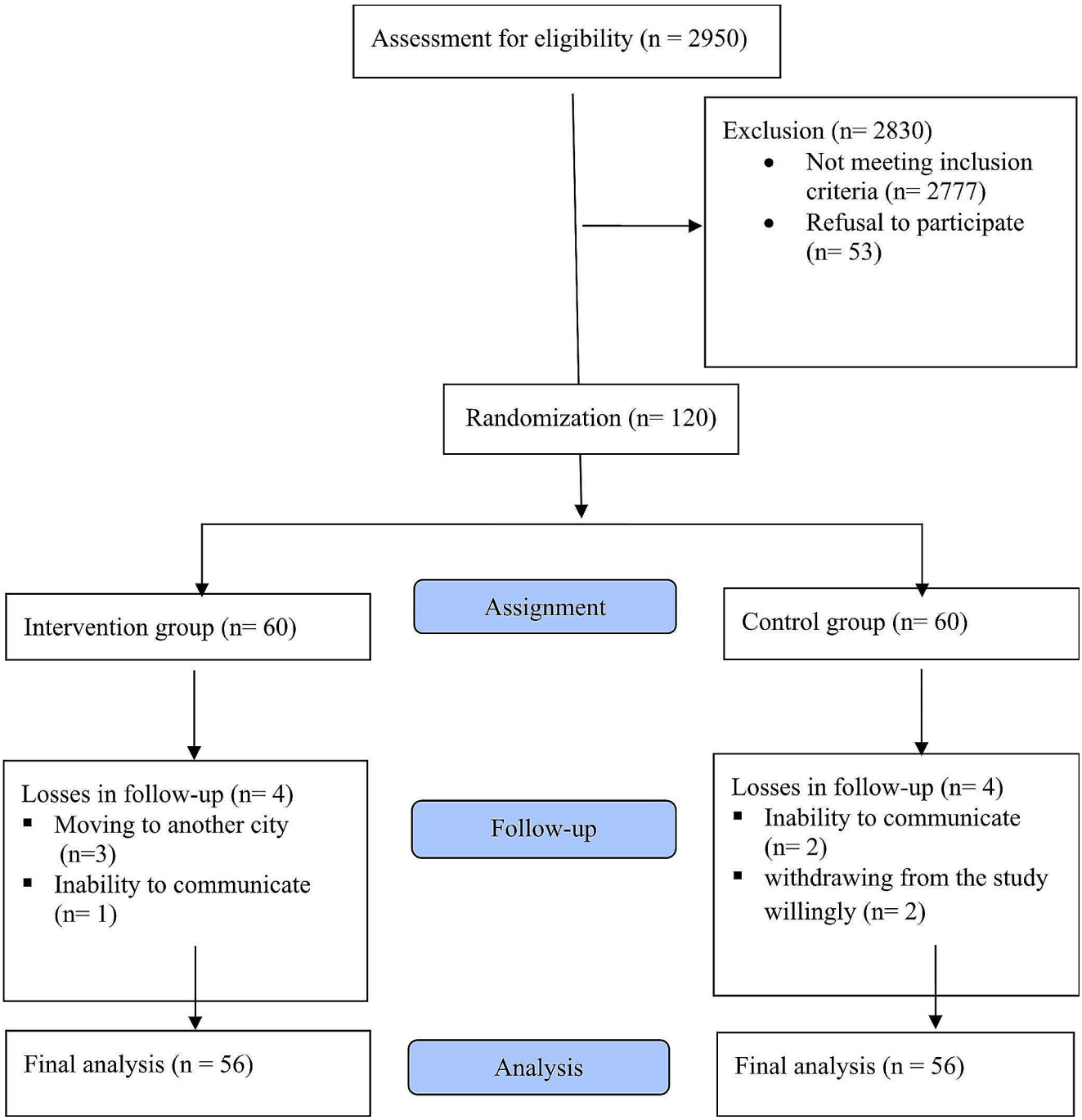


Fig. 1 CONSORT diagram flow

group they were assigned to. However, due to the nature of the intervention, it was not possible to blind the researcher who provided the care.

Intervention

To reduce postpartum depression, a nursing care program was created by examining the theoretical structure of LCM and previous studies (Evcili et al., 2020; Levine, 1988, 1989; Ozcan & Eryilmaz, 2021). Seven home visits were paid and a nursing care program was implemented under the guidance of LCM. The first home visit was paid on the 8th day of postpartum and pretest data were collected with the Personal Information Form, Postpartum Physical Symptom Severity Scale (PPSSS), Postpartum Sleep Quality Scale (PSQS) and Postpartum Support Scale (PSS). During the first home visit, problems related to women's breastfeeding were discussed, and breastfeeding education

was given to them. Although the participating women were informed about breastfeeding before they were discharged from the hospital, they had difficulty in breastfeeding. The main problems they had with breastfeeding were as follows: nipple cracking, insufficient milk supply and insufficient suckling power of the infant. The first four home visits were paid once a week and the remaining three home visits were paid every 15 days.

The second home visit was between the 15th and 17th days after birth. During the second home visit, women were given training on personal hygiene, episiotomy care for those with episiotomy, lochia control and nutrition. These trainings were given to preserve structural integrity.

The third home visit took place between the 22nd and 24th days. During the third home visit, the women were given training on fatigue and sleep problems to preserve their energy. In the same session, the participating women were informed about how they could help their babies sleep, how their babies could sleep better (e.g., keeping the baby asleep in dim light or darkness, not changing the baby's diapers at night if possible, not communicating with the baby in a stimulating way at night). In Turkey, someone stays with the puerpera during the first 40 days of postpartum to help her with housework and baby care. Support was sought from their spouses or other family members to help the women sleep comfortably through the night.

The fourth home visit was between the 29th and 30th days. Pilates exercises were performed to preserve women's energy and personal integrity. During the fourth home visit, the researcher who was a Pilates instructor taught the puerperae how to do Pilates exercises by demonstrating the exercises. All the puerperae were able to perform Pilates exercises, and no puerperae quitted Pilates exercises. The Pilates exercises included 15 basic movements [Shoulder Bridge, the Hundred, Leg Pull, Swimming, Double-Leg Stretch, Double-Leg Kick, Spine Stretch, Spine Twist Supine, Roll-up, Neck Pull, Rolling Back, Teaser, Rocker with Open Legs, Seal Puppy, and Rest Position (stretch and relaxation)] all of which made the entire body muscles of the puerperae work.

The fifth home visit was paid during postpartum 40-45 days. During this home visit, the women were asked to keep a diary in which they could write down their feelings. In order to protect the social integrity of women, home visits were paid and women were advised to keep a diary in which they wrote about their feelings. The researcher provided 24/7 support to the women in the experimental group to help them solve their problems related to breastfeeding, personal hygiene, fatigue, insomnia and nutrition. When women needed help, they were helped through phone calls.

The sixth home visit was paid during postpartum 55-60 days. During the sixth home visit, whether the women did Pilates exercises regularly was questioned, their fatigue, insomnia and mood conditions were evaluated, and the problems they experienced were solved.

The seventh home visit was paid during postpartum 75-80 days. During the seventh home visit, the women's breastfeeding, their sleep patterns, their babies' sleep patterns, their doing Pilates exercises regularly, the diaries they kept, and their emotional states were evaluated. If necessary, previous training was given again.

The eight home visit was paid during postpartum 90-92 days, and the post-test data of the study were collected. All the trainings were given in accordance with each conservation model. All home visits were paid by the first researcher with 10 years of experience in this field. All the trainings were given in accordance with each conservation model. Sleep and fatigue training on energy conservation, training on personal hygiene, nutrition, and episiotomy care to conserve structural integrity (to ensure the rapid healing of episiotomy without infection), and training on Pilates exercises for the protection of personal integrity were prepared in line with the literature based on the module (James, 2014; Wilson et al., 2019). Each training lasted an average of 45-50 minutes. In addition, the conceptual-theoretical-experimental structure of the research was shown in Figure 2.

Applications undergone by the control group

The primiparous puerperae in the control group received routine postpartum care. Standard nursing care includes only breastfeeding education, women's psychological states are not monitored and no home visits are paid. Pretest data were collected when women in the control group were called to the hospital on the 7th day after birth with the Personal Information Form, VAS-F, EPDS, PPSSS, PSQS, and PSS. The final test data were collected during postpartum 90–92 days with the same scales. After collecting the posttest data, the control group was given all trainings and training booklets. Considering the ethical dimension of the study, the women in the control group were also given training on sleep, fatigue and Pilates exercises. After the training was completed, they were given brochures about the subjects on which they were trained.

Data collection tools

Data were collected with the Personal Information Form, VAS-F, Postpartum Physical Symptom Severity Scale (PFSSS), Postpartum Sleep Quality Scale (PSQS), EPDS and Postpartum Support Scale (PSS).

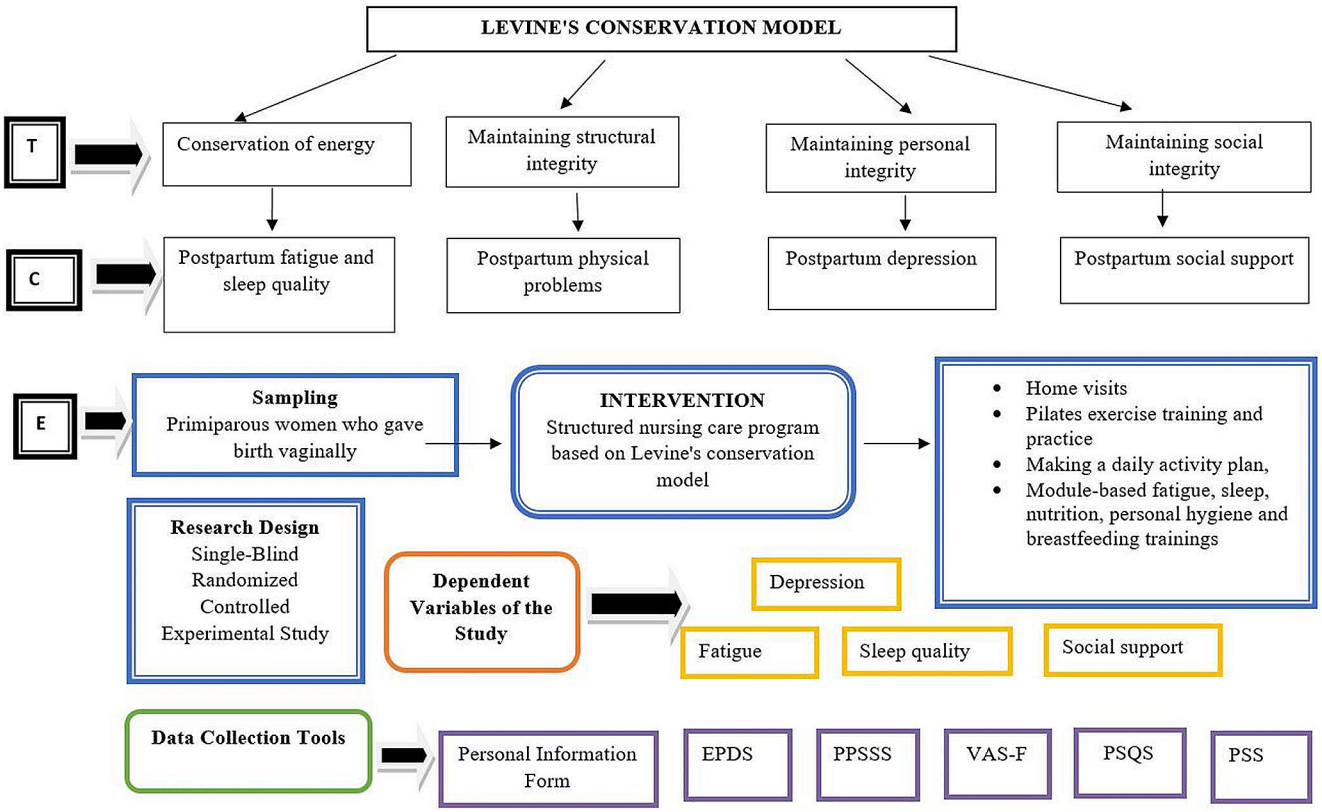


Fig. 2 Theoretical (T)- Conceptual (C)-Experimental (E) structure of the study based on Levine's conservation model

Personal information form This form consists of seven items questioning the sociodemographic and obstetric characteristics of the participating women.

Visual Analogue Scale for Fatigue (VAS-F) The VAS-F adapted into Turkish by Yurtsever and Beduk (2003) was used to assess the fatigue level. It consists of 18 items. While 13 of the items measure fatigue levels, 5 of them measure energy levels. The scale has a horizontal line of 10 cm with positive expressions at one end and negative expressions at the other end of each item. The patient marks a point on the line corresponding to the severity level of his/her feeling. Then, the point marked for each item is measured with a ruler and evaluated objectively. The highest and lowest possible scores that can be obtained from the fatigue sub-dimension are 130 and 0 respectively. The highest and lowest possible scores that can be obtained from the energy sub-dimension are 50 and 0 respectively. High scores obtained from the items that measure fatigue and low scores obtained from the items that measure energy indicate that the severity level of fatigue is high. In the present study, the Cronbach's α value was 0.798 at the pretest and 0.786 at the post-test for the fatigue sub-dimension, and 0.843 at the pretest and 0.834 at the post-test for the energy sub-dimension.

Postpartum physical symptom severity scale (PPSSS) The PFSSS adapted into Turkish by Arkan and Egelioğlu Çetişli (2017) consists of 18 items that question the prevalence and continuity of postpartum physical symptoms. The lowest and highest possible scores that can be obtained from the scale are 0 and 54 respectively. An increase in the score obtained from the scale indicates that the severity level of postpartum physical symptoms is high. The Cronbach's α value of the scale in the present study was 0.856 at the pretest and 0.843 at the post-test.

Postpartum sleep quality scale (PSQS) The PSQS adapted into Turkish by Boz and Selvi (2018) is a 14-item scale used to measure women's postpartum insomnia and sleep quality levels. The lowest and the highest possible scores that can be obtained from the scale are 0 and 56 respectively. An increase in the score obtained from the scale indicates that the quality of sleep is poor. The Cronbach's α value of the

scale in the present study was 0.863 at the pretest and 0.876 at the post-test.

Edinburgh postpartum depression scale (EPDS) The 10-item EPDS used to diagnose postpartum depression was adapted to Turkish by Engindeniz et al. (1996). While the minimum possible score that can be obtained from the EPDS is 0, the maximum possible score is 30. A score of 12 or more obtained from the EPDS indicates that women are at risk of depression. The Cronbach's α value of the EPDS in the present study was 0.791 at the pretest and 0.843 at the post-test.

Postpartum support scale (PSS) The PSS adapted to Turkish by Ertürk and Karaca Saydam (2007) consists of two parts: "The Importance of the Need" and "the Support Received" for this need. In each part of the scale, there are four subdimensions: financial support, emotional support, information support and comparison. The scale consists of 34 items. While the lowest possible score that can be obtained from the scale is 0, the highest possible score is 238. The higher the total score is, the greater the need for support is. The Cronbach's α value of the scale in the present study was 0.878 at the pretest and 0.899 at the post-test.

Analysis of the data

The data were analyzed in the IBM SPSS Statistics Standard Concurrent User V 25 (IBM Corp., Armonk, New York, USA) statistical package program. Dependent variables of the study are as follows: VAS-F score, PSQS score, PPSSS score, EPDS score and PSS score. Independent variable of the study is as follows: Nursing care prepared under the guidance of LCM. The number of units (N), percentage (%), mean ± standard deviation (x ± SD), median (M), 25th percentile (Q1) and 75th percentile (Q3) were used in descriptive statistics. Exact method of the chi-square test was used to compare groups with categorical variables. Inter- and intra-group comparisons of the scale scores obtained at the pretest and posttest were performed with the two-way repeated measures analysis of variance. In the intra-group comparisons of the categorical variables, the McNemar test was used. Inter scale associations were evaluated using Pearson's correlation analysis. *P*-values less than 0.05 were considered statistically significant.

Ethical principles

Before the study was conducted, approval was obtained from Erzincan Binali Yıldırım University clinical research ethics committee (dated: December 26, 2018 and numbered: 33216249–604.01.02-E.57786). Permission was also obtained from the hospitals where the research was to be carried out. Written informed consent was obtained from the primiparous puerperae who participated in the study. The participants were told that their identity and personal information would be kept confidential and that they could withdraw from the study at any time. The study was conducted in accordance with the principles of the Helsinki Declaration.

Results

There was no significant difference between the primiparous puerperae in the experimental and control groups, in terms of the independent variables such as age, educational status, working status, monthly income, receiving help with housework, and duration of help received while housework is done (Table 1).

Effectiveness of energy conservation applications

The mean scores obtained from the VAS-F at the post-test by the women in the experimental group were significantly lower than were those obtained by the women in the control group ($F = 95.310$, $p < 0.001$). The effect size of this difference (Cohen's d) was determined as 1.844503, which indicated that the effect of the interventions was high. This was also valid for the postpartum sleep quality. The mean scores obtained from the PSQS-Total at the post-test by the women in the experimental group were significantly lower than were those obtained by the women in the control group ($F = 142.696$, $p < 0.001$). A low score indicates that sleep quality has improved. The effect size of this difference (Cohen's d) was determined as 2.259196, which indicates that the effects of the interventions performed in the experimental group were very high. All the data on fatigue, energy and sleep quality of the women in the experimental and control groups were given in Table 2.

Effectiveness of the structural integrity conservation applications

The PPSSS pretest mean scores of the women in the experimental and control groups were 19.07 ± 5.51 and 18.63 ± 5.77, respectively, and there was no statistically significant difference between them ($F = 0.175$; $p = 0.676$). However, the PPSSS posttest mean scores of the women in the experimental and control groups were 4.96 ± 2.06 and 19.98 ± 5.73, respectively, and there was a statistically significant difference between them ($F = 341.032$; $p < 0.001$). The post-test mean scores of the women in the experimental

Table 1 Comparison of the participants' socio-demographic characteristics by group

	Groups		Test Statistics	
	Experimental $n=56$	Control $n=56$		
Age				
$\overline{x} \pm ss$	25.8 ± 4.2	25.1 ± 4.2	$t=0.867$	$p=0.388$
Education Status				
Primary school graduate	9 (16.1)	9 (16.1)	$\chi^2=3.602$	$p=0.476$
High school graduate	17 (30.4)	14 (25.0)		
Associate degree	8 (14.3)	14 (25.0)		
Bachelor's degree	21 (37.4)	16 (28.6)		
Master's degree	1 (1.8)	3 (5.4)		
Employment Status				
Employed	12 (21.4)	17 (30.4)	$\chi^2=1.163$	$p=0.388$
Unemployed	44 (78.6)	39 (69.6)		
Monthly Income ($)				
$M\ (Q_1\text{-}Q_3)$	365.1 (278.8–511.8)	329.1 (286.6–430.1)	$z=0.134$	$p=0.893$
Receiving help for doing housework at the pretest				
Yes	34 (60.7)	34 (60.7)	$\chi^2=0.000$	$p=1.000$
No	22 (39.3)	22 (39.3)		
Duration of help for doing housework at the pretest				
$M\ (Q_1\text{-}Q_3)$	2.5 (1.0–5.0)	2.5 (1.7–4.0)	$z=0.063$	$p=0.950$
Receiving help for doing housework at the posttest				
Yes	31 (55.4)	34 (60.7)	$\chi^2=0.330$	$p=0.702$
No	25 (44.6)	22 (39.3)		
Duration of Help for doing Housework at the posttest				
$M\ (Q_1\text{-}Q_3)$	4.0 (2.0–5.0)	2.5 (1.7–4.0	$z=0.993$	$p=0.321$

t independent samples t-test; χ^2 Chi-square exact test, *z* Mann–Whitney *U* test

Q1: 25. percentage value, Q3: 75. percentage value

group were significantly lower than were those of the women in the control group, and the effect size of the difference (Cohen's d) between them was 3.488475, which suggests that the effects of the interventions performed in the experimental group were very high.

Effectiveness of the personal integrity conservation applications

The EPDS pretest mean scores of the women in the experimental and control groups were 14.75 ± 2.88 and 16.09 ± 3.55, respectively, and there was a statistically significant difference between them (F = 4.808; $p=0.030$). The effect of this difference (Cohen's d) was [(16.09—14.75) / 3.232406 = 0.414552] and it was considered as minimal. The EPDS posttest mean scores of the women in the experimental and control groups were 5.59 ± 3.74 and 15.45 ± 2.21, respectively, and there was a statistically significant difference between them (F = 288.476; $p<0.001$). The post-test mean scores of the women in the experimental group were considerably lower than were those of the women in the control group, and the effect size of the difference (Cohen's d) between them was 3.209862, which was considered quite high. Although there was a difference between the pre-test mean scores in terms of depression, the effect size of the difference between the post-test mean scores was much higher, which indicates that the interventions were very effective. Risk status of the women in the experimental and control groups according to their pretest and posttest scores obtained from the Edinburgh Postpartum Depression Scale were given in Table 3.

Effectiveness of social integrity conservation applications

Pretest scores obtained from the overall PSS and its financial support, emotional support, information support and comparison sub-dimension of received support section were similar in the experimental and control groups. However, there was a statistically significant difference between the experimental and control groups in terms of their posttest scores obtained from the overall PSS and all its sub-dimensions. The statistical values and effect sizes of all the women in the experimental and control groups regarding the mean scores for the overall PSS and its subscales were given in detail in Table 4.

Discussion

In the present study, the reduction in the risk of postpartum depression with care given under the guidance of LCM was examined. At the beginning of the study, 83.9% of the women in the experimental group and 92.9% of the women in the control group were at risk of depression (Table 3). At the end of the study, depression risk decreased to 8.9%

Table 2 Comparison of Visual Analogue Scale for Fatigue and Postpartum Sleep Quality Scale values by groups

Scales/Subscales	Measurements	Groups				Between Groups Test Statistics		Model Statistics*		
		Experimental ($n=56$)		(Control $n=56$)						
		$\overline{x}$	ss	$\overline{x}$	ss	F	p	Source Of Effect	F	p
Visual Analogue Scale for Fatigue/ Fatigue	**Pretest**	62.89	19.88	76.89	22.72	12.041	0.001	Group	60.562	< 0.001
	Posttest	40.38	16.26	76.46	22.38	95.310	< 0.001	Measurement	28.525	< 0.001
	Intra-group TS	$F=54{,}398$; $p<0.001$		$F=0.020$; $p=0.888$				Group X Measurement	26.434	< 0.001
Cohen's *d* = (76.46—40.38)/19.560828 = 1.844503										
Visual Analogue Scale for Fatigue/ Energy	**Pretest**	25.93	8.32	26.70	8.56	0.232	0.631	Group	7.355	0.008
	Posttest	34.52	8.93	26.41	8.55	24.072	< 0.001	Time	21.345	< 0.001
	Intra-group TS	$F=45{,}679$; $p<0.001$		$F=0{,}051$; $p=0.823$				Group X Measurement	24.384	< 0.001
Cohen's *d* = (26.41—34.52)/8.742065 = 0.927698										
Scales/Subscales	Measurements	Groups				Between Groups Test Statistics		Model Statistics*		
		Experimental ($n=56$)		Control ($n=56$)						
		$\overline{x}$	ss	$\overline{x}$	ss	F	p	Source Of Effect	F	p
Postpartum Sleep Quality Scale/Total	**Pretest**	29.82	7.27	24.48	7.36	14.912	< 0.001	Group	20.712	< 0.001
	Posttest	9.71	5.81	24.79	7.44	142.696	< 0.001	Measurement	161.116	< 0.001
	Intra-group TS	$F=332.187$; $p<0.001$		$F=0.076$; $p=0.784$				Group X Measurement	171.147	< 0.001
Cohen's *d* = (24.79—9.71)/6.674942 = 2.259196										
Postpartum Sleep Quality Scale/Sleep problems related to baby care	**Pretest**	13.50	3.96	11.84	3.25	5.884	0.017	Group	16.699	< 0.001
	Posttest	5.73	3.30	11.89	3.30	97.714	< 0.001	Time	118.649	< 0.001
	Intra-group TS	$F=240.605$; $p<0.001$		$F=0.011$; $p=0.915$				Group X Measurement	121.968	< 0.001
Cohen's *d* = (11.89—5.73)/3.3 = 1.866667										
Postpartum Sleep Quality Scale/Sleep problems related to physical symptoms	**Pretest**	8.46	3.03	7.05	3.35	5.459	0.021	Group	24.726	< 0.001
	Posttest	1.43	1.50	7.11	3.34	134.747	< 0.001	Time	103.498	< 0.001
	Intra-group TS	$F=210.184$; $p<0.001$		$F=0.012$; $p=0.912$				Group X Measurement	106.698	< 0.001
Cohen's *d* = (7.11—1.43)/2.588977 = 2.193917										
Postpartum Sleep Quality Scale/Good sleep quality	**Pretest**	7.86	2.14	5.59	2.43	27.578	< 0.001	Group	2.042	0.156
	Posttest	2.55	2.27	5.79	2.44	52.638	< 0.001	Time	82.933	< 0.001
	Intra-group TS	$F=178.870$; $p<0.001$		$F=0.245$; $p=0.621$				Group X Measurement	96.183	< 0.001
Cohen's *d* = (5.79—2.55)/2.356533 = 1.374901										

*F: Two-way analysis of variance in repeated measurements; *TS*: Test statistics

Table 3 Inter- and intra-group comparisons of risk statuses with Edinburgh Postpartum Depression Scale (EPDS) values

Scale	Measurements	Groups				Between Groups Test Statistics		Model Statistics*		
		Experimental ($n=56$)		Control ($n=56$)						
		$\overline{x}$	ss	$\overline{x}$	ss	F	p	Source Of Effect	F	p
EPDS	**Pretest**	14.75	2.88	16.09	3.55	4.808	0.030	Group	178.880	< 0.001
	Posttest	5.59	3.74	15.45	2.21	288.476	< 0.001	Measurement	133.678	< 0.001
	Intra-group TS	$F=233.443$; $p<0.001$		$F=1.150$; $p=0.286$				Group X Measurement	100.914	< 0.001
Cohen's *d* = (15.45—5.59)/3.071783 = 3.209862										
EPDS Risk Status		No Risk *n* (%)	Risk *n* (%)	No Risk *n* (%)	Risk *n* (%)	χ^2	p			
	Pretest	9 (16.1)	47 (83.9)	4 (7.1)	52 (92.9)	2.176	0.237			
	Posttest	51 (91.1)	5 (8.9)	0 (0.0)	56 (100)	93.639	< 0.001			
	Intra-group TS	$p<0.001$**		-						

*F: Two-way analysis of variance in repeated measures; **McNemar test; χ^2: Chi-square exact test; *TS*: Test statistics

in the women in the experimental group, but increased to 100% in the women in the control group (Table 3). These results indicate that if women at risk of postpartum depression are not intervened, the risk increases even more. In the present study, of the participating women, those who were at risk of postpartum depression were intervened by providing holistic care based on the nursing model. Many different interventions have been noted in the literature to prevent postpartum depression. Among them are hypnosis, cognitive behavioral therapy, counseling (Widiasih et al., 2021),

Table 4 Comparison of the Received Support sub-dimension of the Postpartum Support Scale values by groups

Scales	Measurements	Groups				Between Groups Test Statistics		Model Statistics*		
		Experimental ($n=56$)		Control ($n=56$)						
		$\overline{x}$	ss	$\overline{x}$	ss	F	p	Source Of Effect	F	p
Total	**Pretest**	124.80	42.59	112.39	34.98	2.840	0.095	Group	**22.045**	**< 0.001**
	Posttest	150.39	25.21	114.29	33.34	**41.797**	**0.001**	Measurement	**11.784**	**0.001**
	Intra-group TS	$F=$**20.434**; $p<$**0.001**		$F=0.112$; $p=0.739$				Group X Measurement	**8.7610**	**0.004**
Cohen's *d* = (114.29—150.39)/29.555877 = 1.221415										
Financial Support	**Pretest**	36.30	14.17	32.55	12.07	2.273	0.135	Group	**6.765**	**0.011**
	Posttest	38.32	8.24	33.34	11.02	**7.345**	**0.008**	Time	1.000	0.320
	Intra-group TS	$F=1.036$; $p=0.311$		$F=0.157$; $p=0.693$				Group X Measurement	0.193	0.661
Cohen's *d* = (33.34—38.32)/9.7298 = 0.51183										
Emotional Support	**Pretest**	35.73	13.80	30.98	11.55	3.902	0.051	Group	**24.630**	**< 0.001**
	Posttest	44.43	8.21	31.57	11.60	**45.805**	**< 0.001**	Time	**13.919**	**< 0.001**
	Intra-group TS	$F=$**24.417**; $p<$**0.001**		$F=0.112$; $p=0.738$				Group X Measurement	**10.610**	**0.001**
Cohen's *d* = (31.57—44.43)/10.048983 = 1.279732										
Information support	**Pretest**	39.63	15.90	34.50	10.97	3.940	0.050	Group	**20.443**	**< 0.001**
	Posttest	45.63	9.04	35.00	10.62	**32.510**	**< 0.001**	Time	**5.189**	**0.025**
	Intra-group TS	$F=$**8.843**; $p<$**0.001**		$F=0.061$; $p=0.805$				Group X Measurement	3.715	0.056
Cohen's *d* = (35—45.63)/9.861694 = 1.077908										
Comparison	**Pretest**	13.14	9.05	14.36	6.92	0.637	0.427	Group	**9.902**	**0.002**
	Posttest	22.02	5.18	14.38	6.84	**44.444**	**< 0.001**	Time	**25.615**	**< 0.001**
	Intra-group TS	$F=$**51.024**; $p<$**0.001**		$F=0.001$; $p=0.989$				Group X Measurement	**25.410**	**< 0.001**
Cohen's *d* = (14.38—22.02)/6.067042 = 1.259263										

*F: Two-way analysis of variance in repeated measures; TS: Test statistics

exercise, individualized home visits by nurses or midwives, providing support by phone, and spousal support (McCurdy et al., 2017). These interventions have also been successful in reducing depression. Although many interventions have been made to prevent postpartum depression, there has been no previous study conducted to determine how to reduce the risk of postpartum depression with care provided using the nursing model. The present study is the first study indicating that women's postpartum depressive moods can be intervened if nurses and midwives focus on holistic care. Postpartum care requires a holistic perspective, which can be provided by nursing models. One of the models that will provide this perspective is LCM.

LCM has four conservation principles (Levine, 1989). The first is the conservation of energy. It is known that women's energy balance is impaired in the postpartum period and their need for physical energy increases (Evcili et al., 2020). Planning and implementing of all the nursing interventions individually in accordance with the LCM are very important in maintaining the energy of the individual and reducing his or her fatigue level (Levine, 1989). Fatigue occurs if energy cannot be adequately maintained. In the present study, the sleep quality of the women in the experimental group improved and their fatigue levels decreased compared to those of the women in the control group (Table 2). The effect sizes of the interventions undergone by the women in the experimental group ranged between 0.9276 and 2.2591 (Table 2), which indicates that the interventions implemented were quite effective. In the present study, the participating women were given face-to-face training to improve their sleep quality. In addition, although they were given information on how they could help their babies sleep better, whether the babies' sleep improved or not was not evaluated because it was not within the aims of the present study. Future studies may focus on the effect of babies' sleep quality on mothers' sleep, fatigue, and depressive mood. In previous studies, face-to-face training has also been shown to be very useful in reducing fatigue and improving sleep quality in the postpartum period (Gholami et al., 2017; Gholami and Bahadoran, 2018). In the literature, postpartum exercises (Yang & Chen, 2018), especially Pilates exercises (Ashrafinia et al., 2014; Ko et al., 2015) have been shown to reduce postpartum fatigue and depression. In addition, in the present study, Pilates exercises were performed to increase the energy of the puerperae at risk of postpartum depression. After these interventions, the fatigue of the puerperae decreased and their energy increased. These results are similar to those of previous studies (Ashrafinia et al., 2014; Ko et al., 2015; Ozcan & Eryilmaz, 2021). In the present study, the improvement in the participating women's sleep quality and a decrease in their fatigue levels may have made them feel better because one of the most challenging problems for women during the postpartum period is insomnia and fatigue. In a study conducted in Turkey, it was determined that women's suffering from fatigue ($r = 0.397$; $p < 0.001$) and insomnia ($r = 0.441$; $p < 0.001$) in the postpartum period was associated with postpartum depression (Ozdemir & Ozcan, 2023).

The second principle of LCM is the preservation of structural integrity. According to Levine, the primary responsibility of nurses in maintaining an individual's structural integrity is to focus on the individual's recovery process (Levine, 1989). In order for a person to recover as soon as possible, he or she must first have a strong immune system. In a study, it was found that women had insufficient knowledge of healthy eating and that poor nutrition damaged their immune system (Snyder et al., 2020). Episiotomy performed at birth causes pain and discomfort in women and negatively affects their performing activities of daily living (He et al., 2020). In addition, breastfeeding problems such as nipple cracks are common in women who give birth for the first time, usually due to lack of experience and knowledge (Shafaei et al., 2020). Postpartum women feel constant pain due to episiotomy and breast problems, which causes stress (He et al., 2020; Shafaei et al., 2020). Healing of episiotomy and nipple crack is important in maintaining structural integrity. In accordance with the literature information, face-to-face nutrition and hygiene trainings were given in the present study to the puerperae in the experimental group to strengthen their immune system, to accelerate wound healing and to prevent them from getting infection. Protecting women's physical health during the postpartum period can also have a positive effect on their psychological health because health is a state of well-being in every respect. While the women in the experimental and control groups obtained similar mean scores from the PSS at the pretest, there were significant differences between their scores at the posttest. It was determined that LCM-guided care for the structural integrity conservation sub-component improved the well-being of the puerperae in the experimental group compared to the puerperae in the control group, maintained their structural integrity and reduced the risk of postpartum depression.It was determined that focusing on women's nutrition, wound healing, and breastfeeding problems to preserve their structural integrity is quite effective.

The third principle of LCM is the preservation of personal integrity. Levine states that the conservation of personal integrity depends on the individual's self-knowledge and self-respect (Levine, 1989). Hormonal changes in the postpartum period make women highly susceptible to psychiatric disorders (Fellmeth et al., 2019). In the present study, the puerperae in the experimental group at risk of postpartum depression were asked to do Pilates exercises. They were advised to keep a diary. In addition, home visits

were paid at regular intervals to provide support to the primiparous puerperae, and constant telephone support was provided. It was found that the risk of depression decreased from 83.9% to 8.9% in the experimental group. Shorey et al. (2015) found that home visits, training, and telephone support improved women's psychological well-being. The World Health Organization (WHO) has also emphasized the impact of postpartum home visits on solving physical and mental health problems (WHO, 2013). In addition, Pilates exercises have also been found to reduce postpartum fatigue and depression (Ashrafinia et al., 2014; Ko et al., 2015). In the present study, LCM-guided care for the personal integrity conservation sub-component maintained personal integrity and reduced the risk of postpartum depression in the women in the experimental group compared to those in the control group.

The fourth principle of LCM is the conservation of social integrity. According to Levine, the support that an individual receives from her social environment is very important for the conservation of social integrity (Levine, 1989). The more adequate the social support women receive during the postpartum period is, the less likely they are to experience postpartum depression (Vaezi et al., 2019). In a study, it was found that the educational support and informative support women received could prevent or reduce postpartum depression (Prevatt et al., 2018). In the present study, home visits were paid at regular intervals to provide social support to the puerperae. During these home visits, they were given trainings on how to solve the problems in advance they might experience. Family members of the puerperae were encouraged to provide social support. In addition, during times other than home visits, the researcher provided support to the puerperae by phone. The puerperae who experienced financial difficulties were directed to official institutions and organizations offering social assistance. In the current study, the risk of depression decreased in the puerperae in the experimental group receiving high level of social support. The level of social support provided to the puerperae in the experimental group increased compared to that of the puerperae in the control group, their communication with the social environment and their social integrity were maintained, and the risk of developing postpartum depression decreased with LCM model-guided care for the social integrity conservation sub-component.

Limitations

The present study has a few limitations. One of the limitations is that the researcher was not blinded. Due to the nature of the study, it was not possible to blind the researcher. However, the patients were blinded. Another limitation of the present study was that the individual effect levels of many interventions applied to reduce postpartum depression were unknown. For instance, it was not possible to determine the effect of Pilates exercises done by the women on their own. Similarly, not knowing the effect of nutrition education, hygiene, breastfeeding counseling, keeping a diary, and sleep training for mother and baby on each woman was another significant limitation. However, since it is very difficult to measure such parameters in the postpartum period, the effects of all the interventions on the risk of postpartum depression were investigated in general. The other limitation is that the women in the control group underwent only routine applications and that their depressive symptoms were not adequately intervened. Because the participants in the present study were Turkish, its results can be generalized only to the Turkish society. It is recommended that issues investigated in the present study should be tested in different cultures and different health care practices. For instance, the effects of all these practices on postpartum depression may be different in countries in Asia, Europe and America.

Conclusion

All the hypotheses put forward in the present study were confirmed with the analysis conducted. People with high fatigue scores and at risk of developing depression had improved sleep quality and decreased postpartum fatigue, they maintained their structural, personal and social integrity, and that holistic care given under LCM guidance reduced their risk of developing postpartum depression. Thus, we recommend that nursing care given under LCM guidance to primiparous puerperae in the postpartum period should be added to routine care. Interventions should be performed to ensure that mothers feel adequate and well, especially during the postpartum period. In addition, during this period, women's mental health can be negatively affected by even the slightest physical problem, insufficient weight gain of the baby, difficulties in breastfeeding, and the weight remaining from pregnancy. Therefore, providing holistic care during this period has a very good effect on mental health. If any of the interventions such as exercise, training, writing a diary, therapy, calling on the phone or paying a home visit is performed alone, it is not enough. Solving women's problems before they occur with a holistic care that combines all these is very important for women at risk of postpartum depression.

Relevance for clinical practice

The present study provides an example of how depressive symptoms of women with postpartum depressive symptoms can be reduced by nursing care. The results confirm that

postpartum depressive symptoms of women can be reduced by presenting all nursing interventions in the postpartum period together. What is important in such a case is to provide care holistically in the postpartum period. Women in the postpartum period need help and support on many issues. Paying regular home visits and monitoring women closely, especially to solve problems such as breastfeeding problems, baby-related sleep problems, fatigue, lack of hygiene, sedative life, postpartum sadness, and lack of social support reduce the risk of postpartum depression. It is recommended that all women should be screened on the seventh postpartum day using the EPDS, and that those whose score is above 12 should be referred to holistic nursing care.

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Data availability The datasets analyzed in this current study are available from the corresponding author upon reasonable requests.

Declarations

Ethical approval Before the study was conducted, approval was obtained from Erzincan Binali Yıldırım University clinical research ethics committee (dated: December 26, 2018 and numbered: 33216249–604.01.02-E.57786). Permission was also obtained from hospitals where the research was to be carried out. Written informed consent was obtained from primiparous puerperae who participated in the study. The participants were told that their identity and personal information would be kept confidential and that they could withdraw from the study at any time. The study was conducted in accordance with the principles of the Helsinki Declaration.

Clinical trial registry and registration number The name of the name of the trial register: Can Postpartum Depression Be Prevented With Care.
The clinical trial registration number: NCT05295069.
The trial at the registration website: https://clinicaltrials.gov/ct2/show/NCT05295069?cond=postpartum+depression&draw=18&rank=166

Conflict of interest None declared.

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