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RESEARCH ARTICLE

Effects of care given in line with Levine's conservation model on the quality of life of women receiving infertility treatment: A single blind randomized controlled trial

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ABSTRACT

Although infertility is not a life-threatening condition, it decreases the quality of life of people. This single blind randomized controlled trial was conducted with 80 women who received infertility treatment in an IVF Center located in a city center in the west of Turkey between May 2020 and February 2021. It was determined that thanks to the holistic care given in line with Levine's Conservation Model (LCM), fatigue levels of the women in the experimental group decreased, their energy levels increased, their structural, personal and social integrity was conserved and thus their quality of life improved compared to the women in the control group (all $p < 0.001$).

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Background

Infertility is defined as the inability of couples to have children despite unprotected sexual intercourse for 12 or more months (Zegers-Hochschild et al., 2017). Infertility affects approximately 10 to 15% of couples of reproductive age (18–45 years old) (Casu et al., 2018; Shahraki et al., 2018). The incidence of infertility in Turkish society is, on average, 15% (Sezgin & Hocaoglu, 2014). Infertility is a crisis situation that negatively affects the emotional state, social life, marital relationships, sexual life, self-esteem and future plans of couples (Jansen & Saint Onge, 2015; Lakatos et al., 2017; Namavar Jahromi et al., 2018). Most couples define infertility as the most serious crisis they have experienced in their lives (Zeren & Gursoy, 2019). In fact, although infertility is not a life-threatening condition, it decreases the quality of life of individuals (Namdar et al., 2017).

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Today, one of the prominent criteria in determining the development levels of countries is the quality of life of individuals. According to the World Health Organization (WHO), quality of life is defined as the way individuals perceive their own lives within the framework of the culture and values system in which they live regarding their goals, concerns, expectations about life, and living standards (Goker et al., 2018; The WHOQOL Group, 1995). The quality of life is affected by several cultural, psychological, physical and social factors which are the integral parts of their lives (Aduloju et al., 2018). The quality of life of infertile individuals decreases due to tests performed to diagnose and treat infertility, lack of knowledge about the treatment process, and stress and anxiety they experience during the treatment process (Zeren & Gursoy, 2019). Another negative effect of infertility on the quality of life is the social pressure it creates (Jansen & Saint Onge, 2015). Social pressure is a problem that can negatively affect not only those who experience the problem directly, but also their close family members and even other related people and society (Aduloju et al., 2018).

The stressful situation experienced during the infertility treatment process affects the quality of life of both women and men. However, since most of the procedures performed during this period are undergone by women, they feel physically and mentally more tired, sleepless, stressed and depressed (Maroufizadeh et al., 2017). Therefore, the quality of life of women is affected more adversely than that of men (Agostini et al., 2017; Casu et al., 2018; Goker et al., 2018). In a study in which the infertility treatment process (ovarian stimulation, oocyte retrieval, embryo transfer) was investigated, it was determined that the period in which the quality of life decreases most was the embryo transfer period (Agostini et al., 2017). If the first treatment process fails, then the quality of life of infertile women is negatively affected (Maroufizadeh et al., 2017). At the end of these treatment processes, women whose quality of life is negatively affected experience such serious problems as not enjoying life, being unhappy, loss of expectations about life, and depression (Luk & Loke, 2015).

Women receiving infertility treatment need a holistic care which is to meet their physiological, psychological, emotional and social needs (Devine, 2003). However, the framework of appropriate care has not been clearly defined in previous studies. To provide holistic care, a nursing model/theory should be used. In recent years, there has been an increase in theory- and model-based studies conducted with women/couples receiving infertility treatment (Arslan-Ozkan et al., 2014; Durgun Ozan & Okumus, 2017; Ozkan et al., 2013; Safaei Nezhad et al., 2020; Shahbazi et al., 2020; Zaidouni et al., 2019). Nursing care based on Watson's Theory of Human Caring has been determined to reduce the negative effects of infertility

on women receiving infertility treatment and to increase their self-efficacy and adaptation levels (Arslan-Ozkan et al., 2014). Nursing care based on Watson's Theory of Human Caring has been determined to decrease women's anxiety, and to contribute to the effective use of methods in coping with stress during the infertility treatment process or in case the infertility treatment process is unsuccessful (Durgun Ozan & Okumuş, 2017). Nursing counseling provided based on Orem's Theory of Self-Efficacy and Bandura's concept was determined to be effective in reducing stress and increasing self-efficacy in couples receiving infertility treatment (Zaidouni et al., 2019). One of the nursing models that can be used in the care of women receiving infertility treatment is Levine's Conservation Model (LCM).

Levine's conservation model

Myra Estrin Levine defined nursing as human interaction and advocated that people should lead a quality life (Levine, 1988). The three major concepts of LCM are adaptation, integrity and conservation. According to Levine, adaptation is the process in which an individual maintains his or her interaction and integrity with his or her internal and external environment under changing conditions (Levine, 1988). Levine considered an individual's ability to retain his or her adaptation to his or her environment as the assurance of the integrity in all dimensions of life (Levine, 1996). According to Levine, conservation is one of the results of adaptation. Conservation is one of the most critical concepts that should be evaluated in maintaining a person's life. The purpose of LCM is to increase the adaptation of an individual to the situation, and to conserve and maintain their functional integrity by using the conservation principles. Every person is a unique individual, and nurses should bring together their skills, techniques and opinions that they especially plan for the individual while providing care for him or her (Levine, 1996; Mefford, 2004; Mock et al., 2007). Levine developed four conservation principles within the framework of holistic patient care. These principles are aimed at conserving energy, structural integrity, personal integrity and social integrity. According to LCM, nurses should provide patient-centered care while implementing these four principles. Nurses should conserve a person's energy, and structural, personal and social integrity by enabling the person to adapt to the changing situation. LCM was previously used in providing care to preterm babies, older adults, patients with cancer, patients with congestive heart failure and postpartum women, and in improving the quality of postpartum sexual functions, and it has been found to be highly effective (Abumaria et al., 2015; Evcili et al., 2020; Mefford, 2004; Mock et al., 2007; Ozcan & Eryilmaz, 2021; Schaefer & Shober Potylycki, 1993). However, there is

a gap in the literature related to studies in which the effects of infertility treatment on fatigue and quality of life of women were investigated. Therefore, in order to reduce infertile women's fatigue, to improve their quality of life and to increase their energy, arranging nursing care programs based on LCM is of great importance. The aim of the researchers of the present study was to relieve fatigue experienced by women receiving infertility treatment with the holistic care provided in line with LCM, and to improve their quality of life by conserving their structural, personal and social integrity. They also aimed to enable nurses who give care to women receiving infertility treatment under the guidance of LCM to develop a holistic perspective. Because infertility is a multidimensional problem, it would be very beneficial to provide nursing care from a multidimensional (holistic) perspective.

Study hypotheses

H_0: The care given based on the conservation of structural, personal, social integrity sub-component of LCM not change energy levels, fatigue levels, and the quality of life of women in the experimental group compared to the control group.

H_1: The care given based on the conservation of structural, personal, social integrity sub-component of LCM improves the quality of life of women in the intervention group compared to the control group.

H_2: The care given based on the conservation of energy sub-component of LCM increases energy, decreases fatigue levels in women in the intervention group compared to the control group.

Materials and methods

Research design

The present study is a single blind pretest-post-test randomized controlled study. The design and reporting of this study was prepared in line with the Consolidated Standards of Reporting Trials (CONSORT) guidelines (Figure 1).

Research participants

Eighty women who received infertility treatment in an In Vitro Fertilization (IVF) Center located in a city center in the west of Turkey between May 2020 and February 2021 were registered in the study. The inclusion criteria of the study are as follows: (i) having a diagnosis of primary infertility, (ii) having chosen one of the assisted reproductive techniques for the

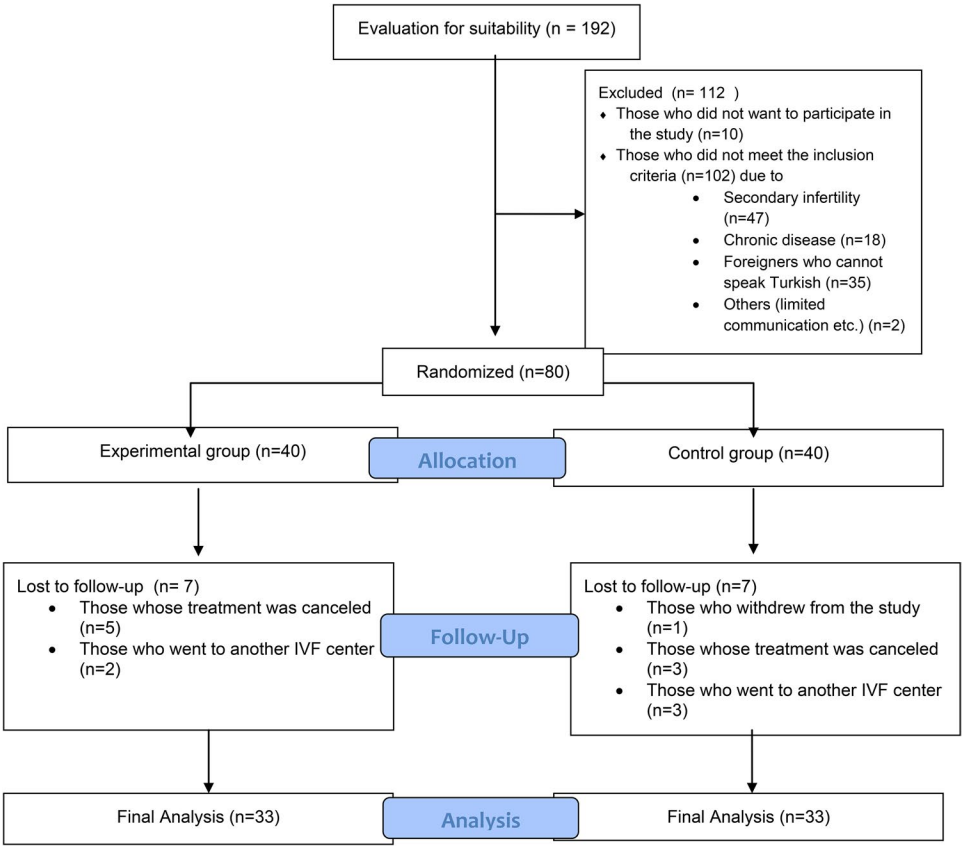

Figure 1. CONSORT diagram. Passage of participants through each trial stage.

treatment, (iii) being able to read and understand a text in Turkish, (iv) having neither current nor past history of psychiatric illness. The exclusion criteria of the study are as follows (i) having a diagnosis of secondary infertility, (ii) being in the diagnostic process for treatment, (iii) having a chronic illness, (iv) being unable to communicate, (v) withdrawing from the study voluntarily.

Sample size

The sample size of the study was calculated as 80 women by a statistician using the G * Power 3.1.5 program referring to Dural et al.'s study (Dural et al., 2016) within one point of deviation, at 95% confidence interval, 80% power and 0.005 significance level. Eighty women were registered in the study. However, because eight women's treatment was canceled, five women went to another IVF center, and one woman left the study voluntarily (Figure 1), the study was completed with 66 women. Of them, 33 were assigned to the experimental group and 33 to the control group.

Randomization

In order to have an equal number of women in the two groups, the 66 women included in the study were assigned to either the experimental or the control group on the computer by using the simple randomization method. The women who met the inclusion criteria and agreed to participate in the study were given sealed envelopes, according to the order of their arrival at the IVF center. According to this method, the participants identified the groups they would be included in by choosing any envelope, but they were not allowed to know which group they would be in.

Blinding

The women were blinded so that they did not know which group they were in. The women in one group did not know what interventions the women in the other group would undergo. The researcher administered the pretests to the women in the experimental and control groups. Later, the women were subjected to the procedures in the group they were assigned to. However, due to the nature of the intervention, it was not possible to blind the researcher who gave care to the women.

Intervention

After the theoretical structure of LCM and studies previously conducted on this issue were reviewed, a nursing care program that can be used in the care of women receiving infertility treatment was created (Levine, 1988; Levine, 1996; Mefford, 2004; Mock et al., 2007; Ozcan & Eryilmaz, 2021). The program was carried out in a quiet room in the IVF center through one-on-one, face-to-face interviews by taking the women's infertility treatment schedule into account (Table 1). The women assigned to the experimental group were interviewed five times when they presented to the IVF center within a period of 10–15 days until the OPU (Oocyte pick-up) day and/or ET (Embryo transfer) day, depending on the conditions of their treatment. The time and content of these five interviews were as follows:

In the first interview (on the second day of infertility treatment), the pretest was administered to the women who received infertility treatment using the Personal Information Form, the Visual Analogue Scale for Fatigue (VAS-F) and Fertility Quality of Life (FertiQol) Questionnaire.

In the second interview (on the fifth day of infertility treatment), the women were given one-on-one, face-to-face training about diet and the effects of the drugs administered and the way they were administered

Table 1. Nursing care given to women based on Levine's Conservation Model and its results.

Conservation principles	Goal	Variables	Nursing interventions	Outcomes of Nursing Care
Conservation of energy	*Conserving women's energy, reducing their fatigue, increasing their quality of life	*Fatigue *Life quality	*On the eighth day of the infertility treatment, the women were given one-on-one, face-to-face training on how to reduce the physical fatigue and how to increase energy during the treatment process using the question-and-answer method. A booklet on the training was given to the women. *On the fifth day of the infertility treatment, the women were given training on diet. A booklet on the training was given to the women. *On the tenth day of the infertility treatment, Yoga exercises were practiced.	*Fatigue decreased. *Quality of life improved. *Energy was conserved.
Conservation of structural integrity	*Protecting women from infection and establishing proper diet	*Prevention of infections *Appropriate administration of medication	*On the fifth day of infertility treatment, the women were given one-on-one, face-to-face training about diet and the effects of the standard drugs administered and the way they were administered using the question-and-answer method. A booklet on the training was given to the women.	*Neither wounds nor infections occurred in the area where the drug was administered. *The structural integrity of the area was conserved. Treatment tolerability increased.
Conservation of personal integrity	*Helping the women feel emotionally well	*Psychological changes	*On the tenth day of the infertility treatment, Yoga exercises were practiced. *On the tenth day of infertility treatment, the women were asked to write down what they experienced and how they felt during the infertility treatment process. *The researcher's phone was available 24/7.	*With the interventions performed, personal integrity was preserved.
Conservation of social integrity	*Increasing social support the women receives, improving their social relations in a positive way	*Social relations *Social support	*The women were assigned to groups including maximum three women in order to increase their social support and to enable them to share their experiences in a group *The researcher's phone was available 24/7. *They were encouraged to share their experiences in the group to make them feel better and to prevent social isolation.	*Social support increased, communication was established with the social environment, and social integrity was conserved.

using the question-and-answer method. A booklet on the training was given to the women.

In the third interview (on the eighth day of the infertility treatment), the women were given a one-on-one, face-to-face training on how to reduce the physical fatigue and how to increase energy during the treatment process using the question-and-answer method. At the end of this 60-minute training, the women were given a booklet on the training.

In the fourth interview (on the tenth day of infertility treatment), the women were asked to write down what they experienced and how they felt during the infertility treatment process. In this interview, the researcher who had a yoga-training certificate taught the women how to perform yoga exercises to help them relax. Before coming to this interview, the women were asked to wear comfortable clothes. The IVF center's exercise room was used to perform yoga exercises. The researcher made the room suitable for performing yoga exercises. Yoga mats, meditation cushions, and piqué were adjusted accordingly. The room was designed to help relaxation. The materials required for designing the room were provided by the researcher. Yoga consists of breathing exercises, asanas (postures) and relaxation exercises. Yoga exercises consist of the following stages: a 5-minute breathing exercise in the standing position, a 5-minute breathing exercise in the sitting position, a 5-minute breathing exercise in the lying position, a 10-minute meditation in the sitting position, and a 15-minute deep meditation in the lying position. During the meditation and deep meditation phases, music was played. The women in the experimental group were assigned to groups of 3–6 people for yoga exercises. Yoga exercises took an average of 40 minutes and at the end of the training, the women were given a booklet about the training.

In the fifth interview (on the thirteenth day of infertility treatment), the women were assigned to groups including maximum three women in order to increase their social support and to enable them to share their experiences in a group. They were encouraged to share their experiences in the group to make them feel better and to prevent social isolation. After this interview was over, the post-test was administered to the women using the VAS-F and FertiQol Questionnaire, and after their views about the interviews were asked, they were farewelled.

Examples of feedbacks given by the women after these five interviews were as follows: "*I could not give an injection to myself before the training. I was very afraid, but now, I can administer the medication better, I pay more attention to my diet, I can sleep better, I feel more relaxed, I feel more competent as a woman, I feel vigorous, I do not feel tired, I started to enjoy life more …*"

The women in the control group underwent only the routine nursing interventions performed in the in vitro fertilization center. Routine nursing interventions included only the monitoring of the vital signs of the women. They did no undergo any other intervention. On the second day of infertility treatment, they were administered the pretest using the Personal Information Form, VAS-F and FertiQol Questionnaire. On the thirteenth day of infertility treatment, they were administered the post-test. After the post-test data were collected, they were given the training on nutrition, fatigue and yoga exercises the same as the one given to the women in the experimental group. In addition, after the researcher taught them how to perform yoga exercises, they were given the booklets on yoga exercises (what they learned in the trainings).

Instruments

The study data were collected using the Personal Information Form, The Visual Analogue Scale for Fatigue (VAS-F), and Fertility Quality of Life Questionnaire (FertiQol)

Personal information form

The form which includes 13 items questioning the participants' socio-demographic and infertility characteristics of women was developed by the researchers.

The visual analogue scale for fatigue (VAS-F)

In the present study, the Visual Similarity Scale for Fatigue adapted to Turkish by Yurtsever and Beduk (2003) was used to measure fatigue in women. This scale consists of 18 items, 13 of which measure fatigue and five of which measure energy. Each item of the scale is rated on a 10-cm horizontal line with positive expressions at one end and negative expressions at the other end. The women marked a point on the line corresponding to the level of their emotions. Then, the marked point was measured with a ruler and assessed objectively. The highest and lowest scores that can be obtained from the fatigue sub-dimension are 130 and 0, respectively. While the highest score that can be obtained from the energy sub-dimension is 50, the lowest score is 0. High scores obtained from the fatigue sub-dimension and low scores obtained from the energy sub-dimension indicate that the severity of fatigue is high. While the Cronbach's α internal consistency coefficient of the 13-item fatigue subscale was 0.90, that of the 5-item energy subscale was 0.74, and the correlations

between the items of the scale were all significantly high (Yurtsever & Beduk, 2003). The Cronbach's α value of the scale in the present study for the fatigue sub-dimension was 0.756 at the pretest and 0.785 at the post-test, and for the energy sub-dimension, it was 0.804 at the pretest and 0.834 at the post-test.

Fertility quality of life (FertiQol) questionnaire

In the present study, the Turkish version of the FertiQol Questionnaire developed by Cetinbas et al. (2014) was used to measure the quality of life of women. The questionnaire has two main modules: the core module and the treatment module. The core module includes 24 item in 4 sub-scales: Emotional, Mind-Body, Relational, and Social.

The emotional subscale includes 6 items that question the effects of negative emotions (such as jealousy, sadness, depression) on the quality of life. The mind-body subscale includes 6 items that question the effect of infertility on physical health, cognition and behaviors. The relational sub-dimension consists of 6 items that question the effect of fertility problems on relationships. The social subscale consists of 6 items that question to what extent social interactions are affected by fertility problems. The "Treatment Module" includes 10 items in 2 sub-dimensions: Treatment environment and Treatment tolerability. The 6-item treatment environment sub-dimension questions to what extent the quality and accessibility of treatment affects the quality of life. In the 4-item treatment tolerability sub-dimension, the extent of mental and physical symptoms resulting from infertility treatment and their effect on daily life are questioned. The responses given to the items are rated on a 5-point Likert type scale. After the scores obtained from the FertiQol Questionnaire are calculated, they are converted to values ranging between 0 and 100. Seven items are reverse scored. For these items, the reverse of the response scale is used. After these items are reverse scored, the total score obtained from the scale is calculated by summing all the subscale item scores multiplied by 25/k where k refers to the number of the items in the desired subscale or total scale. The higher the score is the better the quality of life is. In the present study, the Cronbach's α values calculated for the FertiQol Questionnaire and its subscales at the pretest and post-test were as follows: 0.739 and 0.809 for the emotional subscale, 0.740 and 0.806 for the mind-body sub-dimension, 0.670 and 0.807 for the relational subscale, 0.617 and 0.801 for the social subscale, 0.722 and 0.800 for the treatment environment subscale, 0.707 and 0.777 for the treatment tolerability subscale, and 0.758 and 0.816 for the overall FertiQol Questionnaire.

Ethical considerations

Before the study was started, approval was obtained from Erzincan Binali Yildirim University clinical research ethics committee (dated December 12, 2018 and numbered 33216249-604.01.02-E.54918). In addition, permission was obtained from the in vitro fertilization center where the study was to be conducted. Written informed consent forms were obtained from all the women who agreed to participate in the study. They were told that their personally identifiable information will be kept confidential and they can withdraw from the study whenever they want. The study was conducted in accordance with the Helsinki declaration. During the research process, the women were contacted during their visits to the IVF center, or by phone and/or e-mail, as long as they wanted.

Data analysis

The data were analyzed in the IBM SPSS Statistics Standard Concurrent User V 25 (IBM Corp., Armonk, New York, USA) statistical package program. In the descriptive statistics, numbers (n), percentages (%), arithmetic mean ± standard deviation (x ± SD), and median (M) values were used. The internal consistency of the scales was assessed by the Cronbach's alpha coefficient. The t-test was used for the intra- and inter-group comparisons of the pretest and post-test scores. The chi-square test was used for intra-group comparisons of categorical variables. A p value <0.05 was considered statistically significant.

Results

The nursing interventions performed in this study in line with the four principles of LCM in women undergoing infertility treatment, and outcomes of nursing care are shown in Table 1. There were no significant differences between the women in the experimental and control groups in terms of the independent variables such as age, educational status, place of residence, occupation, monthly income, duration of marriage, and duration of infertility (Table 2).

Evaluation of interventions for energy conservation

While the difference between the fatigue scores obtained by the women in the experimental and control groups at the pretest was not significant ($t = 1.469$, $p = 0.147$), it was significant between those obtained at the post-test ($t = -14.243$, $p < 0.001$). While the difference between the energy scores obtained by the women in the experimental and control groups

Table 2. Comparison of experimental and control groups according to their socio-demographic characteristics.

Variables	Groups: Experimental $n=33$	Groups: **Control $n=33$**	Inter-group test statistics	
Age				
$\overline{X} \pm SD$	34.42 ± 3.17	34.57 ± 3.56	t=-.182	$p=0.856$
Educational Status				
High School Graduate	15 (45.4)	13 (39.3)	χ2 = 0.248	$p=0.618$
Bachelor degree	18 (54.6)	20 (60.6)		
Occupation				
Self-employed	11 (33.3)	11 (33.3)	χ^2=0.983	
Government officer	17 (51.6)	14 (42.5)	$p=0.612$	
Worker	5 (15.1)	8 (24.2)		
Monthly income				
Income less than expenses	28 (84.9)	26 (78.8)	χ^2=0.407	$p=0.523$
Income equal to expenses	5 (15.1)	7 (21.2)		
Duration of marriage (years)				
$\overline{X} \pm SD$	7.06 ± 3.82	6.03 ± 1.87	$t=1.392$	$p=0.171$
Paying the treatment costs				
From her own budget	8 (24.2)	11 (33.3)		
Partly from her own budget partly by the social security	25 (75.8)	22 (66.7)	χ^2=0.665	$p=0.587$
Place of residence				
City center	16 (48.4)	17 (51.6)	χ^2=0.061	$p=0.806$
District	17 (51.6)	16 (48.4)		
Duration of infertility				
1–2 years	6 (18.1)	6 (18.1)		
3–5 years	20 (60.6)	24 (72.8)	χ^2=1.964	$p=0.375$
6–11 years	7 (21.2)	3 (9.1)		
Who is infertile?				
Woman	10 (30.3)	13 (39.4)		
Man	11 (33.3)	11 (33.3)	*χ^2=0.820*	*$p=0.664$*
Both	12 (36.4)	9 (27.2)		

t: Independent Two-sample t Test; χ^2: Chi-square test.

at the pretest was not significant (t = -. 081 $p=0.935$), it was significant between those obtained at the post-test (t = 14.318, $p<0.001$) (Table 3).

Evaluation of interventions for the conservation of structural integrity

While the difference between the scores obtained from the treatment tolerability subscale by the women in the experimental and control groups at the pretest was not significant (t = −1.383, $p=0.171$), it was significant between those obtained at the post-test (t = 7.368, $p<0.001$) (Table 4).

Evaluation of interventions for the conservation of personal integrity

The differences between the scores obtained from the emotional and mind-body subscales by the women in the experimental and control groups at the pretest were not significant (t = −1.808, $p=0.075$, t = 0.555, $p=0.581$, respectively); however, they were significant between those obtained at the post-test (t = 15.522, $p<0.001$; t = 15.905, $p<0.001$, respectively) (Table 4).

Table 3. Comparison of the scores obtained from the Visual Analogue Scale for Fatigue by the Groups.

Subscales of the VAS-F		Groups: Experimental (n = 33) $\bar{X}$	Experimental (n = 33) SD	Control (n = 33) $\bar{X}$	Control (n = 33) SD	Inter-group test statistics t^{**}	Inter-group test statistics p
Fatigue	Pretest	90.66	9.01	87.33	9.41	1.469	0.147
	Post-test	43.66	17.60	94.45	10.47	−14.243	**<0.001**
		t^{*}=14.059; **p < 0.001**		t^{*}=-8.568; **p < 0.001**			
Energy	Pretest	15.57	4.54	15.66	4.54	-.081	0.935
	Post-test	36.06	6.71	15.54	4.75	14.318	**<0.001**
		t^{*}=-14.907; **p < 0.001**		t^{*}=0.237; p = 0.814			

t*: Dependent sample t test; t**: Independent two-sample t test.

Table 4. Comparison of the scores obtained from the FertiQol Questionnaire by the groups.

Subscales of the FertiQol Questionnaire		Groups: Experimental (n = 33) $\bar{X}$	Experimental (n = 33) SS	Control (n = 33) $\bar{X}$	Control (n = 33) SS	Inter-group test statistics t^{**}	Inter-group test statistics p
Emotional	Pretest	30.55	9.23	34.84	10.33	−1.808	0.075
	Post-test	72.09	8.80	35.22	10.42	15.522	<0.001
		t^{*}=-20.450; p < 0.001		t^{*}=-.294; p = 0.770			
Mind-body	Pretest	30.42	9.96	28.91	12.10	0.555	0.581
	Post-test	68.68	7.44	32.44	10.76	15.905	<0.001
		t^{*}=-22.958; p < 0.001		t^{*}=-1.722; p = 0.095			
Relational	Pretest	39.39	9.32	40.65	8.07	-.588	0.558
	Post-test	74.36	9.26	37.50	8.65	16.706	<0.001
		t^{*}=-14.625; p < 0.001		t^{*}=2.111; p = *0.043*			
Social	Pretest	39.01	7.78	41.79	16.15	-.890	0.377
	Post-test	70.32	8.11	39.39	8.53	15.088	<0.001
		t^{*}=-18.828; p < 0.001		t^{*}=0.814; p = 0.422			
Treatment environment	Pretest	57.95	12.02	50.12	11.14	2.742	0.008
	Post-test	88.00	6.89	61.11	12.04	11.135	<0.001
		t^{*}=-13.968; p < 0.001		t^{*}=-6.254; *p < 0.001*			
Treatment tolerability	Pretest	36.17	9.34	39.39	6.52	−1.383	0.171
	Post-test	60.98	12.98	40.34	9.51	7.368	<0.001
		t^{*}=-8.563; p < 0.001		t^{*}=-. 841; p = 0.406			
Total score	Pretest	39.08	6.52	39.28	7.66	-.114	0.909
	Post-test	73.08	5.39	41.04	7.40	20.097	<0.001
		t*=-26.286; p < 0.001		t^{*}=-1.371; p = 0.180			

t*: Dependent sample t test; t**: Independent two-sample t test.

Evaluation of interventions for the conservation of social integrity

Although the differences between the scores obtained from the relational and social subscales by the women in the experimental and control groups at the pretest were not significant (t = -, 588, p = 0.558; t = -, 890, p = 0.377, respectively), they were significant between those obtained at the post-test (t = 16.706, p < 0.001; t = 15.088, p < 0.001, respectively) (Table 4).

In conclusion, while the differences between the scores obtained from the overall FertiQol Questionnaire by the women in the experimental and control groups at the pretest were not significant (t = -, 114, p = 0.909), the differences between the scores obtained at the post-test were significant (t = 20.097, p < 0.001) (Table 4).

Discussion

The infertility treatment process not only is physically painful and emotionally stressful for couples, but also brings about financial burden (Hasanpoor-Azghdy et al., 2014). In this process, the quality of life of women is affected more negatively than that of men (Nagórska et al., 2019). Evaluation of the quality of life of infertile women during the treatment process and evaluation of their ability to cope with conditions that may negatively affect their quality of life are very important for the success of the treatment (Xiaoli et al., 2016). There is a need for holistic nursing care, in order for women to cope with situations that may negatively affect their quality of life. In the present study, the effect of care given to women under the guidance of the LCM, which provides a holistic perspective to the care of women receiving infertility treatment, on their fatigue and quality of life was investigated. It was determined that the care given under the guidance of the LCM significantly reduced the women's fatigue levels and significantly increased their quality of life. It was deemed appropriate to discuss the findings as a whole and in line with Levine's 4 conservation principles.

Conservation of energy

According to Levine (1988), the whole life process mostly depends on an individual's energy production and consumption. Energy is not hidden, and it can be measured, increased and managed. Measuring vital signs and assessing a person's fatigue level in nursing practices is one of the daily measurements of energy parameters. That all nursing interventions implemented within the scope of LCM are aimed at conserving an individual's energy is extremely important (Levine, 1996). Increasing energy production is as important as conserving energy. If energy cannot be conserved, fatigue occurs (Levine, 1988, 1996).

Infertility treatment is a very stressful situation (Galhardo et al., 2013; Oron et al., 2015). This stressful situation also affects women's sleep quality negatively (Kirca & Ongen, 2021). Women whose sleep quality is negatively affected also feel fatigued, which causes them to suffer from stress more. In order to break this vicious cycle, there is a need for interventions aimed at reducing women's stress. In the present study, women in the experimental group were given information how to reduce their fatigue levels through face-to-face trainings and they were informed of the role of diet in conserving their energy. In addition, after they were physically and emotionally relaxed, they were made to perform breathing and relaxation (meditation) exercises and to practice yoga asanas (postures) in order to reduce fatigue. Moreover, in order to make it easier for women to express

their feelings during the treatment process, relaxing instrumental music was played during the sessions. It has been reported that relaxation exercises help reduce fatigue, anxiety and depression (Nekavand et al., 2015). It has been determined that relaxation exercises accompanied with music therapy reduce anxiety and fatigue more (Aba et al., 2017). Yoga has been found to be effective in reducing stress and improving overall quality of life during infertility treatment (Dumbala et al., 2020; Kirca & Pasinlioglu, 2019; Oron et al., 2015). In the present study, after the interventions were performed, fatigue levels of the women in the experimental group decreased significantly and their energy levels increased significantly compared to the women in the control group. On the other hand, fatigue levels of the women in the control group increased significantly. This increase in the control group may have resulted from the uncertainties and difficulties of the infertility treatment process. This increase in the fatigue levels of the women in the control group who did not undergo any interventions during the infertility treatment process indicates how important and necessary it is for the infertility nurse to intervene in the fatigue of women. This result confirms the hypothesis that care given in line with the energy conservation sub-component of the LCM increases the energy levels of women in the intervention group and decreases their fatigue levels compared to women in the control group.

Conservation of structural integrity

According to Levine, the main responsibility of nurses in maintaining the structural integrity of individuals is to plan and implement nursing interventions that will prevent an individual from being injured and will contribute to the healing of wounds if there are any (Levine, 1988, 1996). In order for the individual to recover as soon as possible, first he or she must have a strong immune system. In order to have a strong immune system, the person must have a healthy diet. In a study, it was reported that in the process of infertility treatment, women should be given training on nutrition and that they should be informed about the importance of healthy diet (González-Rodríguez et al., 2018). In another study, it was revealed that most women suffered from malnutrition during the infertility treatment process (Langley, 2014). Therefore, in the present study, the participating women were given information about healthy diet through face-to-face trainings. The fact that women know how to administer drugs they routinely take during the infertility treatment process reduces the risk of drug administration-related infections. Therefore, in the present study, the participating women were given a one-on-one, face-to-face training on what the effects of medication administered were and how

this medication should be administered using the question-and-answer method. While there was no significant difference between the scores obtained from the treatment tolerability sub-dimension by the women in the experimental and control groups at the pretest, there was a significant difference between their post-test scores. After the interventions performed in the present study, the treatment tolerability of the women in the experimental group increased significantly compared to that of the women in the control group. The women in the experimental group developed neither wounds nor infections in the area where the drug was administered, and the structural integrity of the area was conserved.

There were no significant differences between the scores obtained from the treatment tolerability subscale by the women in the control group at the pre- and post-tests. That there was a significant difference between the scores obtained from the treatment tolerability subscale by the women in the experimental and control groups indicates that the women in the experimental group were able to access treatment more easily day by day and that they were satisfied with the quality of the treatment they received. The mean score obtained from the treatment environment sub-dimension by the women in the experimental group was higher, which may have resulted from the fact that they were given detailed information about the treatment process by the researcher.

Conservation of personal integrity

According to Levine, the conservation of personality integrity focuses on the individual's feelings about himself or herself (Levine, 1996). The conservation of personal integrity can be achieved by enabling the individual to make or participate in decisions, by recognizing or respecting him or her as an individual, by providing self-awareness for him or her, and by supporting him or her emotionally (Levine, 1988). Infertility treatment process is a very stressful and exhausting process. Various invasive procedures used in the treatment of infertility, pain, discomfort, fatigue caused by drugs and hormones (Rooney & Domar, 2018), fear of failure of the treatment, excessive financial burden cause women to suffer stress, anxiety and depression. In the present study, after the participants were physically and emotionally relaxed, they were made to perform breathing and relaxation (meditation) exercises and to practice yoga asanas (postures) in order to reduce their fatigue levels. They were recommended to keep a diary to express how they felt during the treatment process, and they were supported by phone calls. It is stated that yoga improves the quality of life associated with infertility, reduces anxiety, depression, and negative emotions and thoughts related to infertility in particular (Dumbala et al.,

2020; Kirca & Pasinlioglu, 2019; Oron et al., 2015). In the infertility treatment process, it has been determined that providing counseling services to women, encouraging them to take part in support group sessions (Galhardo et al., 2013), and applying mind-body relaxation strategies are highly effective on women's quality of life. Thanks to all these interventions, the mean scores the women in the experimental group obtained from the emotional and mind-body sub-dimensions increased significantly compared to the women in the control group. No significant changes were observed in the mean scores the women in the control group obtained from the emotional and mind-body sub-dimensions. This result suggests that the personal integrity of women who do not receive adequate and planned support from the infertility nurse is adversely affected.

Conservation of social integrity

Levine (1996) believes that individuals are social people (creatures) and that having good relationships with other people will make them feel good. However, these relationships can be disrupted in stressful situations such as illness. In Turkish society, the inability to bear children is often perceived as a shameful inadequacy in fulfilling the role of reproduction and continuation of the lineage and creates a social stigma (Kaya & Oskay, 2020). Those who are vulnerable to such stigma the most are women because bearing children is the determinant of the social status in Turkish society and family. In patriarchal societies, the main role of women is considered as motherhood (Karaca & Unsal, 2012). Especially in the rural areas of Turkey, women unable to fulfill this role are often stigmatized and are treated insensibly (Keskin & Gumus, 2014). Women who are faced with this situation feel worthless, perceive themselves inadequate, and tend to blame themselves and commit suicide (Karaca & Unsal, 2012). In studies conducted in Jordan (Daibes et al., 2018) and Nigeria (Hollos et al., 2009), women also feel similar inadequacies and stigmatization. Therefore, infertile women need social support in this process so that they could protect their physical and mental health. Social support programs should be developed to increase social acceptance and to cope with people's negative attitudes toward infertility (Khalid & Dawood, 2020). In the present study, the women were assigned to groups including maximum three women in order to make them feel better and prevent social isolation. The researcher's phone was available 24/7 and the participating women called the researcher when they felt helpless. Thanks to all these interventions, the mean scores the women in the experimental group obtained from the social and relational sub-dimensions increased significantly compared to those of the

women in the control group. The mean scores the women in the control group obtained from the relational sub-dimension at the post-test were significantly lower than were those they obtained at the pretest. This result suggests that the relationships of the women who do not receive adequate and planned support from the infertility nurse are adversely affected.

Limitations of the study

The present study has a few limitations. First, the fact that the study included only women not their husbands is a limitation. Second, the control group received only routine nursing care, and they underwent no intervention during the treatment process. The results of this study cannot be generalized only to the group studied not to all women.

Conclusion and recommendations

The present study is the first example of a randomized controlled study in which LCM was used to increase the quality of life of women receiving infertility treatment. The results of the present study confirm H_1 and H_2 hypotheses. Nursing care given based on this model was determined to have positive effects on women's fatigue, social support and quality of life levels. Nurses working in IVF centers can use this model to reduce the fatigue levels of women receiving infertility treatment and to increase their levels of energy and quality of life. Although the results of the present study are very promising, we recommend that this model should be tested in different cultures and larger samples.

Author contribution

1. The conception and design of the study, or acquisition of data, or analysis and interpretation of data: Sadiye Ozcan, Nurcan Kirca
2. Drafting the article or revising it critically for important intellectual content: Sadiye Ozcan, Nurcan Kirca
3. Final approval of the version to be submitted: Sadiye Ozcan, Nurcan Kirca

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