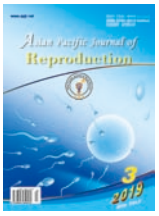

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Effect of preparation program on maternal anxiety of mothers fertilized through *in vitro* fertilization

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ABSTRACT

Objective: To determine the effect of preparation to play a maternal role in mothers fertilized through *in vitro* fertilization on maternal anxiety.

Methods: A total of 60 mothers undergoing *in vitro* fertilization were assigned into intervention group and control group. Pregnancy concerns and stress questionnaires were research tools. Questionnaires were completed in both groups before organizing preparation program. Then, the preparation program was held for four sessions for the mothers in the intervention group, and the subjects in both groups were immediately investigated again after completion of preparation program and one month later. Data analyses about pregnancy stress and concerns of mothers and its dimensions were performed by repeated measure (analysis of variance), Mann-Whitney, Friedman and Wilcoxon tests. Analysis of demographic variables was performed by using independent *t*-test and *Chi*-square test in SPSS 21.

Results: The score of pregnancy stress and concerns before the intervention was not significantly different between the two groups. There was a significant difference in the intervention group in the score of pregnancy stress and concerns before and after the intervention ($P<0.001$), before and one month after the intervention ($P<0.001$), immediately after and one month after the intervention ($P<0.001$) which was not significant in the control group.

Conclusions: Maternal preparation program can be effective in reducing maternal stress and concerns.

1. Introduction

Pregnancy, an influential and challenging situation in life, is associated with anxiety due to physical, psychological, and social changes. During pregnancy, mothers experience anxiety due to confronting and adapting to biological and psychological changes, changes in personal-familial relationships, socioeconomic issues, pregnancy-associated complications, and increased physical and emotional needs[1]. On the one hand, women who are experiencing pregnancy for the first time face higher levels of anxiety concerning motherhood due to absence of experience, self-confidence, sense of competence, and lower levels of awareness[2]. On the other hand,

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women experience more anxiety in infertility, *i.e*. the inability of couples for gestation after one year of regular sexual intercourse without using means of pregnancy prevention[3].

With the progress of science and technology and innovation of novel assisted-reproductive methods, especially *in vitro* fertilization (IVF), a silver lining has emerged for infertile couples[4]. IVF is a process that fertilization of an ovum with sperm outside the body that involves monitoring and stimulating a woman's ovulatory process, removing an ovum from the woman's ovaries and letting sperm fertilize them in laboratory. Then the fertilized zygote is implanted in the woman's uterus, with the intention of establishing a successful pregnancy[5]. Application of IVF has grown due to success in treatment[6], and it has compelled couples to tolerate long treatment courses and more anxiety[4].

Label of infertility, failure in reproduction, experiencing treatment failure, experiencing impaired body image, getting hurt in sexual relationships, frequent referrals to healthcare centers, use of numerous medications and the complications resulting from them, staggering treatment costs, and fear from treatment failure are involved in development of anxiety in couples undergoing assisted-reproductive methods[4]. Women tolerate more emotional problems compared to their spouses in the course of treatment by IVF and even after fertility; these mothers experience more anxiety compared to mothers who have become pregnant naturally[7]. These stresses are experienced concerns over the health status of the fetus, possible damage to the fetus during pregnancy, achieving the maternal role and social support, lack of information about neonatal care, and adaptation to the new maternal role[8].

Anxiety in pregnancy not only jeopardizes the newborn's health, but also affects the mother's health and is associated with detrimental outcomes of pregnancy including preeclampsia, nausea and vomiting, improper food habits, sleep disorders, and mother's irritability[9]. Therefore, an investigation into the level of mother's anxiety during pregnancy is important due to development of various complications such as low birth weight, reduction of Apgar score, spontaneous abortion, and neonatal abnormalities, which has attracted a great deal of attention in different studies[3,10].

The relationship between nurses and mother contributes to identifying and understanding the mother's concerns and becoming aware of her health situation[11]. Extensive studies have been done on mothers who are experiencing motherhood for the first time[12] given the importance and challenge of the mother's first experience[13]. And some studies have been done on the effect of immunization and relaxation on the anxiety of pregnant women with a history of infertility[14,15], as well as the effect of stress level on the success of treatment in infertile women[16,17]. However, the majority of interventions conducted on investigating the effectiveness of stress management during pregnancy in nulliparous women are related to mothers who are naturally pregnant[18].

Based on the results of the review of the studies, there was no study in the country or abroad on preparing mothers fertilized through IVF or playing their maternal role. Much research and therapeutic attention has been invested in coping with fertility treatments, while the options of reducing investment in treatments and finding alternative goals did not receive adequate attention[19]. Thus, because the motherhood with the help of assisted-reproductive methods is challenging, the present research was conducted to determine the effect of preparation to play a maternal role in mothers fertilized through IVF on maternal anxiety.

2. Materials and methods

2.1. Subjects

This randomized clinical trial study with the clinical trial code of (IRCT2017061734592N1) was conducted with the aim of investigating the effect of preparation to play the maternal role on the anxiety of mothers fertilized through IVF from June to August 2017. The subjects were chosen through a convenience sampling method. The participants were assigned into intervention group and control group through a blocked randomization method after receiving the list of mothers undergoing IVF treatment method from the authorities of Royan Institute in Tehran, Iran. In this sampling method, the block size was selected at random to prevent the disclosure of the last assignment in each block. The sample size, according to the study results of Karamouzian *et al*[18], was considered as around 30 subjects in each group, *i.e.* 60 subjects in total with a confidence of 99% and test power of 95% while considering 20% attrition.

2.2. Exclusion criteria

The exclusion criteria were applied to those who had been participated in other educational classes and programs of pregnancy, those who were not willing to continue to participate in the research, and those who experienced premature labor in the course of the research. These excluded women no longer participated in the research.

2.3. Inclusion criteria

The inclusion criteria were mothers fertilized through IVF after at least two years of history of primary infertility, without a history of psychiatric diseases, and gestational age ranged 12th to the end of the 20th week. Selecting the pregnancy age within this range was to remove the anxiety resulting from the stability of pregnancy in the first trimester as well as the anxiety originating from pregnancy in the third trimester.

2.4. Participants in preparation program

All mothers who were qualified for the inclusion criteria were 89 individuals at the beginning of the study, 45 were assigned into the intervention group and 44 were into the control group. The mothers in the intervention group were called by phone and they were explained about the content and time of holding the preparation program. From these mothers in the intervention group, two were on trip during the classes, four were employed and were unable to participate in the classes, three needed absolute rest according to physician's prescription, and six did not manage to cooperate in the research due to the far distance between the research center and their place of residence. Accordingly, 30 mothers of the intervention group were included in the study. Notably, there was no attrition to samples in this group. After contacting 44 mothers of the control group by phone, 12 of them refused to participate in this research due to different reasons including the far distance of research center, physician's prescription for absolute rest, and employment. Two others refused to continue cooperation during the second and third stages of completing the questionnaire. Eventually, 30 of them remained in the control group of the study. During the research, none of the mothers were experienced premature labor.

2.5. Data collection

2.5.1. Questionnaires

For data collection in this study, the two following questionnaires were used: 1) The demographic characteristics questionnaire. This researcher-made questionnaire with validity confirmed by 10 professors of nursing, midwifery, and psychology was about age, level of education, level of household income, employment status, history of abortion, and the existence of pregnancy complications; 2) The questionnaire of pregnancy stress and concerns. This questionnaire included 25 statements across six subsets including mother's health, neonatal health anxiety, labor and motherhood experience, neonatal and maternal interests, personal family, and personal occupation. This questionnaire was based on a 5-point Likert scale. Higher scores represented higher levels of anxiety. Its translation and psychometric analysis were performed by Navidpour *et al*[20].

2.5.2. Content validity and reliability for pregnancy stress and concerns questionnaire

Content validity index for the entire questionnaire was calculated equal to 0.94. In the present study, the content validity index for the entire questionnaire was calculated equal to 2.4, which is suitable. In the final part of the questionnaire, the internal consistency was very good, which had been measured by Cronbach's alpha of 0.89[20]. In this study, the reliability of the research tool was determined through internal consistency method on 30 subjects of IVF pregnant mothers, whereby the Cronbach's alpha coefficient was equal to 0.94.

2.5.3. Invitation of mothers in control group and data collection

In order to invite the mothers in the control group, by phone to enhance the level of their cooperation, the day of getting the questionnaire was matched with the day of their presence in the research center for examination, so that they would not visit this center only for completing the questionnaire. Further, the time of presence of mothers in this group at the research center differed from the time of holding the preparation program. This prevented interventional mothers and control mothers from being present at the research center simultaneously and people in each group did not know the presence of the other group. The mothers in the control group were asked about whether they had taken participation in educational classes for pregnancy period outside the research center. Actually, they only received the cares provided in the research center.

2.5.4. Invitation of mothers in intervention group and data collection

By telephone with the intervention group's mothers, the time and place of the session were announced. The sessions were held on three different days per week to provide the possibility of participation of all mothers of this group in the preparation program. At the first session of the preparation program, a prenatal need assessment form developed by the researcher, after careful review of authoritative articles and references and counseling by nursing, midwifery and psychology professors to examine the needs of mothers in the intervention group for learning, a training program was announced for them. Most mothers were found a sense of need for all of the points mentioned in this form. Before holding the preparation program, the data collection tools were provided to the mothers of both groups.

2.6. Preparation program

The preparation program was held as face-to-face training in the intervention group as four 2-h sessions for four weeks in groups comprising at most 7-8 individuals. This program was held with the help of PowerPoint, lecture, questions, and answers, and playing films by the researcher in the research center. 15-min break and reception was considered in order to prevent boredom and fatigue on the part of mothers because of sitting. The content of sessions was prepared after thoroughly reviewing the papers and references and receiving advice from nursing, midwifery, and psychology professors[1,2,4,10,12,16]. Each session of training was accompanied by exercise, homework, and a review on the educational content of previous sessions with the cooperation of mothers. The content of sessions was also provided to the mothers of the intervention group as educational pamphlets. Four weeks after completing the initial questionnaire and one month after completing the second stage questionnaire, the individuals in both groups were re-investigated and the information was collected by the researcher using the

questionnaires. The questionnaires were completed after receiving informed consent and assuring the subjects about the confidentiality of information. For ethical considerations in this research, after completing the final questionnaires, the educational content was also provided to the mothers of the control group as educational pamphlets.

2.7. Content of maternal preparation program sessions

Session 1: Teaching the objectives and content of the preparation program, explaining the process of motherhood *via* IVF; prenatal care including nutrition, sleep and rest, exercise and physical activity; personal hygiene during pregnancy, posture correction, consumption of supplements and medications during pregnancy through IVF, pregnancy complications and how to control them, anxiety among parents undergoing IVF as an assisted reproductive technique and its management, as well as practices such as effective breathing pattern and mental imagery.

Session 2: Presenting issues on fetal development and necessary care at every stage, fetal attachment and its benefits, maternal-fetal attachment in pregnancies resulting from IVF, teaching fetal attachment-enhancing behaviors, advantages and disadvantages of using IVF as an assisted reproductive technique, and explaining the causes of anxiety in mothers using IVF and its control through progressive muscle relaxation (Jacobson). At the end of the session, relaxation and fetal attachment-enhancing behaviors were practiced; then, the mothers were asked to write down the frequency of relaxation and fetal attachment-enhancing behaviors to increase their attention and recall them.

Session 3: Teaching spousal relationships during pregnancy, sexual relationships during pregnancy, preparation for childbirth, baby care, breastfeeding, growth and development in children, characteristics of infants conceived *via* IVF, features of parents of IVF babies, causes of anxiety in mothers during infancy, mother-infant attachment and its benefits, maternal attachment to IVF babies, and attachment-enhancing behaviors with the neonate.

Session 4: Presenting issues about postpartum care (puerperal care) including care of stitches, bathing, using appropriate clothing, feeding, bowel movements, regulated sleep and rest time, exercise and physical activity, relationship with partners, postpartum sexual intercourse, and measures taken for frozen embryos to have another child.

2.8. Ethic approval

The present study received permission from the Ethics Committee of the Faculty of Nursing and Midwifery and from the research center with the code of IR.SBMU.PHNM.1395.534. The research objectives were explained to the subjects and informed consent was acquired. Optional participation in the study was set, giving subjects the right to quit this study at any stage. The confidentiality of information at all stages of the research and the provision of educational content to the control group were some of the important points in this research.

2.9. Statistical analysis

For data analysis, the data were introduced into SPSS 21 as codes and were then analyzed using independent *t*-test, *Chi*-square test, repeated measure (analysis of variance), Mann-Whitney, Friedman and Wilcoxon tests in line with the objectives of the study. Data were expressed as mean±standard deviation (mean±SD). A *P*-value of less than 0.05 was considered statistically significant.

Mann-Whitney test was used before, immediately after, and one month after the intervention due to abnormality of the data in the intervention and control groups, to compare the scores of pregnancy stress and concerns, anxiety of labor and motherhood experience, anxiety of neonatal and maternal interests, anxiety of maternal health, and personal as well as occupational anxiety between the two groups. Furthermore, the Friedman test was used to compare these scores across the three times (before the intervention, immediately post intervention and one month post intervention). Moreover, Wilcoxon test with Bonferroni correction was employed for paired comparison of the times.

Repeated measure (analysis of variance test) was used considering the mean score of neonatal health anxiety as well as personal and familial anxiety, according to normal data.

3. Results

The demographic characteristics of mothers in the intervention and control groups were presented in Table 1. There was no significant difference between the two groups in terms of age, education level, income, employment status, frequency of history of abortion, and pregnancy complications ($P>0.05$). The results of mean scores of pregnancy stress and concerns and its dimensions were shown in Tables 2 and 3.

3.1. Pregnancy stress and concerns

In the intervention group, there was a significant difference between the score of pregnancy stress and concerns before and after the intervention (four weeks after beginning of the intervention) ($P<0.001$), before the intervention and one month after completion of the intervention ($P<0.001$), and immediately after the intervention and one month after the intervention ($P<0.001$). In the control group, there was a significant difference in the score of pregnancy stress and concerns after completing the first stage of questionnaires and immediately after completing the second stage of questionnaires (four weeks later) ($P=0.018$), after completing

Table 1. Demographic characteristics of mothers in the intervention and control groups.

Variables	Intervention group (n=30)	Control group (n=30)	P-value
Age (year, mean ± SD)	32.8 ± 4.3	31.4 ± 3.9	0.76
Level of education [n(%)]			
Junior high school and high school	10(33.3)	9(30.0)	
Bachelor's degree	15(50.0)	18(60.0)	1.00
Master's degree and higher	5(16.6)	3(10.0)	
Household income status [n(%)]			
Low	2(6.6)	1(3.3)	
Moderate	11(36.6)	14(46.7)	0.83
High	17(56.6)	15(50.0)	
Employment status [n(%)]			
Housewife	17(56.7)	22(73.3)	0.14
Employed	13(43.3)	8(26.7)	
History of abortion [n(%)]			
Yes	5(16.6)	3(10.0)	0.50
No	25(83.3)	27(90.0)	
Pregnancy complications [n(%)]			
Nausea and vomiting	14(46.6)	12(40.0)	
Heartburn	6(20.0)	4(13.3)	0.85
Sleep disorders	2(6.6)	8(26.6)	
Nutritional disorders	8(26.6)	6(20.0)	

The P value of age is measured by independent t-test, while the P values of other variables are measured by the Chi-square test.

Table 2. Mean scores of pregnancy stress and concerns and its dimensions.

Factors	Groups	Before the intervention	Immediately post-intervention	One month post-intervention
Pregnancy stress and concerns	Intervention	46.36 ± 13.38	23.70 ± 10.06	27.10 ± 9.60
	Control	41.63 ± 13.60	34.46 ± 13.14	44.70 ± 13.79
P-value (inter group)		0.108	<0.001	<0.001
Anxiety of labor and motherhood experience	Intervention	11.20 ± 2.63	7.17 ± 2.57	7.73 ± 2.37
	Control	9.96 ± 2.78	10.70 ± 2.81	11.60 ± 2.42
P-value (inter group)		0.244	0.016	0.013
Anxiety of neonatal and maternal interests	Intervention	0.87 ± 0.93	0.10 ± 0.40	0.10 ± 0.30
	Control	0.63 ± 0.96	0.63 ± 0.99	0.66 ± 0.95
P-value (inter group)		0.894	<0.001	<0.001
Maternal health anxiety	Intervention	12.17 ± 4.48	5.97 ± 3.39	7.13 ± 3.27
	Control	12.00 ± 4.98	12.43 ± 5.03	12.26 ± 4.12
P-value (inter group)		0.041	<0.001	<0.001
Personal and occupational anxiety	Intervention	3.50 ± 2.44	2.60 ± 2.06	2.43 ± 2.12
	Control	3.53 ± 2.78	3.66 ± 2.70	4.13 ± 2.55
P-value (inter group)		0.905	0.010	0.008

Data are expressed as mean±SD. Mann-Whitney is used for intergroup comparison. For compare of times in two by two groups, Wilcoxon's test with Bonferroni's correction is used.

the first stage of questionnaires and one month after completing the second stage of questionnaires (P=0.010). However, there was no significant difference in the score of intensity interests and concerns immediately after completing the second stage of questionnaires and one month after that (P=0.118) (Table 2).

3.2. Anxiety of labor and motherhood experience

In the intervention group, there was a significant difference between the score of the anxiety of labor and motherhood experience before intervention and immediately post intervention (P<0.001), before intervention and one month post intervention (P<0.001). However, there was no significant difference in the score of anxiety of labor and motherhood experience immediately after and one month after the intervention (P=1.000), suggesting constancy of the anxiety level without an increase during this period. In the control group, there was no significant difference in the score of anxiety of labor and motherhood experience after completing the first stage of questionnaires and immediately after completing the second stage of questionnaires (four weeks later) (P=0.705), after completing the first stage of questionnaires and one month after completing the second stage of questionnaires (P=0.679), and immediately after completing the second stage of questionnaires and one month after that (P=0.655) (Table 2).

3.3. Anxiety of neonatal and maternal interests

The score of anxiety of neonatal and maternal interests had a significant difference in the intervention group before and after the intervention (four weeks after initiating intervention) (P<0.001), before the intervention and one month after its completion (P<0.001), and immediately after the intervention and one month after that (P=0.003). On the other hand, there was no significant difference in the control group regarding the score of anxiety of neonatal and maternal interests after completing the first stage of questionnaires and immediately after completing the second stage of questionnaires (four weeks later) (P=0.349), after completing the first stage of questionnaires and one month after completing the second stage of questionnaires (P=0.580), and immediately after completing the second stage of questionnaires and one month after that (P=0.896) (Table 2).

3.4. Maternal health anxiety

There was also a significant difference between the score of mother's health anxiety in the intervention group before and after the intervention (four weeks after starting intervention) (P<0.001), before the intervention and one month after that's completion (P<0.001), and immediately after the intervention and one month after that (P=0.004). Similarly, there was a significant difference between the score of mother's health anxiety in the control group after completing the first stage of questionnaires and immediately after completing the second stage of questionnaires (four weeks later) (P=0.015), after completing the first stage of questionnaires and one month after completing the second stage of questionnaires (P<0.001), and immediately after completing the second stage of questionnaires and one month after that (P=0.037) (Table 2).

3.5. Personal and occupational anxiety

In the intervention group, there was a significant difference between the score of personal and occupational anxiety before and after the intervention (four weeks after its start) (P<0.001), before the intervention and one month after its completion (P=0.002), and immediately after the intervention and one month after that (P=0.005). However, there was no significant difference in the control group between the score of personal and occupational anxiety after completing the first stage of questionnaires and immediately after completing the second stage of questionnaires (four weeks later) (P=0.617). Nevertheless, there was a significant difference between the score of personal and occupational anxiety after completing the first stage of questionnaires and one month after completing the second stage of questionnaires (P=0.009), as well as immediately after completing the second stage of questionnaires and one month after that (P=0.024) (Table 2).

3.6. Neonatal health anxiety

In the intervention group, the mean score of neonatal health anxiety immediately and one month after the preparation program was significantly different (P<0.001). However, in the control group, this difference was not significant (P=0.362). Further, there were significant differences in the mean scores of neonatal health anxiety at two time points including immediately post intervention and one month post intervention (P both=0.005), where the after intervention neonatal health anxiety level was higher in the control group compared to the intervention group. The interaction effect of time and group was significant (P<0.001), which was decreased over time, suggesting the effect of the passage of time on mitigation of neonatal health anxiety (Table 3).

3.7. Personal and familial anxiety

The mean score of personal and familial anxiety in the intervention group was significantly different immediately and one month after the intervention (P<0.001). However, in the control group, this difference was not significant (P=0.587). There was no significant difference in mean score of personal and familial anxiety between the two groups at two time points including immediately post intervention and one month post intervention (P both =0.124). The interaction effect of time and group, however, was significant (P<0.001), where the passage of the time influenced the mean score of personal and familial anxiety (Table 3).

Table 3. Mean scores of pregnancy stress and concerns and its dimensions.

Factors	Groups	Before intervention	Immediately post-intervention	One month post-intervention
Neonatal health anxiety	Intervention	11.30 ± 3.84	4.13 ± 2.40	5.30 ± 2.45
	Control	8.96 ± 3.67	9.36 ± 3.93	9.13 ± 3.33
Personal and familial anxiety	Intervention	7.50 ± 3.74	4.33 ± 3.01	4.40 ± 2.64
	Control	6.26 ± 3.16	6.66 ± 3.26	6.90 ± 3.00

Data are expressed as mean±SD.

4. Discussion

The aim of this study was to determine the effect of preparation to play the maternal role in mothers fertilized through IVF on maternal anxiety. This study dealt with investigating the stress and concerns of mothers fertilized through IVF. This anxiety involved the dimensions of the anxiety of labor and motherhood experience, neonatal health anxiety, the anxiety of neonatal and maternal interests, maternal health anxiety, personal and familial anxiety, and personal and occupational anxiety.

4.1. Pregnancy stress and concerns

In the present study, there was a significant difference between the score of pregnancy stress and concerns of mothers in the intervention group before intervention and immediately post intervention, before intervention and one month post intervention, and immediately post intervention and one month post intervention. In this regard, immediately after holding the preparation program for motherhood and one month after its completion, the score of pregnancy stress and concerns were diminished in mothers when compared to the period before the intervention. Teixeira and Martin[21], as well as Toosi *et al*[22], also indicated that the trainings during pregnancy, educating behaviors that develop an attachment to the fetus, and relaxation methods can be effective in mitigating the anxiety of pregnancy, which is in line with the present study. In the control group, there was a significant difference between the score of pregnancy stress and concerns, after completing the first stage of questionnaires and immediately after completing the second stage of questionnaires, after completing the first stage of questionnaires and one month after completing the second stage of questionnaires, where four weeks after completing the initial questionnaires among these mothers and immediately one month after that, the score of pregnancy stress and concerns were diminished when compared to the period before completing the questionnaires. This observation is in line with the results of Teixeira *et al*[23] who indicated that anxiety of mothers is high during the first trimester, which then decreases in the second trimester. During the first trimester, which is the stage of accepting the fetus, mother concentrates more on her fetus, which increases her anxiety. However, during the second trimester, with hormonal changes, the stability of pregnancy, and feeling of the fetal movements, the mother feels better and experiences less anxiety[24].

4.2. Anxiety of labor and motherhood experience

Mother anxiety about labor and motherhood experience is one of the dimensions of the questionnaire of pregnancy stress and concerns. A major part of the stress and anxiety of mothers during pregnancy is related to the anxiety of labor[25]. In this study, there was a significant difference between the score of labor and motherhood experience anxiety before and immediately after the intervention as well as before and one month after that's completion in the intervention group. In this regard, the level of anxiety in mothers about labor and motherhood experience were declined immediately after the preparation program and one month after the program's completion; it probably shows the effect of the maternal care program. The reason is that promoting the women's level of awareness about labor and training relaxation and mental visualization methods through group discussion and playing videos that make mindfulness leads to reduce their anxiety[26,27]. In the present study, these methods were used for training mothers. However, there was no significant difference in the anxiety score of work experience and mission immediately after the intervention and one month after that, indicating the anxiety level stability and its increase during this time period after that. The results of some studies suggest a lack of influence of educational programs before pregnancy on reducing mother's anxiety[28,29], which are incongruent with our results. This can be associated with cultural differences, the mismatch between the educational content and the mother's needs, educational content, the duration and type of training. In the control group, there was no significant difference between the score of labor and motherhood experience anxiety after completing the first stage of questionnaires and immediately after completing the second stage of questionnaires, after completing the first stage of questionnaires and one month after completing the state of questionnaires, and immediately after completing the second set of questionnaires and one month after that. Over time, the level of the mother's anxiety was not lessened. This is in accordance with the findings of Najafi *et al*[30] who observed that the women who do not participate in educational classes for pregnancy are more susceptible to labor anxiety.

4.3. Neonatal health anxiety

Another factor that develops anxiety during pregnancy is a concern about fetal abnormalities, congenital diseases, and neonatal health[29]. Most women who have become pregnant through IVF have high levels of anxiety about neonatal health and possible damages during labor due to imagining hard and special conditions of pregnancy[3]. In this study, the mean score of neonatal health anxiety was significantly different between the intervention and control groups, and the neonatal health anxiety level was higher in the control group in comparison with the intervention group. The mean neonatal health anxiety score in the intervention group was significantly different immediately and one month after holding the preparation program compared to the previous period. This extent was not significant in the control group when comparing the period before holding the maternal preparation program. The results obtained from the study by Hossein Khanzadeh *et al*[31] also showed

that training during pregnancy can be effective in mitigating mother's anxiety with regards to her fetus and they can play a significant role in neonatal health during pregnancy and after labor. In this study, the interaction effect of time and group was significant, where over time the level of neonatal health anxiety has decreased in mothers, which can be due to sensing the fetal movements by the mother[22].

4.4. Anxiety of neonatal and maternal interests

Anxiety during pregnancy can affect the relationship between mother and newborn and can compromise the mother's ability to play her maternal role[32]. In the present study, there was a significant difference in the intervention group between the score of the anxiety of neonatal and maternal interests before and immediately after the intervention, before the intervention and one month after its completion, and immediately and one month after the intervention. In this regard, immediately after holding the preparation program and one month after that, the anxiety of mothers about neonatal and maternal affections (loving the newborn) was decreased. Training proper behaviors for interaction with the fetus and behaviors that develop attachment are among the factors that result in diminished anxiety, enhanced maternal and neonatal health, and improved relationships between the mother and newborn[33], all of which were trained in the intervention of this study. In the control group, there was no significant difference between the score of anxiety of neonatal and maternal affection after completing the first stage of questionnaires and immediately after completing the second set of questionnaires, after completing the first stage of questionnaires and one month after completing the second stage of questionnaires, and immediately after completing the second stage of questionnaires and one month after that, *i.e*. the mother's anxiety had not been diminished. This is in accordance with the findings by Ohoka *et al*[34] which showed that the women who do not receive training that develops attachment and find problems in developing emotional relationship and attachment with the fetus have higher levels of anxiety. So, relaxation and attachment behaviors' training is effective in the reduction of anxiety during pregnancy in mothers fertilized through IVF.

4.5. Maternal health anxiety

Maternal health anxiety is another dimension of the questionnaire of pregnancy stress and concerns. In the intervention group, there was a significant difference between the score of mother's health anxiety before the intervention and immediately after that, before and one month after its completion, and immediately and one month after that, where the level of mother's anxiety about their health was decreased after the preparation program. This is in accordance with the results of the study by Momeni Javid *et al*[35] suggesting that participation in preparatory classes for labor and learning pregnancy care are associated with diminished anxiety, increased awareness, and promoted health of women. In the control group, there was also a significant difference between the score of mother's health after completing the first stage of questionnaires and immediately after completing the second stage of questionnaires, after completing the first stage of questionnaires and one month after completing the second stage of questionnaires, and immediately after completing the second stage of questionnaires and one month after that, where its level was decreased over time. This is incongruent with the results obtained by Micali *et al*[36] who suggested that with an increase in the age of the pregnancy, the concerns and anxiety of pregnant women about their weight, appearance, and health increase. This difference can be due to cultural differences and the greater care Iranian women for fetal health in comparison with their own health.

4.6. Personal and familial anxiety

During pregnancy, various changes occur in different dimensions of physical, psychological, and social health of pregnant women, resulting in increased stress, preoccupation, and anxiety in them[37]. In this study, the mean score of personal and familial anxiety in the intervention group had significant differences immediately and one month after the intervention, where the level of personal and familial anxiety of mothers in the intervention group was decreased after taking part in the preparation program. On the other hand, there was no significant difference in the control group. Similarly, Azmoude *et al*[38] also showed that lack of social support by the spouse, family members, and healthcare staff significantly contributes to the development of anxiety and competence of maternal role, which is in line with the present study.

4.7. Personal and occupational anxiety

During pregnancy, mothers experience anxiety due to a confrontation with an adaptation to physical symptoms, biological changes, and changes in their personal familial relationships as well as personal and social problems[1]. In the intervention group, there was a significant difference between the score of personal and occupational anxiety before the intervention and immediately after that, before the intervention and one month after its completion, and immediately and one month after that, where the level of personal and visual anxiety of mothers was dropped. This can be due to the effect of the maternal preparation program and social support from others. In the control group, no significant difference was observed between the score of personal and occupational anxiety after completing the first stage of questionnaires and immediately after completing the second stage of questionnaires. However, there was a significant difference between the score of personal and occupational

anxiety after completing the first stage of questionnaires and one month after completing the second stage of questionnaires as well as immediately after completing the second stage of questionnaires and one month after that, suggesting the effect of passage of time on reducing the level of personal and occupational anxiety adaptation of mothers to pregnancy changes. The psychological characteristics and states of mothers during completion of questionnaires can affect the research results. Furthermore, the willingness and enthusiasm of mothers in the intervention group to participate in classes and preparation sessions may inevitably influence the results. It is suggested that in future studies, the effect of holding preparation programs be also investigated in mothers and fathers employing other assisted-reproductive methods, and then be compared with other interventions or different educational methods.

In conclusion, the preparation program for playing the maternal role has a positive effect on the stress and anxiety of mothers fertilized through IVF. In this regard, the anxiety score of mothers in the two groups did not significantly differ before the intervention. However, the preparation program significantly decreased in the intervention group after its completion, across all dimensions of maternal anxiety. Therefore, infertility healthcare centers can facilitate the process of motherhood by organizing suitable educational programs. Further, the nurses of these centers can play an effective role in developing a positive experience of pregnancy for mothers and reducing stress and concerns of mothers by training the skills and raising the awareness of mothers.

Conflict of interest statement

The authors declare that there is no conflict of interest.

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