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# The effect of education on anxiety of pregnant mothers before amniocentesis

Shahnaz Mojahed, Razie Sadat Tabatabaei<sup>1</sup>, Fariba Reihani<sup>2</sup>, Ali Dehghani<sup>3</sup>, Faride Khavari

## Abstract:

**BACKGROUND:** Pregnancy alone is associated with many anxieties and worries for many women. Prenatal diagnosis of fetal malformations is one of the most important anxious events for women. Increasing knowledge empowers the person to identify the important issues and by increasing understanding, creates a positive attitude in people. Therefore, the aim of this study was to investigate the effect of education on the level of anxiety of pregnant mothers before invasive screening for fetal abnormalities (amniocentesis).

**MATERIALS AND METHODS :** This is a quasi-experimental study with two parallel designs in three stages: Pretest (before intervention), posttest (after intervention), and after amniocentesis. This study was performed on 80 pregnant women candidates for amniocentesis (40 pregnant women in the control group and 40 pregnant women in the intervention group) referred to the perinatology clinic in Yazd in 2020. Data collection tools were demographic and midwifery questionnaires and Spiel Berger anxiety questionnaires. In the experimental group, the intervention was performed as group training for 90 min immediately before amniocentesis. In the control group, only routine procedures (brief description by a perinatologist during amniocentesis) were performed. SPSS software version 16 was used to analyze the data.

**RESULTS:** The mean age of the research units was  $67/5 \pm 5/33$  years. The results of Mann–Whitney intergroup test showed that the mean scores of overt anxiety before the intervention between the control and intervention groups were not significant ( $P < 0.014$ ) but were significant after training and after amniocentesis ( $P < 0.001$ ). Furthermore, the results of Mann–Whitney group test showed that the mean scores of overt anxiety in the intervention group before and after training were significant ( $P < 0.001$ ). Furthermore, the results of the control group showed significant results ( $P < 0.001$ ). The results of the independent *t*-test showed that the mean scores of latent anxiety before the intervention between the control and intervention groups were not significant ( $P < 0.194$ ) but were significant after the training ( $P < 0.57$ ) but The results were not significant after amniocentesis ( $P < 0.216$ ). Furthermore, the results of paired *t*-test within the group showed that the mean scores of overt anxiety in the intervention group before and after training was significant ( $P < 0.001$ ). Furthermore, the results of the control group showed significant results ( $P < 0.001$ ).

**CONCLUSION:** The findings of the present study indicate the positive effect of education on anxiety of pregnant women candidates for amniocentesis. The results also show the important role of education on the psychological dimension of high-risk pregnant women in relation to the consequences of pregnancy and childbirth. According to the research results, it seems that education affects the cognitive system and information processing by increasing people's awareness of the amniocentesis process and its consequences.

## Keywords:

Anxiety, education, pregnancy, screening

Research Centre for Nursing and Midwifery Care, Shahid Sadoughi University of Medical Sciences, Yazd, Iran, <sup>1</sup>Obstetrics and Gynaecology, Mother and New Born Health Research Centre, Shahid Sadoughi University of Medical Sciences and Health Services, Yazd, Iran, <sup>2</sup>MSc Student in Midwifery Counselling, Student Research Committee, Shahid Sadoughi University of Medical Sciences, Yazd, Iran, <sup>3</sup>Associated Professor, Biostatistics and Epidemiology Department, School of Public Health, Shahid Sadoughi University of Medical Sciences, Yazd, Iran

## Address for correspondence:

Ms. Fariba Reihani, Safaeie Street, School of Nursing and Midwifery, University of Medical Sciences, Yazd, Iran. E-mail: fariba.reyhani38090@gmail.com

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## Introduction

Pregnancy and childbirth is one of the most critical periods in a woman's life,<sup>[1]</sup> which have been identified as the most vital crises in her life. Pregnancy is a physiological event that is associated with neuroendocrine, physical, psychological, and social changes.<sup>[2]</sup> Evidence shows that mood disorders in women are twice as common as in men and peak during the years of pregnancy and childbirth.<sup>[3]</sup> Regardless of the underlying cause, pregnancy alone is associated with a great deal of anxiety and worry for many women.<sup>[4]</sup> Anxiety is a physical and mental disorder that arises from the sense of imminent danger and can be a useful response to a threatening situation.<sup>[5]</sup> Anxiety is a condition that every human being experiences as a result of being stressed or stressed. Anxiety not only affects a person and their quality of life,<sup>[5,8]</sup> but also affects their child's future life.<sup>[8]</sup> During pregnancy, anxiety develops with different severity and symptoms. Anxiety can occur due to pregnancy and neonatal problems. The most important causes of anxiety in pregnancy are abortion, concern about the diagnosis of fetal abnormalities, fetal anaploidy, childbirth and postpartum complications, and acceptance of maternal responsibility.<sup>[8-10]</sup> According to the results of studies, the health status of the fetus is the most worrying factor for pregnant mothers.<sup>[11]</sup> Prenatal diagnosis of fetal malformations as a critical emotional event is anxious for women.<sup>[8,12]</sup> Most pregnant mothers are concerned about the health of the fetus and screening tests.<sup>[13]</sup> Amniocentesis is the most common method of diagnosing fetal abnormalities<sup>[8,14]</sup> in which a doctor inserts a needle into the uterine cavity through the abdomen and samples are taken from the fluid around the fetus.<sup>[12]</sup> Amniotic fluid is rich in embryonic cells and can be used to study the genetics and health of the fetus.<sup>[8]</sup> In most studies, the average anxiety score of amniocentesis mothers is reported to be around 50.<sup>[15,16]</sup> Studies have also shown that women candidates for amniocentesis experience "state anxiety" (anxiety in response to a particular situation) and depressive symptoms.<sup>[17]</sup> In one study, 70% of women candidates for amniocentesis experienced state anxiety and 24% experienced moderate to high anxiety. According to the guidelines for assessing the health of the fetus during pregnancy, pregnant women should make informed choices about performing these tests to reduce their anxiety and worry.<sup>[14]</sup> Conscious selection in individuals requires receiving sufficient quality and appropriate information in the field of the desired procedure.<sup>[18]</sup> Increasing knowledge empowers the individual to identify important issues and by increasing understanding, creates a positive attitude in people;<sup>[19]</sup> Lack of knowledge, on the other hand, can create or reinforce anxiety, and the resulting anxiety overshadows the individual's decision-making.<sup>[20]</sup> Mothers need more psychological support and awareness during screening

tests and invasive procedures during pregnancy, which is a stressful and critical period for the mother. This knowledge can be about how to perform screening interventions and its advantages and disadvantages that give a better view to pregnant women who are candidates for invasive screening. Most researchers also acknowledge that giving the patient the right information and awareness is an important protective factor in dealing with anxiety.<sup>[16,21,22]</sup> Studies show that pregnant women who have access to counseling services perform screening tests with greater acceptance and have fewer negative psychological consequences.<sup>[17]</sup> Therefore, mothers need medical advice and care before performing amniocentesis. This counseling can help pregnant women to go through pregnancy and childbirth without complications.<sup>[21,23]</sup> In patients who use physicians or nurses as sources of information, anxiety levels are significantly lower.<sup>[24]</sup> Providing information face to face can dramatically increase mothers' knowledge. It is also a way to save counseling time and increase patient care.<sup>[25]</sup> Amniocentesis is a method of screening for fetal health that causes anxiety in pregnant women, and education can help control the anxiety of pregnant mothers before amniocentesis. The aim of this study was to investigate the effect of education on the anxiety of pregnant mothers before invasive screening for fetal malformations (amniocentesis).

## Materials and Methods

This study is a quasi-experimental study with two parallel designs in three stages: Pretest (before intervention), posttest (after intervention), and after amniocentesis. This study was performed on 80 pregnant women candidates for amniocentesis (40 in the control group and 40 in the intervention group) referred to the perinatology clinic in Yazd in 1398. After the approval of the research council in the faculty of nursing and midwifery and obtaining the code of ethics from the ethics committee of Shahid Sadoughi University of Medical Sciences of Yazd with the number IR.SSU.REC.1398.088 and also obtaining the necessary letters of introduction and presenting them to the relevant authorities, sampling began. The sample consisted of 80 pregnant women who were candidates for amniocentesis and were eligible for the study with a gestational age of 15–20 weeks. The sample size was calculated according to the following formula by considering the difference of at least 5 points in the average of the two groups for each group of 36 people. Taking into account the 10% drop, 40 people were considered in each group.

$$n = \frac{2s^2p[z_{1-\alpha/2} + z_{1-\beta}]^2}{\mu^2d}$$

$$s^2p = \frac{s_1^2 + s_2^2}{2}$$

$s_1^2$  = standard deviation in study groups (befor) = 6.52

$s_2^2$  = standard deviation in study groups (after) = 4.69

$\mu^2$  = Mean difference = 5

$\alpha$  = significant level = 0.05

$1 - \beta$  = power = 80

$N = 36 + \text{drop } 10\% = 40$

Purposeful sampling was performed based on the objectives of the research and inclusion criteria. The inclusion criteria were: Being Muslim and Iranian, written consent to participate in the study, having a minimum literacy, candidate for amniocentesis according to the specialist, having a gestational age of 15–20 weeks (based on the first day of the last menstrual period or first trimester ultrasound), single pregnancy and live fetus, and positive fetal screening result (abnormal ultrasound tests or findings). The exclusion criteria were as follows: Pregnancy following infertility treatment and the use of assisted reproductive techniques, history of amniocentesis, history of recurrent miscarriages, the presence of major abnormalities in ultrasound, maternal knowledge about the details of amniocentesis, use of hookah-cigarettes-drugs-alcohol-psychotropic drugs, history of seeing a psychiatrist or psychologist, taking medication or hospitalization due to mental illness. Amniocentesis was performed in the second trimester of pregnancy and before the 20<sup>th</sup> week of pregnancy. Data collection tools in this study were as follows: Demographic and midwifery information questionnaires and Spiel Berger anxiety questionnaires. The demographic and midwifery information questionnaire consisted of two parts. (a) Demographic information including: Age, education, occupation, satisfaction with economic status, etc., (b) Midwifery characteristics including: Gestational age, number of pregnancies and deliveries, having a live and stillborn child, history of abortion, history of stillbirth and infant death, history of fetal or neonatal abnormalities in previous pregnancies, and cause of amniocentesis.

The Spiel Berger Anxiety Inventory was developed by Spiel Berger in 1996 as a standard self-assessment tool and test that has a high scientific validity. It consists of two parts to measure overt and covert anxiety. The Spiel Berger Anxiety Inventory includes 40 questions to assess overt or present anxiety (20 questions) and latent or adjective anxiety (20 questions). This questionnaire is graded in four Likert options from 1 to 4 (1: Never, 2: Somewhat, 3: Medium and 4: Very high). To obtain a person's anxiety score in each of these two scales, the sum of the scores of twenty phrases in each scale is calculated. It should be noted that questions 1, 2, 5, 8, 10, 11, 15, 16, 19, 20, 21, 23, 26, 27, 30, 33, 34, 36, and 39

are given inverse points. Therefore, the scores of each of the two scales of overt and covert anxiety can be in the range between 20 and 80. The interpretive criteria for overt and covert anxiety are as follows. 31-20 are mild anxiety, 42-32 are moderate to low anxiety, 53-43 are moderate to high anxiety, 54–54 are relatively severe anxiety, 75-65 are severe anxiety, and 76 and above are very severe anxiety. The total range of anxiety scores is between 40 and 160 points.<sup>[8]</sup> Formal and content validity was used to validate the demographic and midwifery questionnaires. Thus, after studying the latest books and articles in the field of research, the initial writing of the relevant questionnaires was done. Then, for review and correction, it was given to several faculty members of the School of Nursing and Midwifery and its content and face validity was confirmed. After applying the final comments of the professors, the final tool was written and used. The validity and reliability of the Persian version of the Spielberger questionnaire in Mehram's research in 1995 under the title "Standardization of the Spielberger Anxiety Test" was examined on 600 people. Its scientific reliability has been obtained through Cronbach's alpha formula, and it has been determined that the reliability of the test as the ratio of variance of the observed scores is acceptable and high. Cronbach's alpha coefficients of the overt anxiety scale and the latent anxiety scale were reported to be 0.90 and 0.91, respectively. For the total test, Cronbach's alpha coefficient was obtained 0.94.<sup>[3]</sup> In this study, content validity was used to confirm the validity and retest method was used to confirm the reliability, which was confirmed with an alpha of 0.89. Referral amniocentesis was performed in the evening of even days in Yazd perinatology clinic (research environment). After selecting the samples based on the objectives of the study, individuals were randomly assigned to the control and intervention groups by the method of random sampling until the number of samples was completed. Initially, sufficient explanations about the objectives and stages of the research were given to both control and intervention groups. Participants were then given informed consent, and the study participants (pregnant women candidates for amniocentesis) were assured that their information would be kept confidential. Demographic characteristics and Spiel Berger Anxiety Questionnaire (pretest) were completed by both intervention and control groups before amniocentesis and intervention. In the experimental group, the intervention was performed as group training for 90 min immediately before the amniocentesis according to the schedule. In the control group, routine procedures (brief description by a perinatologist during amniocentesis) were performed [Table 1].

### Course schedule

After the intervention (training), the posttest was completed by both groups. In the next stage, amniocentesis was performed under ultrasound guide with a spinal

**Table 1: Course schedule**

Title	Period of time	Provider
Introduce and express the goals of education	5 min	Researcher
Definition of diagnostic method of amniocentesis	5 min	Researcher
How to perform amniocentesis and its indications	15 min	Researcher
Possible complications following amniocentesis and how to deal with it	5 min	Researcher
Discussion about the causes and factors causing anxiety in amniocentesis candidate mothers	15 min	Pregnant mothers amniocentesis candidate and researcher
Learn to use breathing techniques to reduce anxiety	15 min	Researcher
Broadcasting educational animation focusing on how to perform amniocentesis	10 min	Researcher
Expressing the experiences of pregnant mothers	10 min	Pregnant mothers amniocentesis candidate and researcher
Visit the amniocentesis site and get acquainted with the relevant perinatologist	10 min	Pregnant mothers, researcher and perinatologist

needle No. 22 made in Japan with a length of 9 cm by the relevant perinatologist and after disinfecting the mother's abdomen with betadine antiseptic liquid. Then, 20 cc of aspirate liquid was delivered to the mother to be sent to the laboratory. Finally, the research units in both groups completed the above questionnaires immediately after amniocentesis. statistical software package IBM SPSS version 16 (IBM, USA, 2007). was used for the statistical analysis of data. Descriptive and analytical statistics were used to analyze the data. Frequency distribution tables, mean statistical indices, and standard deviation were used to describe the characteristics of the research unit and the data. In the performed tests, 95% confidence interval and  $\alpha \leq 0.05$  significance level were considered.

## Results

In the present study, 80 pregnant mothers participated. The total age range of the participants was between 17 and 44 years with a mean of  $33.5 \pm 5.67$  years, the number of pregnancies was 0–4 and the gestational age was 14–20 weeks. The mean scores of anxiety after training and after amniocentesis were significantly lower than before training. The mean score of anxiety after amniocentesis had increased somewhat compared to the posttraining stage. While in the control group, the mean scores of anxiety in the three stages of the study had a decreasing trend [Table 2].

At the beginning of the study, the subjects had moderate-to-high anxiety, which decreased to moderate to low after training in both the control and experimental groups and remained at this level until after amniocentesis.

The results of the data related to the apparent anxiety score showed that the control group had higher overt anxiety than the intervention group at all stages and the minimum and maximum pain was higher in the

intervention group at the beginning of the study but decreased after training [Table 2].

The results of the study of hidden anxiety data showed that the highest mean score of latent anxiety was related to the control group. The highest minimum at the beginning of the study was related to the intervention group, which decreased in the later stages of the study [Table 3].

The results of the data showed that in the intervention group, most participants had anxiety scores in the severe and very severe range, but after training, the number of people with very severe anxiety decreased and were placed in other groups of anxiety. Compared to before training after amniocentesis, the number of people with very severe anxiety decreased, but still the highest number of people had very severe anxiety, but in the control group at all stages, the highest number of people were in the group of very severe anxiety [Table 4].

The results of Mann–Whitney intergroup test showed that the mean scores of overt anxiety before the intervention between the control and intervention groups were not significant ( $P < 0.014$ ) but were significant after training and after amniocentesis ( $P < 0.001$ ). Furthermore, the results of Mann–Whitney intragroup test showed that the mean scores of overt anxiety in the intervention group before and after training were significant ( $P < 0.001$ ). Furthermore, the results of the control group showed significant results ( $P < 0.001$ ) [Table 5].

The results of the independent *t*-test showed that the mean scores of latent anxiety before the intervention between the control and intervention groups were not significant ( $P < 0.194$ ) but were significant after the training ( $P < 0.57$ ), but the results were not significant after amniocentesis ( $P < 0.216$ ). Furthermore, the results of paired *t*-test within the group showed that the mean scores of latent anxiety in the intervention group before

and after training were statistically significant ( $P < 0.001$ ). Furthermore, the results of the control group showed significant results ( $P < 0.001$ ) [Table 6].

**Table 2: Mean, standard deviation, minimum and maximum scores of overt anxiety in three stages of study in research units**

Overt anxiety variable	Mean±SD	Minimum	Maximum
Overt anxiety before training			
Intervention group	53/6000±10/85995	32	80
Control group	56/5750±9/54312	27	76
Overt anxiety after training			
Intervention group	35/7500±8/48150	21	61
Control group	51/6750±8/48645	24	69
Overt anxiety after amniocentesis			
Intervention group	41/7000±10/08985	21	68
Control group	49/9250±9/40646	22	77

SD=Standard deviation

**Table 3: Mean, standard deviation, minimum and maximum hidden anxiety scores in three stages of study in research units**

Hidden anxiety variable	Mean±SD	Minimum	Maximum
Hidden anxiety before training			
Intervention group	43/8000±8/34573	28	62
Control group	46/7000±9/74074	25	67
Hidden anxiety after training			
Intervention group	29/4750±6/43702	20	50
Control group	42/4250±8/53616	23	64
Hidden anxiety after amniocentesis			
Intervention group	34/7250±7/95818	20	54
Control group	41/3250±10/55969	23	81

SD=Standard deviation

## Discussion

Psychological stress during pregnancy is one of the important phenomena that unfortunately is not measured in routine pregnancy care, so its extent during pregnancy and its impact on maternal health is somewhat unclear. On the other hand, aggressive measures to assess the health of the fetus can increase the psychological stress of pregnant mothers. Therefore, the aim of this study was to determine the effect of education on the anxiety of pregnant women candidates for amniocentesis. The results of this study showed that education reduces anxiety before amniocentesis in pregnant mothers. On the other hand, education reduces anxiety after amniocentesis in pregnant mothers and the level of anxiety of pregnant amniocentesis candidates in the education group was significantly reduced. In other words, pregnant mothers' awareness of the intervention process and related matters can reduce their anxiety. In this regard, a study by Kordi *et al.* in 2015 entitled "Comparison of the effect of group and individual training on anxiety of pregnant women about screening tests for fetal chromosomal abnormalities" was performed on 240 pregnant women with a gestational age of <10 weeks. The results showed that the mean scores of overt and covert anxiety in the three groups of control, individual, and group education had a statistically significant difference ( $P = 0.001$ ). Due to the effectiveness of individual and group training methods in reducing the obvious anxiety of pregnant women about screening tests for fetal chromosomal disorders, each of these training methods can be used according to the conditions of the clinical environment to encourage pregnant mothers to use screening tests.<sup>[26]</sup> Furthermore, the study of Amel Sh *et al.* in 2014 with the aim of "determining the effect of structured counseling on the level of anxiety in women undergoing amniocentesis" was performed on 32 pregnant women. The results

**Table 4: Determining the number and percentage of people in the interpretive criteria of anxiety**

Groups	Steps of conducting research		
	Before training, n (%)	After training, n (%)	After amniocentesis, n (%)
Mild anxiety	0 (0/0)	0 (0/0)	0 (0/0)
Moderate down anxiety	0 (0/0)	3 (7/5)	1 (2/5)
Moderate upward anxiety	0 (0/0)	4 (10/0)	1 (2/5)
Moderately severe anxiety	0 (0/0)	13 (32/5)	7 (17/5)
Severe anxiety	7 (17/5)	14 (35/0)	7 (17/5)
Very severe anxiety	33 (82/5)	6 (15/0)	24 (60/0)
Total	40 (100/0)	40 (100/0)	40 (100/0)
Mild anxiety	0 (0/0)	0 (0/0)	0 (0/0)
Moderate down anxiety	0 (0/0)	0 (0/0)	0 (0/0)
Moderate upward anxiety	1 (2/5)	1 (2/5)	1 (2/5)
Moderately severe anxiety	0 (0/0)	1 (2/5)	1 (2/5)
Severe anxiety	1 (2/5)	0 (0/0)	3 (7/5)
Very severe anxiety	38 (95/0)	38 (95/0)	35 (87/5)
Total	40 (100/0)	40 (100/0)	40 (100/0)

**Table 5: Evaluation of the effect of education on the level of overt anxiety of pregnant women candidates for amniocentesis in the control and intervention groups**

Overt anxiety	Group, mean±SD		P, Mann- Whitney
	Intervention group	Control group	
Overt anxiety before training	53/6000±10/85995	56/5750±9/54312	0/014
Overt anxiety after training	35/7500±8/48150	51/6750±8/48645	0/001
Overt anxiety after amniocentesis	41/7000±10/08985	49/9250±9/40646	0/001
P, Mann- Whitney	0/001	0/001	

SD=Standard deviation

**Table 6: Evaluation of the effect of education on latent anxiety in pregnant women candidates for amniocentesis in both control and intervention groups**

Latent anxiety	Group, mean±SD		P, Mann- Whitney
	Intervention group	Control group	
Latent anxiety before training	43/8000±8/34573	46/7000±9/74074	0/194
Latent anxiety after training	29/4750±6/43702	42/4250±8/53616	0/057
Latent anxiety after amniocentesis	34/7250±7/95818	41/3250±10/55969	0/216
P, Mann- Whitney	0/001	0/001	

SD=Standard deviation

showed that the anxiety score decreased immediately after the intervention in the experimental group, which was a significant difference between the experimental and control groups. As a result, preamniocentesis counseling reduces the anxiety levels for amniocentesis. Therefore, it is recommended that routine counseling for pregnant women before amniocentesis be performed by midwives.<sup>[27]</sup> The study of Balci *et al.* (2011) aimed to “determine the effect of preamniocentesis counseling on maternal pain and anxiety” was performed on 240 single pregnant women with a gestational age of 16–20 weeks. The results showed that the mean levels of anxiety in women before counseling (anxiety 1) and after counseling before amniocentesis (anxiety 2) and after amniocentesis (anxiety 3) were 3, 6, and 5, respectively. Counseling before amniocentesis had a significant positive effect on reducing anxiety levels. Therefore, routine counseling for pregnant women before amniocentesis is recommended.<sup>[28]</sup>

Furthermore, the present results of this study showed that the mean scores of overt anxiety before the intervention between the control and intervention groups were not significant, but after training and after amniocenter were significant. The mean scores of latent anxiety before the intervention between the control and intervention groups were not significant, but after the training was significant, but the results were not significant after amniocentesis. The mean scores of overt anxiety in the intervention group before and after training were significant. In this regard, the results of a study by Kordi *et al.* showed that the mean score of overt anxiety after screening tests decreased in the individual and group training groups, but increased in the control group. The results also showed that the mean score of latent anxiety in pregnant women who underwent screening tests was

not different from those who did not. However, the mean score of overt anxiety in pregnant women after screening tests was significantly lower than those who did not perform these tests.<sup>[4]</sup>

However, in the study of Björklund *et al.* (2013), the mean score of overt and covert anxiety of pregnant women after watching the educational video in the two groups of intervention and control was not statistically significant,<sup>[29]</sup> which was not consistent with the results of the present study. In the Björklund *et al.* study, overt and covert anxiety was assessed only at 26 weeks of gestation, but in the present study, it was assessed before intervention, then after intervention, and after amniocentesis. Furthermore, the type of education was different in the present study. In the study of Kaiser *et al.*, the mean score of overt and covert anxiety of pregnant women after group counseling was not statistically significant different from before counseling, which was not consistent with the present study.<sup>[30]</sup> There was no control group in their study. Furthermore, the age of pregnant mothers was 35 years old, and the anxiety variable was evaluated in two stages before and immediately after the consultation, but in the present study, anxiety before the intervention and after the intervention and after amniocentesis was evaluated.

In other words, it can be said that one of the areas of stress and anxiety in patients is lack of knowledge and lack of sufficient information on how to perform the operation. Mothers need more psychological support and awareness during screening tests and invasive procedures during pregnancy, which is a stressful and critical period for the mother. In education and counseling, one tries to help the other to understand and solve adaptation problems.<sup>[31-33]</sup> Studies focusing on educational programs have shown

the positive effects of short-term education, which reflects the existential philosophy of the need to educate patients and empower them. It improves life expectancy in these patients and strengthens coping mechanisms in them. Studies show that both face-to-face and remote counseling increase mothers' awareness of prenatal screening.<sup>[25]</sup> Furthermore, when mothers use doctors or nurses as sources of information, the level of anxiety is significantly lower.<sup>[17,26]</sup> In the study of Isfahani and Yazdanpanah, it was pointed out that counseling and individual and group education methods are effective in reducing stress and anxiety during pregnancy.<sup>[34,35]</sup> Therefore, counseling and educational measures before such interventions can be an important step in reducing the anxiety of pregnant mothers. For this reason, it is recommended that health-care providers explain the process of procedures to pregnant mothers at any stage in relation to pregnant women. On the other hand, pregnant mothers who are candidates for amniocentesis may have other concerns that add to the anxiety of amniocentesis. For this reason, it seems necessary to study the causes of anxiety and ways to reduce it. Cultural and social differences can also affect these. For this reason, the study of such studies in different cultures and different consensus can increase the application of the results of this study. On the other hand, in this study, only one type of training was examined; therefore, it is recommended that other studies be performed by reviewing and comparing various teaching aid methods to increase the generalizability of the results. Another limitation of the present study was that unknown personality and mental disorders of pregnant mothers may affect overt anxiety.

## Conclusion

The findings of the present study indicate the positive effect of education on anxiety of pregnant women candidates for amniocentesis. The results show the important role of education on the psychological dimension of high-risk pregnant women in relation to the consequences of pregnancy and childbirth. According to the research results, it seems that face-to-face education affects the cognitive system and information processing by increasing people's awareness of the amniocentesis process and its consequences. Therefore, due to the effectiveness of this type of education and considering the benefits of this method in improving the perceived anxiety and stress of mothers, its widespread use as a method of prevention and nonpharmacological treatment is recommended.

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## Conflicts of interest

There are no conflicts of interest.

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