

RESEARCH

Open Access



# The effect of prenatal education on health anxiety of primigravid women

Sahar Nikoozad<sup>1</sup>, Faranak Safdari - Dehcheshmeh<sup>2,3</sup>, Farangis Sharifi<sup>2,3</sup> and Forouzan Ganji<sup>2,4\*</sup>

## Abstract

**Background and aim** Health anxiety is a mental disorder that characterized by an excessive fear about health and physical symptoms. High anxiety in pregnancy is associated with adverse outcomes. The aim of this study was to investigate the effect of prenatal education on health anxiety of primigravid women.

**Methods** The present study was quasi-experimental study. 122 primiparous pregnant women referred to comprehensive health services Shahrekord (A city in the southwest of Iran) clinics in 2019, after receiving consent to participate in the study, randomly divided into two intervention and control groups. The intervention group participated in 8 sessions (1.5-h), once every 2 weeks, from 20 to 37th weeks of gestation. The health anxiety questionnaire was completed on 20th (before the beginning of the courses), 28th and 37th weeks by two groups. Consequences of pregnancy included weight, Apgar score, delivery type, labor time and first breastfeeding time. SPSS version 16 software was used for data analysis.

**Results** No significant difference was found type of delivery, gestational age, height, weight, head length, Apgar score, duration of hospitalization and first breastfeeding time. The duration of the active and latent phase of labor was significantly lower and the weight of newborn was significantly higher in the intervention group than the control group ( $P < 0.05$ ). At 37th week, the scores of illness concern, negative consequence and total health anxiety in the intervention group decreased by 3.42, 0.93 and 4.36 respectively and in control group increased by 2.82, 0.03 and 2.86.

**Conclusion** Pregnancy educational courses has positive effects on health anxiety, decrease duration of labor time and increased newborn weight. In order to improve the outcome of pregnancy, educational classes during pregnancy should be considered.

**Keywords** Health anxiety, Pregnancy anxiety, Pregnancy courses, Primigravid women

\*Correspondence:

Forouzan Ganji  
foruzan2000@yahoo.co.in

<sup>1</sup> Faculty of Medicine, Shahrekord University of Medical Sciences, Shahrekord, Iran

<sup>2</sup> Social Determinants of Health Research Center, Shahrekord University of Medical Sciences, Shahrekord, Iran

<sup>3</sup> Department of Midwifery and Reproductive Health, Nursing and Midwifery School, Shahrekord University of Medical Sciences, Shahrekord, Iran

<sup>4</sup> Department of Community Medicine, Faculty of Medicine, Shahrekord University of Medical Sciences, Shahrekord, Iran



© The Author(s) 2024. **Open Access** This article is licensed under a Creative Commons Attribution-NonCommercial-NoDerivatives 4.0 International License, which permits any non-commercial use, sharing, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons licence, and indicate if you modified the licensed material. You do not have permission under this licence to share adapted material derived from this article or parts of it. The images or other third party material in this article are included in the article's Creative Commons licence, unless indicated otherwise in a credit line to the material. If material is not included in the article's Creative Commons licence and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder. To view a copy of this licence, visit <http://creativecommons.org/licenses/by-nc-nd/4.0/>.

## Introduction

Health anxiety characterized by extreme fears and delusions about health and physical symptoms [1]. Health anxiety includes four emotional, cognitive, behavioral and perceptual components. The emotional component includes health concerns. The cognitive component refers to a strong belief that one is sick against medical evidence. The behavioral component includes reassurance-seeking behaviors in order to reduce the fear of illness, and the perceptual component includes mental preoccupation with physical symptoms and feelings [2]. People with health anxiety have many visits to medical centers and pay significant medical costs [3]. Health anxiety is often associated with other mental disorders. Additionally they are often not aware of the fact that their physical symptoms are caused by depression and anxiety [4]. According to the evidence, anxiety is one of the psychological problems of a pregnant mother. Prevalence of pregnancy anxiety has been various and commonly undiagnosed [5], additionally, the mental state of the mother during pregnancy is effective on childbearing process and the health of the baby [6]. This problem can take the form of illness and affect the mental health of the mother and the baby, associated with mental health problems in adulthood, and even have a profound effect on the whole life [7, 8]. Mother's anxiety increases the possibility of shortness of breath in the newborn period, relationship between mother and baby and reduces the mother's ability in the role of mother and baby, spontaneous abortion, premature birth and preeclampsia, cesarean delivery and bacterial vaginosis low birth weight, small head circumference, neuroendocrine disorders, low Apgar, crying and a more unstable condition in the baby, and decreases the production and secretion of breast milk in the postpartum period [9–13]. Anxiety and worry during pregnancy, has a significant relationship with the young age of the mother in the first pregnancy, lack of support from her husband and history of abortion [5].

There is not any specific vulnerable period of gestation; prenatal stress effects vary for different gestational ages possibly depending on the developmental stage of specific brain areas and circuits, stress system and immune system [14]. Drug therapy in order to reduce anxiety and worry during pregnancy is only one of the ways to deal with anxiety due to the many side effects on the baby [15]. Although some of nonpharmacologic interventions can be convenient and low cost, there is an inconsistent result of these modalities [13, 16–18].

Expectant mothers have high rates of anxiety and depressive disorders, and many are susceptible to a variety of stressors during pregnancy [13], and continuous childbirth education programs for pregnant women in different antenatal care settings are highly recommended

[19]. Based on evidence encouraging and supporting women to attend the full course of educational classes has the potential to increase women's preference towards vaginal birth, resulting in a reduction in the caesarean section rate and fear of childbirth, self-efficacy improvement, and satisfaction to cope with labor pain [20–22]. Since in Shahrekord city, the effect of courses held in clinics of comprehensive health service centers on the health anxiety of primiparous pregnant women has not been investigated, this study aims to “determine the effect of prenatal education on health anxiety of primigravid women referring to comprehensive health service centers of Shahrekord city”.

## Materials and methods

Current study with ethic code: “IR.SKUMS.REC.1396.208” is a quasi-experimental in the population of primiparous pregnant women referring to Shahrekord (a city in the southwest of Iran and the capital of Chaharmahal and Bakhtiari province) comprehensive health service centers in 2019 was done. After receiving written consent, participants randomly divided into two intervention and control groups.

Inclusion criteria included: first pregnancy, 20 weeks gestational age, uncomplicated pregnancy, without anxiety disorders and Depression based on the General Health Questionnaire (GHQ) score, and non-use of psychoactive and herbal drugs. Exclusion criteria included dissatisfaction with the continuation of the study, absence from courses, occurrence of stressful events during the study (such as the death of relatives) and pregnancy complications during the study (such as abnormality and death of the fetus during the study).

The sample size was obtained based on available continuous sampling and according to the information obtained from similar studies [15, 23] and the following formula, including 10% possible attrition, 65 people for each group. The file numbers of the selected pregnant women were written on one-shaped cards and put in a box, then they were randomly assigned to study groups (intervention and control groups).

The information was collected by the researcher using the health anxiety questionnaire and the pregnancy outcomes registration checklist. In the first stage of the study, both groups completed the questionnaires in the 20th week of pregnancy (before the intervention).

For measure health anxiety, the short form of the health anxiety questionnaire designed by Warwick and Salkoskis in 2002 was used. This questionnaire has three parts (18 questions) included as probability of contracting the disease, negative consequences of contracting the disease and general health concern [24]. In this questionnaire, option A is assigned a score of 0 (no health anxiety)

and option D is assigned a score of 3 (most health anxiety). The range of scores of this test is between 0 and 54, and higher scores indicate more health anxiety. The studies have shown that the health anxiety questionnaire has good validity and reliability [25, 26].

Participants were asked to select the appropriate option that accurately describes their situation in the past 6 months. The second stage was completing the questionnaire in the 28th week and the third stage in the 37th week for both groups. The intervention group participated in 8 sessions of 1.5 h, once every two weeks, from week 20 to week 37. The educational content provided to the intervention group is shown in Table 1. During this period, the control group received routine prenatal care specific to Iran. In the maternity hospital, the researcher completed the checklist of pregnancy outcomes including (newborn weight, Apgar score, labor duration, type of delivery and first breastfeeding time).

Data analyze were used SPSS version 16 software developed by IBM. Data were expressed as frequency or mean and standard deviation. In order to analyze the data, Chi-square, t-test and regression analysis were used.

### Findings

One hundred twenty-two primiparous pregnant women were included in the present study. Mean GHQ score was  $21.68 \pm 8.60$ , maximum 39 and minimum 6. The attrition rate of the sample was 6.1 percent (totally 8 persons in intervention and control groups), because absence in the courses, pre-term labor and failure of filling the questionnaires.

Normal vaginal delivery was 80.3% in the intervention group and 88.5% in the control group. The comparison

of the components of the health anxiety questionnaire in the study groups shown in Table 2. The probability of contracting the disease and the overall health concern score before the intervention in the intervention and control groups were significantly different ( $P < 0.05$ ). There was no significant difference between the study groups in the 28th and 37th weeks ( $P > 0.05$ ). In the 28th week, compared to before the intervention, the probability of contracting the disease, the negative outcome of contracting the disease, and the overall health concern score in the intervention group decreased by 2.21, 0.44, and 2.62, respectively, and in the control group, the probability of contracting the disease and the overall health concern score increased by 2.33 and 2.13 points, respectively, and the score of the negative consequence of contracting the disease was reduced by 0.2 points. In the 37th week, compared to before the intervention, the probability of contracting the disease, the negative outcome of contracting the disease, and the overall health concern score in the intervention group decreased by 3.42, 0.93, and 4.36, respectively, and in the control group, the scores increased by 2.82, 0.03 and 2.86, respectively.

The overall average of the various components of health anxiety before intervention vs 28th week, 28th week vs 37th week, before intervention vs 37th week didn't significantly different ( $P > 0.05$ ), but only the average score of "negative outcomes of contracting the disease" in the 37th week compared to before of intervention significantly decreased ( $P < 0.03$ ).

According to the results of Table 3, there was no significant difference of gestational age, mother's weight gain, height, head circumference and Apgar score of the baby, duration of hospitalization, and first breastfeeding time

**Table 1** Educational content provided to intervention group

Session number	Gestational age	Content
1	20–23 weeks	Statement of goals and methods in the courses, conduction of courses, presentation of mothers, anatomical and physiological changes, common complaints in pregnancy, breathing, body relaxation and stretching exercises
2	24–27 weeks	Overview of common complaints, the importance of pregnancy care, danger signs and personal hygiene.
3	28–29 weeks	Mental health, nutrition in pregnancy, fetal growth and development, breathing, body relaxation and stretching exercises.
4	30–31 weeks	Nutrition during pregnancy, labor pain and cognition of different methods of reducing pain, film screening, pain reduction methods, breathing, body relaxation and stretching exercises.
5	32–33 weeks	Acquaintance with the stages of childbirth and various childbirth situations, necessary interventions during childbirth, breathing, body relaxation and stretching exercises, visiting birthing centers (if possible).
6	34–35 weeks	Importance of normal delivery and an overview of pain reduction methods and stages of childbirth, the role of a companion, planning for childbirth were discussed, and a video of normal delivery, breathing, body relaxation and stretching exercises.
7	36 weeks	Review of birth planning, family planning, preparation of family members, baby care and baby danger signs, breathing, body relaxation and stretching exercises.
8	37 weeks	Overview of birth planning, family planning, preparation of family members, baby care and baby danger signs, breathing, body relaxation and stretching exercises.

**Table 2** Comparison of the mean and standard deviation of the components of the health anxiety questionnaire in study groups

Variables		Mean $\pm$ standard deviation	P value
Probability score of the disease before the intervention	intervention	26.91 $\pm$ 4.85	*0.000
	control	21.09 $\pm$ 7.67	
The score of the negative outcome of the disease before the intervention	intervention	6.91 $\pm$ 2.37	0.101
	control	6.00 $\pm$ 3.63	
General health concern score before the intervention	intervention	33.83 $\pm$ 6.04	*0.000
	control	27.09 $\pm$ 10.53	
The score of the probability of contracting the disease in the 28th week	intervention	24.70 $\pm$ 5.27	0.366
	control	23.42 $\pm$ 9.65	
The score of the negative outcome of contracting the disease in the 28th week	intervention	6.47 $\pm$ 2.23	0.172
	control	5.80 $\pm$ 3.10	
General health concern score in the 28th week	intervention	31.18 $\pm$ 6.25	0.275
	control	29.22 $\pm$ 12.41	
The score of the probability of contracting the disease in the 37th week	intervention	5.69 $\pm$ 23.49 $\pm$	0.758
	control	23.91 $\pm$ 15.9	
The score of the negative outcome of contracting the disease in the 37th week	intervention	5.98 $\pm$ 1.97	0.919
	control	6.03 $\pm$ 3.19	
General health concern score in the 37th week	intervention	29.47 $\pm$ 6.76	0.758
	control	29.95 $\pm$ 11.78	

\* Significant difference:  $p < 0.05$ **Table 3** Comparison of mean and standard deviation of pregnancy and childbirth outcomes in study groups

Variables		Mean $\pm$ standard deviation	P value
Gestational age (days)	intervention	274.80 $\pm$ 4.85	0.709
	control	275.27 $\pm$ 7.67	
Mother's weight gain (kg)	intervention	13.05 $\pm$ 2.37	0.731
	control	13.19 $\pm$ 3.63	
height (cm)	intervention	50.16 $\pm$ 6.04	0.116
	control	49.54 $\pm$ 10.53	
Baby's weight (grams)	intervention	3316.88 $\pm$ 5.27	*0.000
	control	2993.77 $\pm$ 9.65	
head circumference (cm)	intervention	34.59 $\pm$ 2.23	0.326
	control	34.01 $\pm$ 3.10	
Apgar score of the baby	intervention	8.9 $\pm$ 0.67	0.059
	control	8.7 $\pm$ 0.75	
Hospitalization (hours)	intervention	41.45 $\pm$ 5.69	0.690
	control	40.90 $\pm$ 9.15	
Latent phase length of labor (minutes)	intervention	389.01 $\pm$ 1.97	*0.000
	control	483.44 $\pm$ 3.19	
Length of the active phase of labor (minutes)**	intervention	267.04 $\pm$ 6.76	*0.002
	control	326.88 $\pm$ 11.78	
First breastfeeding time (minutes)	intervention	59.42 $\pm$ 11.78	0.241
	control	46.39 $\pm$ 11.78	

\* Significant difference:  $p < 0.05$ 

\*\* Analyzed only for normal delivery outcome

between the two groups. The duration of the active and latent phase of labor in the intervention group was significantly less than the control group ( $P < 0.05$ ). The weight of the baby in the intervention group was significantly higher than the control group ( $P < 0.05$ ).

## Discussion

The present study was conducted with the aim of investigating the effect of prenatal education on health anxiety of primigravid women. In general, the results of the study show that the level of health anxiety in women participating in education courses decreased over time, but the control group experienced an increase in health anxiety from week 20 to week 37.

The components of the health anxiety questionnaire, in the 28th and 37th weeks in the intervention and control groups did not have a significant difference. This result could be due to the two groups not being the same in terms of the initial values of health anxiety, and in the intervention group, the health anxiety score before the intervention was significantly higher than the control group.

In the study of Doaltabadi et al. [27], Najafi et al. [28] and of Khorsandi et al. (2014) pregnant women who participated in labor preparation and relaxation courses had a statistically significant lower average fear of delivery than the group receiving usual care [27–29]. A quasi-experimental clinical trial by Mosavi et al. (2021) investigated the effect of virtual childbirth preparation training on primiparous women. The expected outcomes included the difference in pregnancy experience, the difference in fear of childbirth measured, the birth preference, and the type of delivery [21]. In the research of Hassanzadeh et al. (2022), participation in Attending prenatal classes was associated with positive childbirth experience and low postpartum depression score [30]. Delaram et al. reported in 2011 that counseling and informing women in the third trimester of pregnancy reduces their anxiety at the beginning of labor [31]. In [32] review, the relaxation program significantly reduced trait-state anxiety and stress in pregnant women [32]. In general, the lack of awareness increases fear and anxiety about pregnancy and labor, especially in primiparous women, and increases the possibility of morbidity and side effects during delivery and postpartum [7].

According to the results of the present study, there was no significant difference between the mother's weight gain, gestational age, height, head circumference and Apgar score of the baby in the group participating in the training courses and the control group. The weight of babies in the group participating in labor preparation courses was significantly higher than the control group. In the study of Mehdizadeh et al., in line with these

results, no significant difference was observed between the height, head circumference and Apgar score of the newborn in the two groups of participants in the training courses and the control group, but, but in the intervention group, the baby weight was slightly higher [33]. In the study by Bastani et al. in 2006, in pregnant women participating in the relaxation program, the number of premature babies with low birth weight was significantly less compared to the control group, which is in line with the present results [34]. In general, psychological stress and distress of pregnant mothers is one of the main predictors of adverse pregnancy outcomes, including low birth weight and preterm babies [35]. During pregnancy, during exposure to stress and anxiety, various hormones, including corticotropin-releasing hormone (CRH), adrenocorticotropin-releasing hormone (ACTH), cortisol, noradrenaline and beta-endorphin, are released in large amounts in the blood [36]. Increased beta-endorphin levels are associated with decreased placental-fetal blood flow, leading to fetal hypoxia [35]. Maternal stress and increased secretion of catecholamines can cause contraction of blood vessels, which can lead to a range of fetal injuries, including brain damage [37]. Mother's mental stress is a strong predictor of low birth weight and preterm infants, which are among the major causes of mortality and morbidity in infants [38]. Therefore, the increase in the weight of babies of women participating in pregnancy preparation courses compared to the control group is due to the reduction of their stress and anxiety, which has led to the improvement of pregnancy outcomes, including the weight of the baby. In the present study, the length of latent and active phase of labor in the case group was significantly less than the control group. In line with the present results in Mehdizadeh et al.'s study (2005), the duration of the latent phase of labor in the group participating in labor preparation courses was significantly less than the control group. The duration of the active phase of labor was significantly longer in the control group than in the group participating in labor courses [33]. Reducing the duration of labor can also be due to the effect of the courses in reducing the fear and anxiety of the mother and her feeling of comfort. In the present study, there was no significant difference in prevalence of normal delivery between the two groups. This is while in the study of Mehdizadeh et al., and Najafi et al. in pregnant women participating in labor preparation courses, rate of normal delivery was significantly more than control group [33, 34]. In Hassanzadeh et al. study (2021), women reported that participation in childbirth preparation classes prepared them well for a vaginal birth, and these classes were perceived to be associated with a positive childbirth experience [20]. In the studies of Sydsjo et al. (2014), Najafi et al. [28] and Bastani et al.'s



study (2006) the rate of emergency cesarean in pregnant women participating in training courses and relaxation program was reported to be significantly lower than in the control group [28, 34, 39].

Training during pregnancy is a dynamic process in which parents get information about the physical and mental changes of pregnancy, childbirth, parenting, neuromuscular exercises and support techniques in pregnancy. These factors reduce the effect of various psychological and biological stressors created during pregnancy and increase the comfort and confidence of pregnant women [19, 32, 40]. Nerum et al. [41], reported that a discussion with women who had fear of delivery and chosen cesarean section, most of them (93%) changed their decision and preferred normal delivery [41].

In the present study, there was no significant difference between first breastfeeding time in the control group and the intervention group. The first breastfeeding time in the intervention group was slightly longer than the control group, which could be due to more cesarean births in this group, and the results may be different in the larger community.

#### Limitations and implementation problems of research

Occurrence of pregnancy complications such as premature birth, which were excluded from the study. Cases of pregnant women not returning to participate in the courses, we tried to prevent them from leaving the study by following up on the phone and considering a gift for them.

#### Conclusion

In the present study, the score of the components of the health anxiety questionnaire showed a decrease in the group under labor preparation courses, which indicates the effect of the educational courses in reducing health anxiety, the length of the active and latent phase and increased of baby. According to the results of this study, suggested that labor preparation courses be offered as a method without complications to reduce the health anxiety of pregnant women. To ensure the health of the population, policy makers should consider pregnancy education courses during health programs.

#### Acknowledgements

We would like to express our gratitude and appreciation to the Honorable Vice-Chancellor of Research and Technology, Faculty of Medicine and Social Determinants of Health Research Center of Shahrekord University of Medical Sciences for their cooperation in reviewing and approving the project. We are also grateful to the pregnant women who participated in this project. Ethics approval Manuscript is taken from the thesis of Sahar Nikoozad, "general medicine student of Shahrekord University of Medical Sciences", that proposal was approved by the ethics committee of Shahrekord University of Medical science (IR.SKUMS.REC.1396.208). Consent to participate and publication: • In

order to participate in the study, written consent was obtained from pregnant women. • After completing the informed consent form, the patients participated in the study with their personal consent, and they could withdraw from the study whenever they wished. • Confidentiality of personal information obtained in the research units was guaranteed. • The purpose of the research was explained to each of the participants. • In order to publish the general results of the research, permission was obtained from the participants.

#### Authors' contributions

F.S. and F.G. and F.S. wrote the main manuscript text and F.G. and F.S. and S.N. prepared tables. All authors reviewed the manuscript.

#### Funding

The budget of this project was provided by Shahrekord University of Medical Sciences (grant number: 954).

#### Availability of data and materials

The data that support the findings of this study are available from the corresponding author (FG): "Data is provided within the manuscript". Ethics approval Manuscript is taken from the thesis of Sahar Nikoozad, "general medicine student of Shahrekord University of Medical Sciences", that proposal was approved by the ethics committee of Shahrekord University of Medical science (IR.SKUMS.REC.1396.208). Consent to participate and publication: • In order to participate in the study, written consent was obtained from pregnant women. • After completing the informed consent form, the patients participated in the study with their personal consent, and they could withdraw from the study whenever they wished. • Confidentiality of personal information obtained in the research units was guaranteed. • The purpose of the research was explained to each of the participants. • In order to publish the general results of the research, permission was obtained from the participants.

#### Declarations

##### Ethics approval and consent to participate

Manuscript is taken from the thesis of Sahar Nikoozad, "general medicine student of Shahrekord University of Medical Sciences", that proposal was approved by the ethics committee of Shahrekord University of Medical science (IR.SKUMS.REC.1396.208).

##### Consent of publication

In order to publish the general results of the research, permission was obtained from the participants.

##### Competing interests

The authors declare no competing interests.

Received: 24 March 2024 Accepted: 24 July 2024

Published online: 14 August 2024

#### References

1. Hamann S. Cognitive behavioral therapy in hypochondriasis and fear of illness. Basel: Karger; 2015.
2. Henningsen P. Somatic symptom disorder and illness anxiety disorder. In: The American Psychiatric Association publishing textbook of psychosomatic medicine and consultation-liaison psychiatry. 2019. p. 305–22.
3. Taylor S. Anxiety sensitivity: theory, research, and treatment of the fear of anxiety. New York: Routledge; 2014.
4. Lopez-Sola C, Bui M, Hopper J, Fontenelle L, Davey C, Alonso P, et al. Understanding hypochondriasis: a novel twin study model of potential causal relationships with anxiety and OC-related disorder symptoms. *Eur Neuropsychopharmacol*. 2016;2(26):S631.
5. Wilson MP, Nordstrom K, Shah AA, Vilke GM. Psychiatric emergencies in pregnant women. *Emerg Med Clin*. 2015;33(4):841–51.
6. Bazr Afshan M, Mahmoodi RA. The relationship between women's anxiety during pregnancy and labor outcomes in Larestan hospitals. *Mandish*. 2009;1(1):1–12.

7. Baba NL, Kafi S. Relationship of pregnancy anxiety to its different periods, sexual satisfaction and demographic factors. 2008.
8. Oates MR. Adverse effects of maternal antenatal anxiety on children: causal effect or developmental continuum? *Br J Psychiatry*. 2002;180(6):478–9.
9. Kurki T, Hiilesmaa V, Raitasalo R, Mattila H, Ylikorkala O. Depression and anxiety in early pregnancy and risk for preeclampsia. *Obstet Gynecol*. 2000;95(4):487–90.
10. Alawamir AMA, Zakaria NI, Alsbhani WM, Khalifah AM, Almohamad AA, Al Shamrani AAM, et al. Depression and anxiety in early pregnancy and its risk for preeclampsia. *Egypt J Hosp Med*. 2017;67(2):683–91.
11. Vieten C, Astin J. Effects of a mindfulness-based intervention during pregnancy on prenatal stress and mood: results of a pilot study. *Arch Womens Ment Health*. 2008;11:67–74.
12. Tanpradit K, Kaewkiattikun K. The effect of perceived stress during pregnancy on preterm birth. *Int J Womens Health*. 2020;12:287–93.
13. Traylor CS, Johnson JD, Kimmel MC, Manuck TA. Effects of psychological stress on adverse pregnancy outcomes and nonpharmacologic approaches for reduction: an expert review. *Am J Obstet Gynecol MFM*. 2020;2(4): 100229.
14. Van den Bergh BR, van den Heuvel MI, Lahti M, Braeken M, de Rooij SR, Entringer S, et al. Prenatal developmental origins of behavior and mental health: the influence of maternal stress in pregnancy. *Neurosci Biobehav Rev*. 2020;117:26–64.
15. Alwan S, Reefhuis J, Rasmussen SA, Olney RS, Friedman JM. Use of selective serotonin-reuptake inhibitors in pregnancy and the risk of birth defects. *Obstet Gynecol Surv*. 2007;62(11):702–3.
16. Tragea C, Chrousos GP, Alexopoulos EC, Darviri C. A randomized controlled trial of the effects of a stress management programme during pregnancy. *Complement Ther Med*. 2014;22(2):203–11.
17. Mueller SM, Grunwald M. Effects, side effects and contraindications of relaxation massage during pregnancy: a systematic review of randomized controlled trials. *J Clin Med*. 2021;10(16): 3485.
18. Hossein Khanzadeh A, Rostampour A, Khosrojavid M, Nedaee N. Effectiveness of cognitive-behavioral education on anxiety during pregnancy and delivery method in primiparous women. *J Nurs Educ*. 2017;5(6):24–32.
19. Rashed MS, Nour SA, Mohamed HSED, Ragab AR, Salama NS, Nasr EH. Effectiveness of childbirth education on primigravida women's knowledge about childbirth preparation. *Port Said Sci J Nurs*. 2023;10(2):95–113.
20. Hassanzadeh R, Abbas-Alizadeh F, Meedy S, Mohammad-Alizadeh-Charandabi S, Mirghafourvand M. Perceptions of primiparous women about the effect of childbirth preparation classes on their childbirth experience: a qualitative study. *Midwifery*. 2021;103: 103154.
21. Mousavi SR, Amiri-Farahani L, Hasanpoor-Azghady SB, Saravi SO. Comparing the effect of in-person and virtual childbirth preparation trainings on the fear of childbirth (FOC) and pregnancy experience of pregnant women: protocol for a quasi-experimental feasibility study. *Pilot and feasibility studies*. 2021;7(1):194.
22. Said AR, Hassan HM, Salama AM. Effect of childbirth preparation classes on women's knowledge, self-efficacy and satisfaction to cope with labour pain. *Int J Manag*. 2022;13(4):47.
23. Heydarpour S, Feli R, Yazdanbakhsh K, Heydarpour F. The impact of mindfulness-based counseling on the levels of anxiety during pregnancy and on newborns' physiological parameters. *Scientific Journal of Nursing, Midwifery and Paramedical Faculty*. 2020;6(1):106–17.
24. Salkovskis PM, Rimes KA, Warwick HM, Clark D. The Health Anxiety Inventory: development and validation of scales for the measurement of health anxiety and hypochondriasis. *Psychol Med*. 2002;32(5):843–53.
25. Ebrahimi E, Moulavi H, Ghafour M, Yaghoubi B. Psychometric properties and factor structure of General Health Questionnaire 28 (GHQ-28) in Iranian psychiatric patients. *Journal of Research in Behavioural Sciences*. 2007;5(1):5–12.
26. Karimi J, Homayuni Najafabadi A, Homayuni NF. Evaluation of psychometric properties of the health anxiety inventory. *Hakim Res J*. 2015;17(4):297–305.
27. Doaltabadi Z, Amiri-Farahani L, Hasanpoor-Azghady SB. Implementation of virtual and face-to-face childbirth preparation training for the spouses of the primiparous women to reduce the fear of childbirth, improve the pregnancy experience, and enhance mother-and father-infant attachment: protocol for a quasiexperimental clinical trial. *Obstet Gynecol Int*. 2021;2021(1):6686934.
28. Najafi F, Abouzari-Gazafrudi K, Jafarzadeh-Kenarsari F, Rahnama P, Gholami CB. Relationship between attendance at childbirth preparation classes and fear of childbirth and type of delivery. *Journal of Hayat*. 2016;21(4):30–40.
29. Khorsandi M, Vakilian K, Nasir zadeh Masooleh M. Investigating different factors of fear in normal delivery among pregnant women, in arak-a cross sectional study. *J Adv Biom Sci*. 2014;4(2):161–7.
30. Hassanzadeh R, Abbas-Alizadeh F, Meedy S, Mohammad-Alizadeh-Charandabi S, Mirghafourvand M. Comparison of childbirth experiences and postpartum depression among primiparous women based on their attendance in childbirth preparation classes. *The Journal of Maternal-Fetal and Neonatal Medicine*. 2022;35(18):3612–9.
31. Bahrami N, Araban M, Bahrami S. The Impact of antenatal education on postpartum depression, Dezful, Iran. 2010.
32. Bastani F, Hidarnia A, Kazemnejad A, Vafaei M, Kashanian M. A randomized controlled trial of the effects of applied relaxation training on reducing anxiety and perceived stress in pregnant women. *J Midwifery Womens Health*. 2005;50(4):e36–40.
33. Mehdizadeh A, Roosta F, Chaichian S, Alaghebandan R. Evaluation of the impact of birth preparation courses on the health of the mother and the newborn. *Am J Perinatol*. 2005;22(01):7–9.
34. Bastani F, Hidarnia A, Montgomery KS, Aguilar-Vafaei ME, Kazemnejad A. Does relaxation education in anxious primigravid Iranian women influence adverse pregnancy outcomes?: a randomized controlled trial. *J Perinat Neonatal Nurs*. 2006;20(2):138–46.
35. Rondó PH, Ferreira RF, Nogueira F, Ribeiro MC, Lobert H, Artes R. Maternal psychological stress and distress as predictors of low birth weight, prematurity and intrauterine growth retardation. *Eur J Clin Nutr*. 2003;57(2):266–72.
36. Mulder EJ, De Medina PR, Huizink AC, Van den Bergh BR, Buitelaar JK, Visser GH. Prenatal maternal stress: effects on pregnancy and the (unborn) child. *Early Human Dev*. 2002;70(1–2):3–14.
37. Uno H, Eisele S, Sakai A, Shelton S, Baker E, DeJesus O, et al. Neurotoxicity of glucocorticoids in the primate brain. *Horm Behav*. 1994;28(4):336–48.
38. Sandman CA, Wadhwa PD, Dunkel-Schetter C, Chiciz-DeMET A, Belman J, Porto M, et al. Psychobiological influences of stress and HPA regulation on the human fetus and infant birth outcomes a. *Ann NY Acad Sci*. 1994;739(1):198–210.
39. Sydsjö G, Bladh M, Lilliecreutz C, Persson A-M, Vyöni H, Josefsson A. Obstetric outcomes for nulliparous women who received routine individualized treatment for severe fear of childbirth-a retrospective case control study. *BMC Pregnancy Childbirth*. 2014;14:1–7.
40. Sharifi F, Nouraei S, Sharifi N. Factors affecting the choice of type of delivery with breast feeding in Iranian mothers. *Electron Physician*. 2017;9(9): 5265.
41. Nerum H, Halvorsen L, Sørli T, Øian P. Maternal request for cesarean section due to fear of birth: can it be changed through crisis-oriented counseling? *Birth*. 2006;33(3):221–8.

## Publisher's Note

Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.