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The role of psychological self-care on worry of vaccination against COVID-19 in Iranian pregnant women: A cross-sectional study

Seyyedeh M. Mirtabar[1] | Farzan Kheirkhah[2] | Zahra Basirat[3] | Shahnaz Barat[3] | Zeynab Pahlavan[4] | Reza Ghadimi[5] | Hemmat Gholinia[6] | Nooshin Fateri[7] | Banafsheh ZarinKamar[8] | Mahbobeh Faramarzi[9]

[1]Student Research Committee, Health Research Institute, Babol University of Medical Sciences, Babol, Iran

[2]Department of Psychiatry, Social Determinants of Health Research Center, Health Research Institute, , Babol University of Medical Sciences, Babol, Iran

[3]Department of Obstetrics and Gynecology, Infertility and Reproductive Health Research Center, Health Research Institute, Babol University of Medical Sciences, Babol, Iran

[4]Clinical Research Development Unit, Ayatollah Rouhani Hospital, Health Research Institute, Babol University of Medical Sciences, Babol, Iran

[5]Social Medicine Department, Social Determinants of Health Research Center, Health Research Institute, Babol University of Medical Sciences, Babol, Iran

[6]Department of Biostatistics, Social Determinants of Health Research Center, Health Research Institute, Babol University of Medical Sciences, Babol, Iran

[7]Clinical Research Development Unit, Rohani Hospital, Health Research Institute, Babol University of Medical Sciences, Babol, Iran

[8]Clinical Research Development Unit, Shahid Yahya Nejad Hospital, Health Research Institute, Babol University of Medical Sciences, Babol, Iran

[9]Department of General Courses, Social Determinants of Health Research Center, Health Research Institute, Babol University of Medical Sciences, Babol, Iran

Correspondence

Mahbobeh Faramarzi, Social Determinants of Health Research Center, Health Research Institute, Babol University of Medical Sciences, Babol, Iran.
Email: mahbob330@yahoo.com

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Abstract

Background and Aims: Although previous studies have reported some psychological factors to prevent the worry of vaccination against COVID-19 in pregnant women, the role of psychological self-care is unclear. The present study aimed to investigate the role of psychological self-care in pregnant women on the depressive symptoms, psychological distress, and worry of vaccination against COVID-19.

Methods: The present cross-sectional study was conducted during the peak of the Delta variant of COVID-19 in Babol city (North, Iran) from August to November 2021. Two hundred pregnant women referring to three prenatal clinics completed five questionnaires including; demographic characteristics, Edinburgh postnatal depression scale, psychological self-care, brief symptom inventory 18, corona disease anxiety scale, and acceptance of vaccination-3 inventory.

Results: Pregnant women were in relatively good condition based on psychological self-care but were not significantly associated with demographic characteristics, such as age, gestational age, educational background, pregnancy, and risk of parity. It was psychological self-care of pregnant women which negatively predicted the

depressive symptoms ($\beta = -0.311$, $p < 0.001$), anxiety symptoms ($\beta = -0.269$, $p < 0.001$), psychological distress ($\beta = -0.269$, $p < 0.001$), and worry of vaccination against COVID-19 ($\beta = -0.214$, $p < 0.001$).

Conclusion: Women's psychological self-care plays a protective role against the depressive symptoms, anxiety symptoms, psychological distress, and worry of vaccination against COVID-19 during pregnancy. Clinicians need to pay more attention to the role of psychological self-care as an important factor in preventing the symptoms of anxiety and depression during regular pregnancy visits.

KEYWORDS

anxiety, COVID-19, depression, psychological distress, psychological self-care, vaccination

1 | INTRODUCTION

Self-care is an important contributor to physical and mental health outcomes. It is recognized as a fundamental element of primary healthcare, especially in maternity healthcare services.[1] Self-care is defined as "the ability of individuals, families, and communities to promote health, prevent disease, maintain health, and cope with illness and disability, with or without healthcare provider support."[2] Self-care includes all health decisions and actions which people make for themselves and their families to maintain healthily. In other words, it covers any activity of an individual or family to improve or restore health, treat, and prevent diseases such as eating well, observing hygiene, and avoiding health risks such as smoking and harmful drinks to prevent the diseases.[3] Self-care behaviors help reduce the accumulation and effects of stress and improve a person's psychological well-being.[4]

Psychological self-care refers to the purposeful measures taken by individuals and organizations which help improve health and reduce stress and keeps the individuals' thoughts and emotions in an optimal state.[5] Furthermore, psychological self-care was defined with seven components, including self-awareness, communication effectiveness, time effectiveness, coping with problems, development, and maintenance of social support systems, religious activities, and physical self-care.[6] Self-awareness, which is an important subcomponent of psychological self-care, has significant effects on daily function.[7] Evidence suggests that self-awareness is negatively associated with anxiety and depression.[8] Strategies to increase self-awareness in pregnant women, such as mindfulness effectively treat women's anxiety.[9] According to a study, pregnant women with higher self-awareness had lower depressive symptoms, perceived stress, anxiety, rumination, and higher mother–child attachment.[10] Religion and its activities are other subcomponents of self-care and are negatively related to anxiety in pregnant women. A study has supported that spirituality directly negatively affects state anxiety.[11] The role of social support is very important in the mental health of pregnant women. Evidence confirms that the women with higher perceived social support are at a lower risk for mental disorders during pregnancy.[12] Coping strategies, which refer to any attempt to manage situations considered to be stressors, were introduced as the moderators of psychological distress.[13] Furthermore, the type of coping with the problems may affect psychological self-care in pregnant women. Emotion-focused coping with acceptance, as well as problem-focused coping, may positively affect physical and mental self-care.[14]

The mental health of pregnant women is related to their ability to maintain physical and mental care.[15] Appropriate mental health self-care behaviors promote self-esteem and the ability to manage stress and anxiety, or mental health problems. People with a sense of self-worth increase their power over life's issues.[5] According to the evidence, there is a moderately positive correlation between self-care practices during pregnancy, childbirth, and pregnancy outcomes. It is advocated that improving self-care practices during pregnancy improves labor outcomes.[16] A study investigated the effect of self-care training on glycosylated hemoglobin levels A1 (HbA1) in the participants with type 2 diabetes. The results showed that the self-care program reduced fasting blood glucose and HbA1c levels by promoting awareness, attitude, and self-care behaviors.[17] Moreover, another study reported that self-care training in the women with gestational diabetes reduced the rate of macrosomia and cesarean delivery.[18]

Evidence indicates that ending the COVID-19 transmission focuses not only on health providers' health efforts but also on raising the self-awareness of pregnant women about the need for personal and prenatal counseling.[19] Psychological self-care is an effective factor in reducing the negative consequences of COVID-19.[20] Therefore, women with lower self-awareness have more negative consequences of COVID-19.[19] During the COVID-19 pandemic, people with healthy coping styles and effective coping strategies, such as behavioral activation, acceptance-based coping, mindfulness training, and loving exercises, had higher resilience and lower perceived stress.[21]

Joint Committee on Vaccination and Immunization in April 2021 recommended that all pregnant women should receive the COVID-19 vaccine.[22] Despite this recommendation, the vaccination was not welcomed by pregnant women. Reports indicated that 16.3% received a single dose of the COVID-19 vaccine. 5.3% started

vaccination during pregnancy, and only 11.1% completed the vaccination.[23] Unvaccinated pregnant women are at a greater risk of needing hospital treatment for COVID-19 than those who were vaccinated.[22] The hesitation to receive the vaccination in terms of the fear of harm to the infant is still a main concern of pregnant women. They may be afraid or reluctant to get vaccinated for various reasons. Some women stated that their strong fear of vaccination is in terms of the threat to the fetus, and the lack of sufficient information about the future effects of vaccination.[13] The psychological self-care of pregnant women is a determinant of attitudes towards vaccination. Despite few studies in this field, there is evidence that people with higher interpersonal relationships were more likely to get vaccinated. Hence, the rate of a positive tendency to vaccination is related to the vaccination of physicians, health providers, family members, and information on social media.[24] In another study, the most important factors influencing vaccine acceptance were public awareness of the risk of infection, vaccine safety, and the way of providing reliable information, if necessary, support from physicians and society, and anxiety in pregnant women.[25]

Despite the fact that research has looked at the link between specific psychological variables and depression in pregnant women,[13,26] a few studies on the role of psychological self-care in psychological distress in pregnant women were done to our knowledge. Furthermore, during the COVID-19 pandemic, some studies examined some factors affecting attitudes toward the worry of vaccination against COVID-19, but the role of psychological self-care is not clear to promote the infection prevention behaviors, that is, increasing the desire to vaccinate against COVID-19. The present study aimed to identify the role of psychological self-care on symptoms of depression in pregnant women to open horizons for a better understanding of ways to prevent mental disorders during pregnancy. The results of this study will help physicians and maternal healthcare providers find appropriate solutions to alleviate pregnant women's concerns about taking preventative measures for infectious diseases such as the necessary vaccinations. The hypotheses of the present study are as follows:

1. Psychological self-care is associated with the demographic and fertility factors in pregnant women.
2. Psychological self-care and its factors are associated with depressive symptoms in pregnant women.
3. Psychological self-care and its factors are associated with anxiety symptoms in pregnant women.
4. Psychological self-care and its factors are associated with psychological distress in pregnant women.
5. Psychological self-care and its factors are associated with the concerns of pregnant women about vaccination against COVID-19.
6. Psychological self-care plays a protective role to prevent depressive/anxiety symptoms, and psychological distress by controlling demographic factors.

2 | METHODS

2.1 | Study design

The present cross-sectional study was conducted during the peak of the Delta variant of COVID-19 in Iran from August to November 2021. The research began when widespread vaccination was beginning in Iran. The Iran Ministry of Health has recently (August 18, 2021) announced the order of vaccination of pregnant women to maternal care centers.

We used five questionnaires to assess the variables of the study. The "psychological self-care" is considered a dependent variable and assed with the "psychological self-care scale." Four dependent variables were assessed by the following scales; "depressive symptoms" with Edinburgh postnatal depression scale (EPDS), "psychological distress" with global distress index (GSI) of brief symptom inventory 18 (BSI-18), "fear of COVID-19" with corona disease anxiety scale (CDAS), and "anxiety of vaccination against COVID-19" with acceptance of vaccination questionnaire-3.

2.2 | Study participation

The participants of the study were pregnant women in the obstetrics and gynecology clinics of the university hospitals of the University of Medical Sciences (Rouhani and Yahyanejad) and clients of private offices of physicians and rural and urban clinics in Babol city. The research included a total of 200 pregnant women who satisfied the inclusion criteria based on the inclusion/exclusion criteria. The inclusion criteria were as follows: education level higher than the fifth grade of primary school, and the woman's desire to participate in the study. Individuals with severe mental disorders such as psychosis were excluded from the study. The convenience sampling method was utilized, and the sample size was estimated based on the following equation with $\alpha = 0.2$. However, during the pandemic, our previous study showed that some participants did not answer the questions well in the online survey.[27] Thus, we estimated the sample size with an attrition risk of 15% in valid questionnaires

$$n \geq \left(\frac{Z_{1-\alpha/2} + Z_{1-\beta}}{\frac{1}{2}\log_e \frac{1+r}{1-r}} \right)^2 + 3.$$

2.3 | Data collection

A trained midwife explained the research purpose to the pregnant women seeking routine pregnancy care at each sampling center. The first author taught the midwife about the objectives of the study, the conduct of the interview, the conditions of inclusion/exclusion criteria of the study, the types of research questionnaires, the completion of the questionnaires on paper, and the online guidance of the questionnaires, in a 4-h session. Then, the midwife interviewed the pregnant women, and if they met the inclusion criteria, they were

invited to the study and received an explanation of how to complete the questionnaires. Participants were free to choose to complete the scale on paper or online at home. The researcher collected online questionnaires using the DigiSurvey® platform which were sent in links to women via Whatsapp® or Telegram. Patients could complete online questionnaires in a week or less. All 200 participants completed the EPDS, BSI-18, CDAS, the acceptance of vaccination questionnaire-3, and psychological self-care-46.

3 | ASSESSMENTS

3.1 | Demographic characteristic

Age, education level, employment, gestational age, number of pregnancies and deliveries, history of physical and mental illness, history of hospitalization, and history of medication usage were among the demographic characteristics of the women participating in the study.

3.2 | Edinburgh postnatal depression scale

This questionnaire has 10 questions that aim to measure the rate of pregnancy and postpartum depression. The response method was based on a 4-point scale. Holden and Cox[28] developed the tool in 1987. The total scores ranged from 0 to 30. The Iranian validity of the questionnaire was conducted by Ahmadi kani Golzar et al.,[29] and the Cronbach's α value of this test was equal to 0.70.

3.3 | Brief symptom inventory 18

This inventory is the brief form of psychological symptoms which has subcomponents, namely depression, anxiety, and somatization. It calculates the GSI.[30] In pregnant women, we defined psychological stress as a GSI score >0.5 for BSI-18.[31] On the basis of findings of research by Akhavan Abiri et al.,[32] the results of validity and reliability of the questionnaire were acceptable in the Iranian population and the Cronbach's α was equal to 0.81.

3.4 | Psychological self-care scale

This tool was developed by Yunibh in 1991. The participants rated their agreement with a 4-point Likert scale (1 = seldom, 2 = sometimes, 3 = often, 4 = always). The total score ranged from 46 to 184.[6] The scale includes 46 items and seven subscales including: 1) *self-awareness*: It covers seven items with following means; listen willingly to feedback from others, consider for knowing personality traits, think about the reason for action, examine feeling about the situations, discover strength and weakness via life experience, achieve goal, find the cause before think incompetent, and examine successes in the past, 2) *effectiveness of the communication:* It covers 12 items with following means; examine opinion, while talking to others, remember goals and needs in life, consider the feelings of those with whom speak, think of the interests of person, show sympathy with those who are in troubles, show admiration for those who have succeeded, willingly help others, always make a new friend, find a way to contact and talk with close friend, 3) *effectiveness of the time*: It consists of two items by meaning of finding ways to relieve stress at the same time and think positive, 4) *coping with problems*: It covers five questions regarding to the strategies of coping with new situation. An example of items is "*When facing a problem, you will first think of solving the problem on your own,*" 5) *developing and maintaining a social support system*: it consists of seven items with the following means; solving a problem and always asking for help, plan to solve a problem considering the possibility, tell to someone trust, take time to participate in activities to bring pleasure, and find activities that make happy, 6) *religious activities*: it consists of six items and covers following means: refrain from doing what is against morality, help others, pray and gives compassion to others, and listen to sermons and lectures, and 7) *physical self-care*: it consists of seven items by following means: act as the health worker advises, get enough sleep, observe physical health, take account the benefit and needs of the body such as five main food groups, doing exercise, and indoor and outdoor physical activities.

We assessed the validity of the scale. Structural equation modeling was used to investigate the correlations among the variables. This questionnaire's confirmatory factor analysis performed using Amos 21 software, yielded seven subcomponents, confirming the theoretical foundation and indicating that the measurement model was well-fitting. Cronbach's α coefficient was 0.70 for the 46-item questionnaire.

3.5 | Corona disease anxiety scale

This questionnaire has seven questions about the individuals' experience and feelings in exposure to the coronavirus. The higher scores indicate more anxiety and fear of the coronavirus.[33] The Iranian validity of the questionnaire was presented by Ahorsu et al.[34] which consisted of seven items. The participants indicated their agreement with the statements using the 5-point Likert scale. Responses included "strongly disagree," "disagree," "neutral," "agree," and "strongly agree." The minimum possible score was 1 and the maximum was 5 for each question. The total score was calculated by adding the score of each item (from 7 to 35). The higher the score indicated the greater the fear of COVID-19. In particular, reliability values, such as internal consistency ($\alpha = 0.82$), and test–retest reliability (intraclass correlation coefficient = 0.72) were acceptable.

3.6 | Acceptance of vaccination questionnaire-3

This questionnaire includes three researcher-made questions about accepting the vaccine and anxiety about the side effects of the

vaccine for yourself and the fetus. It scores from 0 and up to a maximum of 14, and the higher the score, the greater the fear of being vaccinated.

3.7 | Statistical analysis

Quantitative variables in studies such as self-care, depression, and fear of COVID 19 follow a normal distribution, so we used a parametric test to compare the means. The participants' mean psychological self-care profiles were compared using *t*-tests. We used a series of one-way analyses of variance (ANOVA) to determine whether there are any statistically significant differences among the means of multiple groups. Furthermore, comparing the means of psychological variables, including depression, psychological distress, fear of COVID-19, and fear of vaccine, in different population groups was performed according to demographic characteristics using the ANOVAs. Then, we used post hoc tests to compare every mean with every other mean. The post hoc test of the means was Tukey's test.

Finally, we performed a quadruple multivariate linear regression model that included psychological self-care as an independent variable. In each model, the dependent variables included depressive symptoms, psychological distress, and worry of vaccination against COVID-19. Moreover, age, gestational age, education level, and pregnancy complications were considered moderating factors in all models. We used SPSS 23 (SPSS Inc.) to analyze data and considered the $p < 0.05$ (two-sided) as a significant level.

4 | RESULTS

Table 1 presents the demographic characteristics of the participants. The mean age of pregnant women was 30 (SD = 6.2). About 93 pregnant women (46.5%) were in the third trimester, 50 persons (24.5%) in the second trimester, and 47 persons (29%) in the first trimester. One hundred ninety of the respondents (75%) had primary/secondary education, and only 39 persons (20%) of women were employed. Sixty persons (30%) of the participants had a history of coronavirus infection. About 96 individuals of the participants (48%) had a high-risk pregnancy, and about 16 (8%) of the participants had a history of mental illness.

The mean psychological self-care scale indicated that pregnant women had a higher than the average level of psychological self-care score in the total score ($M = 143.65$, SD = 18.95 of total 184). Furthermore, the mean scores of the subscales of psychological self-care were high, including self-awareness ($M = 20.78$, SD = 3.77 of total 28), the effectiveness of communication ($M = 39.15$, SD = 5.4 of total 28), the effectiveness of the time ($M = 5.42$, SD = 1.5 of total 8), coping with problems ($M = 15.14$, SD = 3.0 of total 20), developing and maintaining a social support system ($M = 20.85$, SD = 4.3 of total 28), religious activities ($M = 16.17$, SD = 2.7 of total 24), and physical self-care ($M = 26.11$, SD = 4.1 of total 28). The mean scores of depressive symptoms showed that the depression score on the 10-item Edinburgh

TABLE 1 Demographic characteristics and psychological profile of the population study

Variables	*N* (%)
Age, mean (SD)	29.9 (6.21)
Education	
Primary school	48 (25)
High school	82 (40)
University	70 (35)
Job	
Employee	40 (20)
Unemployed	160 (80)
Gestational age	
<20 week	58 (29)
21–30	48 (24.5)
≥31	94 (46.5)
Number of parity	
0	86 (43)
1	81 (40.5)
≥2	33 (16.5)
Education of husband	
Primary school	57 (28.5)
High school	77 (38.5)
University	66 (33)
Complication of pregnancy	
High-risk pregnancy	96 (48)
Low-risk pregnancy	104 (52)
History of psychiatric disorders	
Yes	16 (8)
No	184 (92)
Infected with COVID-19	
Yes	60 (30)
No	140 (70)
Psychological self-care, mean (SD)	
Self-awareness	20.78 (3.7)
Effectiveness of the communication	39.15 (5.4)
Effectiveness of the time	5.42 (1.5)
Coping with problems	15.14 (3.0)
Developing and maintaining a social support system	20.85 (4.3)
Religious activities	16.17 (2.7)
Physical self-care	26.11 (4.1)
Total	143.65 (18.9)
Edinburg postnatal depression scale, mean (SD)	6.91 (4.74)

(Continues)

TABLE 1 (Continued)

Variables	*N* (%)
SCL-18, mean (SD)	
Somatization	3.73 (3.1)
Depression	2.19 (3.2)
Anxiety	2.94 (3.1)
Total SCL-18	8.86 (8.0)
GSI	0.49 (0.4)
Fear of COVID-19	11.21 (3.11)
Attitude to vaccination, mean (SD)	
Acceptance of vaccination	3.15 (1.27)
The anxiety of vaccination against COVID-19	7.48 (2.26)

Note: Range of scores: Edinburg postnatal depression scale: 0–30; SCL-18: symptom checklist 0–72; somatization 0–24; depression 0–24; anxiety 0–24; GSI: global severity index 0–4; fear of COVID-19 1–35; acceptance of vaccination 0–4; worry of vaccination 1–10; self-awareness 7–28; effectiveness of the communication 12–48; effectiveness of the time 2–8; coping with problems 5–20; developing and maintaining a social support system 7–28; religious activities 6–24; physical self-care 7–28; total psychological self-care 46–184.

Self-awareness ($M = 20.78$, SD = 3.77), effectiveness of the communication ($M = 20.78$, SD = 3.77), effectiveness of the time $M = 20.78$, SD = 3.77), coping with problems ($M = 20.78$, SD = 3.77), developing and maintaining a social support system ($M = 20.78$, SD = 3.77), religious activities ($M = 20.78$, SD = 3.77), and physical self-care ($M = 20.78$, SD = 3.77).

scale was about 7 (SD = 4.7) of a total score of 30. The score of psychological distress was ($M = 0.49$, SD = 0.4 of 4). The level of fear of COVID-19 was lower than the median of the scale score ($M = 11.21$, SD = 3.11, of a total of 35). In the case of the attitude toward vaccination against COVID-19, even though the acceptance score of vaccination was higher than the average ($M = 3.15$, SD = 1.27 of a total of 4), the level of anxiety of pregnant women reading about vaccination against COVID-19 was also high ($M = 7.48$, SD = 2.26, of 10).

Table 2 presents the relationship between psychological self-care of pregnant women with depressive symptoms, psychological distress, fear of COVID-19, and worry of vaccination. The results revealed that the pregnant women with depressive symptoms (EPDS > 10) had lower self-care scores in all subcomponents of psychological self-care as well as total scale than those without depressive symptoms ($p < 0.001$). Time effectiveness, problem coping, development and maintenance of social support systems, and physical self-care are more significant in the group of women with mental distress (GSI > 0.5 for BSI-18) than in women without mental distress. It was low ($p < 0.05$). Thus, the total scores of psychological self-care, as well as subcomponents such as time effectiveness, problem-solving, the development and maintenance of social support systems, and physical self-care, were significantly lower in a group of women who had a high worry of vaccination against COVID-19 (>5) than in women who had a normal worry of

TABLE 2 Relationship of psychological self-care with depression, psychological distress, fear of COVID-19, and worry of vaccination against COVID-19 in pregnant women

Variables psychological self-care	Depression			Psychological distress			Fear of COVID-19			Worry of vaccination against COVID-19		
	<10 mean (SD)	≥10 mean (SD)	*p*	≤0.5 mean (SD)	>0.5 mean (SD)	*p*	Low ≤17 mean (SD)	High >18 mean (SD)	*p*	Low ≤5 mean (SD)	High >6 mean (SD)	*p*
1. Self-awareness	21.32 (3.9)	20.09 (3.5)	0.02	20.89 (3.8)	20.57 (3.6)	>0.99	20.91 (3.7)	17.28 (3.9)	0.01	21.84 (3.7)	20.63 (3.7)	>0.99
2. Effectiveness of the communication	39.89 (5.1)	38.21 (5.7)	0.03	39.30 (5.5)	38.86 (5.3)	>0.99	39.22 (5.5)	37.28 (3.6)	>0.99	40.93 (5.0)	38.89 (5.5)	>0.99
3. Effectiveness of the time	5.86 (1.3)	4.86 (1.6)	<0.001	5.74 (1.4)	4.81 (1.72)	<0.001	5.46 (1.5)	4.42 (1.9)	>0.99	6.32 (1.3)	5.29 (1.5)	0.002
4. Coping with problems	15.96 (2.9)	14.10 (2.8)	<0.001	15.57 (3.0)	14.30 (3.0)	0.005	15.19 (3.0)	13.85 (2.9)	>0.99	16.39 (2.6)	14.96 (3.0)	0.02
5. Developing and maintaining a social support system	21.95 (3.8)	19.46 (4.5)	<0.001	21.47 (4.1)	19.67 (4.5)	0.005	20.39 (4.3)	18.71 (3.4)	>0.99	21.98 (3.4)	20.69 (4.4)	>0.99
6. Religious activities	16.51 (2.7)	15.73 (2.6)	0.04	16.22 (2.7)	16.07 (2.6)	>0.99	16.16 (2.7)	16.42 (2.2)	>0.99	17.09 (2.7)	16.04 (2.6)	>0.99
7. Physical self-care	27.16 (3.9)	24.76 (4.1)	<0.001	26.80 (3.7)	24.76 (4.57)	0.001	26.10 (4.1)	26.28 (4.0)	>0.99	27.24 (3.8)	25.95 (4.2)	>0.99
8. Total	148.67 (17.7)	137.26 (18.5)	<0.001	146.01 (18.5)	139.07 (19.0)	0.01	143.99 (18.9)	134.28 (17.9)	>0.99	151.82 (15.2)	142.48 (19.1)	0.02

Note: Range of scores: self-awareness 7–28; effectiveness of the communication 8–48; effectiveness of the time 2–8; coping with problems 5–20; developing and maintaining a social support system 7–28; religious activities 6–24; physical self-care 7–28; and total psychological self-care 46–184. All tests were performed with a *t*-test.

TABLE 3 Relationship of psychological self-care with demographic factors

Variables	Age				Education		
	14–30	31–35	>35	*p*	Under diploma	Diploma above	*p*
Psychological self-care							
Self-awareness	20.61 (3.79)	20.88 (3.87)	21.07 (3.81)	>0.99	20.26 (3.98)	20.95 (3.74)	>0.99
Effectiveness of the communication	38.90 (5.80)	39.20 (5.10)	39.63 (5.07)	>0.99	39.03 (5.82)	39.25 (5.36)	>0.99
Effectiveness of the time	5.28 (1.64)	5.61 (1.42)	5.57 (1.62)	>0.99	4.43 (1.69)	5.42 (1.56)	>0.99
Coping with problems	14.87 (3.11)	15.36 (2.94)	15.67 (3.04)	>0.99	14.64 (3.60)	15.31 (2.86)	>0.99
Developing and maintaining a social support system	21.03 (4.51)	20.91 (3.90)	20.33 (4.44)	>0.99	21.04 (4.08)	20.81 (4.45)	>0.99
Religious activities	15.65 (2.93)	16.34 (2.28)	17.34 (2.15)	0.002	16.41 (2.75)	16.11 (2.70)	>0.99
Physical self-care	25.77 (4.22)	26.45 (4.16)	26.68 (4.07)	>0.99	26.03 (4.45)	26.17 (4.08)	>0.99
Total psychological self-care	142.13 (19.48)	144.80 (18.16)	146.33 (18.64)	>0.99	142.86 (19.91)	144.05 (18.66)	>0.99

Gestational age				Parity				Complication of pregnancy		
<20	21–30	>30	*p*	0	1	≥2	*p*	High risk	Low risk	*p*
20.84 (4.01)	20.62 (4.08)	20.82 (3.55)	>0.99	21.04 (3.84)	20.63 (3.55)	20.45 (4.29)	>0.99	20.65 (3.64)	21.18 (3.90)	>0.99
39.86 (5.59)	38.27 (5.92)	39.15 (5.20)	>0.99	39.23 (5.73)	38.54 (5.40)	40.45 (4.93)	>0.99	38.80 (5.57)	39.47 (5.41)	>0.99
5.80 (1.29)	4.95 (1.64)	5.41 (1.67)	0.02	5.37 (1.71)	5.45 (1.45)	5.47 (1.60)	>0.99	5.29 (1.64)	5.54 (1.53)	>0.99
15.63 (2.81)	14.46 (3.63)	15.19 (2.85)	>0.99	15.19 (3.16)	15.16 (2.95)	14.96 (3.12)	>0.99	15.17 (3.07)	15.11 (3.06)	>0.99
21.98 (3.98)	20.06 (4.62)	20.55 (4.32)	0.05	21.33 (4.29)	20.52 (4.16)	20.44 (4.85)	>0.99	20.31 (4.62)	21.36 (4.01)	>0.99
16.35 (2.82)	15.48 (3.00)	16.40 (2.45)	>0.99	15.89 (2.82)	16.09 (2.71)	17.09 (2.22)	>0.99	16.19 (2.90)	16.15 (2.53)	>0.99
26.97 (4.11)	25.45 (4.26)	25.87 (4.11)	>0.99	26.65 (4.22)	5.96 (3.89)	25.06 (4.56)	>0.99	25.53 (4.31)	26.64 (3.97)	0.05
147.45 (19.13)	139.31 (20.92)	143.43 (17.51)	>0.99	144.73 (19.46)	142.38 (18.37)	143.96 (19.37)	>0.99	141.66 (19.02)	145.49 (18.78)	>0.99

Note: Range of scores: Self-awareness 7–28; effectiveness of the communication 12–48; effectiveness of the time 2–8; coping with problems 5–20; developing and maintaining a social support system 7–28; religious activities 6–24; physical self-care 7–28; and total psychological self-care 46–184. All tests were performed with an analysis of variance.

TABLE 4 Correlation matrix of psychological self-care with depression, psychological distress, fear of COVID-19, and anxiety of vaccination among pregnant women

Variables	Self-awareness	Effectiveness of the communication	Effectiveness of the time	Coping with problems	Developing and maintaining a social support system	Religious activities	Physical self-care	Total self-care	Depression	Anxiety	Psychological distress	Fear of COVID-19	Worry of vaccine
Self-awareness	1												
p													
Effectiveness of the communication	0.514	1											
p	<0.001												
Effectiveness of the time	0.310	0.381	1										
p	<0.001	<0.001											
Coping with problems	0.428	0.552	0.607	1									
p	<0.001	<0.001	<0.001										
Developing and maintaining a social support system	0.412	0.590	0.601	0.615	1								
p	<0.001	<0.001	<0.001	<0.001									
Religious activities	0.451	0.601	0.459	0.600	0.481	1							
p	<0.001	<0.001	<0.001	<0.001	<0.001								
Physical self-care	0.372	0.384	0.442	0.480	0.496	0.388	1						
p	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001							
Total self-care	0.685	0.819	0.655	0.790	0.810	0.738	0.690	1					
p	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001						
Depression	−0.178	−0.178	−0.402	−0.371	−0.360	−0.121	−0.352	−0.358	1				
p	0.01	0.01	<0.001	<0.001	<0.001	>0.99	<0.001	<0.001					
Anxiety	−0.072	−0.090	−0.326	−0.206	−0.242	−0.017	−0.318	−0.229	0.685	1			
p	>0.99	>0.99	<0.001	0.003	0.001	>0.99	<0.001	<0.001	<0.001				

TABLE 4 (Continued)

Variables	Self-awareness	Effectiveness of the communication	Effectiveness of the time	Coping with problems	Developing and maintaining a social support system	Religious activities	Physical self-care	Total self-care	Depression	Anxiety	Psychological distress	Fear of COVID-19	Worry of vaccine
Psychological distress	−0.118	−0.128	−0.383	−0.241	−0.291	−0.066	−0.356	−0.286	0.748	0.852	1		
p	>0.99	>0.99	<0.001	0.001	<0.001	>0.99	<0.001	<0.001	<0.001	<0.001			
Fear of COVID-19	−0.229	−0.145	−0.371	−0.302	−0.266	−0.195	−0.168	−0.293	0.313	0.290	0.298	1	
p	0.001	0.04	<0.001	<0.001	<0.001	0.006	0.01	<0.001	<0.001	<0.001	<0.001		
Worry of vaccination against COVID-19	−0.085	−0.084	−0.257	−0.093	−0.094	−0.100	−0.092	−0.134	0.146	0.180	0.216	0.350	1
p	>0.99	>0.99	<0.001	>0.99	>0.99	>0.99	>0.99	>0.99	0.03	0.01	0.002	<0.001	

Note: Range of scores: self-awareness 7–28; effectiveness of the communication 12–48; effectiveness of the time 2–8; coping with problems 5–20; developing and maintaining a social support system 7–28; religious activities 6–24; physical self-care 7–28; total psychological self-care 46–184; depression 0–24; anxiety 0–24; global severity index 0–4; fear of COVID-19 1–35; and worry of complication of vaccination 1–10.

vaccination against COVID-19 ($p < 0.05$). However, the total scores of psychological self-care and the subcomponents of communication effectiveness, time effectiveness, coping with problems, development and maintenance of social support systems, religious activities, and physical self-care were not significantly different in the two groups of people with high scores of fear of COVID-19 and low scores of fear of COVID-19 ($p > 0.05$).

Table 3 for ANOVA results shows the relationship between psychological self-care scores and demographic factors of pregnant women. Overall means of self-care and of all subcomponents excluding religious activities self-care subcomponents were not significantly different between the three groups. Tukey's post hoc test indicated that women in the age group over 35 years had a higher self-care score for religious activities than those under 30 ($p = 0.002$). Hence, there were no significant differences in the means of total self-care and its sub-components among pregnant women with high school/primary and university education. Except for the time effectiveness, the means of total self-care and its subcomponents were not substantially different in women of various gestational ages. Tukey's post hoc test indicated that the self-care scores of time effectiveness in the pregnant women under 20 weeks were significantly higher than in women with the gestational age of 20–30 weeks ($p = 0.022$). Furthermore, the means of total self-care and its subcomponents were not significantly different in the two groups of women with high-risk and low-risk pregnancies ($p > 0.05$).

Table 4 shows the correlation matrix of psychological self-care with psychological variables of pregnant women. Findings indicated that the total score of psychological self-care of pregnant women and all its sub-components had a significant negative correlation with depressive symptoms ($r = -0.358$), anxiety symptoms ($r = -0.229$), mean fear of COVID-19 ($r = -0.293$), and worry of vaccination against COVID-19 ($r = -0.134$).

Table 5 analyzes the predictive role of psychological self-care in pregnant women on depressive symptoms, anxiety symptoms, psychological distress, and worry of vaccination against COVID-19, using multivariate linear regression. In all four models, the total score of psychological self-care was considered an independent variable. The dependent variables in each model were depressive symptoms, anxiety symptoms, psychological distress, and worry about vaccination against COVID-19. Therefore, age, gestational age, education level, and pregnancy complications were considered moderating factors in all models. The results indicated that psychological self-care negatively predicted depressive symptoms ($\beta = -0.311$, $p < 0.001$), anxiety symptoms ($\beta = -0.269$, $p < 0.001$), psychological distress ($\beta = -0.269$, $p < 0.001$), and worry of vaccination against COVID-19 ($\beta = -0.314$, $p < 0.001$).

5 | DISCUSSION

By describing the self-care status of pregnant women and its relationship with the psychological symptoms and the worry of vaccination against COVID-19 during the peak of the Delta variant of

TABLE 5 Result of linear regression model for psychological self-cares as predictors of depression, anxiety, psychological distress, and worry of vaccination against COVID-19

Dependent variable	Unstandard *B* (SE)	Standard *B*	95.0% Confidence interval for *B*		*p*
			Lower bound	Upper bound	
Depression	−0.008 (0.002)	−0.311	−0.12	−0.005	<0.001
Anxiety	−0.110 (0.028)	−0.269	−0.165	−0.055	<0.001
Psychological distress	−0.006 (0.002)	−0.269	−0.009	−0.003	<0.001
Worry of vaccination against COVID-19	−0.050 (0.011)	−0.314	−0.072	−0.028	<0.001

Note: Independent variable: psychological self-care; dependent variables: depression and anxiety; psychological distress, worry of vaccination, adjusted factors: age, gestational age, educational level, and complication of pregnancy.

COVID-19 in Iran, this study indicated that the self-care of pregnant women determined the severity of their psychological symptoms and the worry of vaccination against COVID-19.

The results indicated that the psychological self-control scores of pregnant women are moderate to high. The total psychological self-control score of pregnant women was not significantly associated with age, gestational age, education level, parity, and high-risk pregnancy status. Besides that, older pregnant women in the subgroup of religious activities also had higher scores in this subgroup. There was no way to compare the mean of this variable with the mean of other studies since there was no published research on psychological self-care in pregnant women. However, the comparisons with self-care subgroups were done, and nonpregnant women have been reported. Consistent with these findings, Solhi et al.[35] reported that the mean self-care scores of pregnant women were moderate before the educational intervention. In a study by RobatSarpooshi et al.[36] to investigate the relationship between health literacy levels in 400 diabetic patients and their self-care behaviors, it was found that people with higher education levels had higher self-care scores. In another study on the relationship between pregnancy self-care and adverse labor outcomes in young pregnant women aged 16–24 years, the results indicated that age was an important factor, and younger pregnant women were at risk for adverse outcomes such as intrauterine growth retardation, low birth weight, and low Apgar scores.[16] In a study to evaluate and compare knowledge about self-care management of gestational hypertension in early pregnancy and multiple pregnancies, the results indicated that women with twins were less likely to take care of themselves than women with multiples pregnancy.[37] The inconsistency of our study with previous results was due to the fact that this study was conducted at the peak of the Delta variant of COVID-19 in Iran (fifth peek of beginning of the pandemic COVID-19), and pregnant women seemed to seek more information about self-care behaviors because of the sensitivity of this period.

The findings confirmed that the total psychological self-care score was significantly negatively associated with the depressive symptoms, psychological distress, and the worry of vaccination against COVID-19. A study aimed to determine the relationship between self-care and depression in the patients undergoing maintenance hemodialysis indicated a strong and negative relationship between self-care and depression, and the results were consistent with our study.[38] However, there are conflicting results in some studies indicating that people with a lower fear of COVID-19 were less likely to engage in self-care behaviors.[39]

Our study found that social support (one of the subscales of self-care) was significantly lower in women with high levels of psychological distress than in those without psychological distress. Consistent with our findings, one study reported that family social support was associated with multiple improvements in drug monitoring.[40] Our finding emphasized that the mean score of coping with problems in women with a psychological problems was significantly lower than those without psychological problems. Similar to our result, a study reported that constructive coping might positively affect physical and mental self-care.[14]

Our findings confirmed that psychological self-care was a negative predictor of the worry of vaccination against COVID-19 in pregnant women. Another study confirmed this finding, and the results of studies on influenza showed that pregnant women with low education levels and low awareness of the protective roles of vaccines to prevent the infection made less effort to receive vaccines.[41] Moreover, pregnant women with lower awareness had less protective behaviors and had the worry about vaccination against COVID-19.[42] The high level of anxiety and stress caused by COVID-19 in pregnant women was an important factor to impair self-care functions in pregnant women. Mousavi et al. found a significant correlation between self-care behaviors and stress.[43] As a result, pregnant women who were more susceptible had lower anxiety levels, better self-care behaviors, and less anxiety when receiving the COVID19 vaccination. The study found that psychological self-care was a negative predictor of depressive-anxiety symptoms and psychological distress in pregnant women. The results were consistent with a study by Law et al. that reported maternal self-care was an important protector against stress and depressive symptoms and a negative predictor of these symptoms.[44] Thus, women who had more personal empowerment resources (e.g. self-care, agency, and self-efficacy), and practiced relaxation techniques, tended to show less stress and depressive symptoms.[45] Our results were consistent with the results of Chehrazi et al. who confirmed the direct impact of spiritual well-being (as a main component of self-care) on health-promoting behaviors.[11] Another study confirmed that religiosity was significantly associated with health promotion as a personal factor and interpersonal influence.[46] In general, mental disorders such as depression and stress during pregnancy could also negatively affect self-care behaviors.[47]

The study had limitations that might affect the results. First, it was a correlational study; hence, the cause and effect result cannot be deduced. It is suggested to conduct a prospective cohort study on the protective role of self-care on depression, and psychological distress. Second, self-care assessment of psychological symptoms of depression was based on self-reported criteria and might be inaccurate; hence, future research is suggested to investigate self-care and psychological symptoms through clinical interviews to cite the findings more accurately. Third, 30 participants (15% risk attrition) did not answer the questionnaire correctly and were excluded from the analysis. As a result, the deletion of these people's information may have led to biased results.

6 | CONCLUSION

Pregnant women had a relatively good status of psychological self-care which had no significant relationship with their demographic characteristics, such as age, gestational age, education levels, and high-risk pregnancy. The psychological self-care scores of pregnant women played a protective role in developing depressive symptoms and psychological distress. Furthermore, people with higher self-care had lower worry about being vaccinated against COVID-19.

The results of the present study have clinical applications in maternal health centers. The results suggest that physicians should be aware of the protective role of mental self-care for pregnant women to prevent mental health problems. Therefore, they are recommended to evaluate the ability of pregnant women in seven subcomponents of self-care, namely self-awareness, communication effectiveness, time effectiveness, coping with problems, development, and maintenance of social support systems, religious activities, and physical self-care. If there is a need for strengthening, it is better to provide the necessary infrastructures to improve its various aspects. These results establish self-care promotion as a critical technique to reduce pregnant women's psychological issues. As a result, these findings suggest that health education and promotion experts present programs to teach women how to improve their self-care skills. These results can be a useful guide to developing comprehensive self-care training programs with a greater focus on mental health. Moreover, sharing these needs and views internationally will lead to more comprehensive international guidelines.

AUTHOR CONTRIBUTIONS

Mahbobeh Faramarzi, Zahra Basirat, and Seyyedeh M. Mirtabar: Conceptualization. **Nooshin Fateri, Banafsheh ZarinKamar, and Seyyedeh M. Mirtabar:** Data curation. **Hemmat Gholinia:** Formal analysis. **Reza Ghadimi and Zeynab Pahlavan:** Investigation. **Hemmat Gholinia and Mahbobeh Faramarzi:** Methodology. **Farzan Kheirkhah:** Project administration. **Shahnaz Barat:** Supervision. **Mahbobeh Faramarzi:** Writing – original draft preparation. **Zahra Basirat, Shahnaz Barat, and Farzan Kheirkhah:** Writing – review and editing. All authors have read and approved the final version of the manuscript.

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

DATA AVAILABILITY STATEMENT

The datasets generated and analyzed for the current study are not publicly available due to ethical concerns but are available from the corresponding author upon reasonable request and after clearance from the ethics committee.

ETHICS STATEMENT

This study was approved by the Ethics Committee of Medical Research Development (National Institute for Medical Research Development). Anonymity and confidentiality for participants were guaranteed. All participants wrote the informed consent at the beginning of the study.

TRANSPARENCY STATEMENT

Mahbobeh Faramarzi affirms that this manuscript is an honest, accurate, and transparent account of the study being reported; that no important aspects of the study have been omitted; and that any discrepancies from the study as planned (and, if relevant, registered) have been explained.

ORCID

Seyyedeh M. Mirtabar http://orcid.org/0000-0003-2679-5449
Farzan Kheirkhah http://orcid.org/0000-0003-1420-5480
Zahra Basirat http://orcid.org/0000-0002-3191-1355
Shahnaz Barat https://orcid.org/0000-0002-7536-7267
Zeynab Pahlavan https://orcid.org/0000-0002-4464-3740
Reza Ghadimi https://orcid.org/0000-0002-4296-2836
Hemmat Gholinia https://orcid.org/0000-0003-0517-2429
Nooshin Fateri https://orcid.org/0000-0001-9558-0500
Banafsheh ZarinKamar https://orcid.org/0000-0001-6635-6825
Mahbobeh Faramarzi https://orcid.org/0000-0002-3568-7039

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