The Effect of Virtual Education on Fear Caused by COVID-19 Pandemic in Pregnant Women: A Quasi-Experimental Study

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ARTICLE INFO	ABSTRACT
	Background & aim: Pregnant women are concerned about their health as well as their infants during the COVID-19 pandemic. The present study was conducted to investigate the effect of virtual education on fear caused by COVID-19 in pregnant women. ***Methods:*** This quasi-experimental study was conducted in Dezful, Iran from November to January 2020. Seventy-three women were assigned to two groups of intervention (n=37) and control (n=36). Virtual training was implemented for the intervention group through sending a combination of audio and video files, educational videos, educational messages and messages for relaxation techniques every three days for four weeks during pregnancy, childbirth and hospital stay. The self-structured questionnaire of pregnant women's fear of COVID-19 was used to collect data two weeks after intervention. Paired t-test, Independent T Test¬, Chi-square, McNemar, and Mann-Whitney U tests were used for data analysis. ***Results:*** After the intervention, the mean score of fear caused by COVID-19 significantly decreased in pregnant women of the intervention (65.48±12.50) compared to the control group (92.22±14.03) (P<0.001). Also, the level of fear of Covid-19 significantly reduced in the intervention (86.5% moderate vs 13.5% severe fear) compared to the control group (8.3% moderate vs 91.7% severe fear) (P<0.001). ***Conclusion:*** Virtual education reduces the fear of pregnant women caused by COVID-19 pandemic. Therefore, they are motivated to attend prenatal visits more regularly and this can improve pregnancy outcomes. Virtual education is therefore recommended to be used in health centers and midwifery clinics during Covid-19 pandemic.

Introduction

Pregnant women are more risky for respiratory viral diseases and their complications (1). They are known as a vulnerable group due to the physiological changes and the immune system (2). This may make this group more susceptible to COVID-19 infection than the general population, especially if the pregnant mother has a chronic disease or maternal complication (3).

In one study, the prevalence of COVID-19 in pregnant women was assessed in 20 countries and 75 studies. The study population was 67,271 pregnant women and the results showed that 10% of all pregnant women admitted to the hospital were diagnosed to have COVID-19

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(4).Viral respiratory infections make the majority of infant mortality. 40% of infant's mortality occurred between the first day and 29 days after birth (5). According to the American Academy of Pediatrics (AAP), the mortality rate of COVID-19 in children is reported to range from 0 to 0.24% of all COVID-19 deaths (6). Therefore, it is natural for pregnant women to be concerned about their own health and their baby health during the COVID -19 epidemics. The main reason for mothers' concern may be that, despite adequate care to prevent coronavirus infection when they are hospitalized for childbirth, they or their baby will be infected with the respiratory virus (7).

Studies have shown that fear for any reason in a pregnant woman can jeopardize the normal course of pregnancy and childbirth. Some pregnant women terminate pregnancy due to the fear of their child having congenital anomalies due to the mother's disease (8). Some of the pregnant women decided to give birth at home. However, home delivery is not a good option for all pregnant mothers (9).

The International Federation of Obstetricians and Gynecologists (FIGO) has proposed changes to the pregnancy care process to reduce the coronavirus transmission to pregnant women and even to their health care providers. They recommended that routine prenatal care be provided by video or phone counseling if possible (10). The use of virtual education in health professions is very important due to improving the level of education using new information and communication technologies in the field of patient's education (11).

Numerous studies have examined the benefits of e-learning compared to traditional education. Raising awareness, accessibility, attractiveness and usefulness, high publishing speed, reproducibility and low cost are some of the advantages of e-learning (12). Also, protecting personal health, community safety and online access are some benefits of virtual learning (13). Some pregnant women refuse to receive counseling, prenatal care, and give birth in hospital due to the fear of infection by COVID-19 (9). In such situations, the use of virtual and distance education is helpful for pregnant women (10). In high-risk situations such as the disease epidemics and the risk of pregnant

mothers in public places, the learner can receive educational materials in the form of virtual training without face-to-face training (14). However, the disadvantages of e-learning include low control over education, inflexibility and lack of direct communication, so that may impact on the effectiveness and satisfaction of learners (15). Also, one of the main obstacles to virtual education is the problems related to technology, which can be reduced with training and management. Another problem is the lack of effective communication between the client and health care provider (16). However, according to the available evidence, the most commonly cited benefit during the COVID-19 pandemic was the reduction of exposure to the virus by reducing in-person visits (17). Given that the fear of getting infected with COVID-19 can prevent essential pregnancy and childbirth care (18), and endangers the health of pregnant women, it is needed to perform a study to reduce the fear of pregnant women about COVID-19. Considering the risk of face-to-face training in COVID-19 pandemics, therefore, this study was performed aimed to investigate the status of pregnant women's fear of COVID-19 in pregnancy and the effect of virtual education on the fear caused by Covid-19 pandemics.

Materials and Methods

This quasi-experimental interventional study was conducted in the health centers of Dezful city in southwestern Iran from November to January 2020. The study population was all pregnant women at third trimester of pregnancy (28-32 weeks of gestation) that referred to the health centers in Dezful to receive pregnancy care. Among pregnant women referring to the health centers, those who were in the third trimester of pregnancy were more afraid and anxious to go to the hospital and give birth in the COVID-19 pandemic. Therefore, the pregnant women in the third trimester of pregnancy were selected to participate in the study**.** The study was approved by the ethics committee of Dezful University of Medical Sciences, Iran (IR.DUMS.REC.1399.035). After approving the research and obtaining the ethics code from all health centers of Dezful city (30 centers), the centers and study samples were selected using multi-stage sampling. In the first stage, 8 health centers were randomly selected

from all centers using cluster sampling. Then, according to the total samples registered in the health system, 10 pregnant women from each center who were in the third trimester of pregnancy and were eligible to enter the study were selected by simple random sampling using a table of random numbers (total of 80 samples). Since there was no similar study, the sample size was calculated based on the study of pregnant women in accordance with the conditions of the study, the prevalence of fear was considered 50% ($P_1 = 0.5$), which according to the opinion of experts in this field at least 30% reduction was expected in fear ($P_2 = 0.2$). With 85% power and alpha level of 0.05, the sample size was calculated as 36 women in each group (N=72 in total). According to the probability of falling as well as maintaining the strength of the study, a total of 80 women were chosen to participate in the study, 40 people in each group.

$$n = \frac{(z_{1-\frac{\alpha}{2}} + z_{1-\beta})^2 [P_1(1-P_1) + P_2(1-P_2)]}{(P_1 - P_2)^2}$$

In the first face-to-face visit of pregnant women in the health centers, the objectives of the study were explained and informed consent was obtained. At first, the participants entered the study based on the inclusion criteria, including being in the third trimester of pregnancy (28-32 weeks of pregnancy), having literacy, no history of mental illness, having a smartphone, access to the Internet and WhatsApp software and getting acquainted with it, and willing to participate in the study. Exclusion criteria were unwillingness to continue participating in the study, migration, and preterm delivery. In the next stage, participants were assigned to two groups of intervention and control (40 pregnant women in the intervention group, 40 pregnant women in the control group).

In the first face-to-face meeting at the health center and before starting the educational intervention, the participants in both intervention and control groups completed the questionnaire of pregnant mothers' fear of COVID-19. Due to the current situation of COVID-19 and the risk of pregnant women

attending medical and public centers to participate in training sessions, pregnant women in the intervention group received training through their mobile phone and entered the WhatsApp group. Also, after the end of the intervention, post-test questionnaire was provided to the participants through WhatsApp; after completing the questionnaires, they were sent to the researcher through WhatsApp. The educational materials aimed to reduce the fear of pregnant women about COVID-19 during pregnancy, childbirth and hospital stay. The training was performed in the form of a combination of audio and video files, educational videos, educational messages and relaxation techniques. The training period was 4 weeks. Educational content was sent to the group every 3 days (Table 1). Two weeks after the training, the questionnaire was completed again by two groups in order to conduct a post-test and assess the fear of pregnant women about COVID-19. In addition to fear, their tendency for mode of delivery before and after the intervention during the conditions of Covid-19 pandemic was examined in both groups. The control group received routine care during the study. Also, in order to not deprive the control group of training and reduce fear of COVID-19, after the intervention and post-test, another virtual group was formed and training was provided to them.

Data collection tools in this study included the demographic information form and pregnancy records, as well as a researcher-made questionnaire of pregnant women's fear of COVID-19. First, a semi-structured interview was conducted with pregnant women and a questionnaire (including 30 questions) was extracted. For the structural validity of this questionnaire, during a pilot study, the initial 30-item scale was provided to 150 pregnant women in the third trimester of pregnancy that referred to the health centers. The feedback of pregnant women towards the scale's items and the review of the researcher and professors indicated that according to the initial factor analysis and elimination of questions that had low coefficients, 22 questions were prepared and adjusted from this scale. To factorize the scale of fear status due to COVID-19 infection in pregnant women, first the KMO coefficient was

examined, which indicates the efficiency of the content sampling of the scale. The KMO value was 0.763, which is an acceptable value. Bartlett's test was used to evaluate the significance of the available data correlation matrix. Bartlett coefficient was 1113.228, which was significant at the level of 0.001. After ensuring the efficiency of the scale content sampling and the significance of the available data correlation matrix, factor analysis by principal component method and varimax rotation were used. Factor analysis showed that the scale of fear status due to COVID-19 in pregnant women consists of two factors that explain 43.50% of the total variance of the scale. The first factor was related to the fear of mother's infection by COVID-19 and consisted of items 1 to 12, which explained 28.51% of the total variance of the scale. The second factor was related to the fear of infant's infection by COVID-19 and consisted of items 13 to 22, which explained 14.99% of the variance of the total scale. Then, the opinions of 30 target population (pregnant women) were quantitatively used to evaluate the face validity. Quantitative evaluation results indicated an agreement above 80% and an impact score above 1.5. In addition to quantitative review, qualitative face validity was confirmed by faculty members and experts. After checking the content validity of the questionnaire, CVI and CVR values were obtained in the item of fear of maternal infection (CVI = 797, CVR = 0.825) and fear of neonatal infection (CVI = 796, CVR = 0.876). Spearman correlation between all questions of the questionnaire (internal consistency) was r = 0.708, which was significant at the level of 0.05.

Also, the indicators related to the reliability and correlation of the questions were examined to determine the reliability of the questionnaire using Cronbach's alpha method and retesting. According to the results, Cronbach's alpha for this questionnaire was obtained in two items: fear of mother's infection (0.835) and fear of infant's infection (0.879). Also, since the correlation value was > 0.7, it is desirable to continue the research with more samples from the community. The questions are based on the Likert scale (strongly agree, agree, do not know, disagree, strongly disagree); the scores of five, four, three, two and one, respectively were

assigned (for negative questions, the score of five to one is inverted). Accordingly, the subjects were divided into three groups based on the fear score: mild, moderate and severe fear (the questionnaire contains a total of 110 points. Each question contains a score of 1 to 5. The score 5 indicates the highest level of fear. The scores 22 to 51 are considered as mild fear, 51 to 81 as moderate fear, and 81 to 110 as severe fear).

Data were analyzed by SPSS statistical software (version 22). P<0.05 was considered statistically significant. Descriptive statistics were used to report percentage, mean and standard deviation and frequency table. Kolmogorov-Smirnov test was used to check the normality of the data. Paired t-test, Independent-Samples T- Test, chi-square, McNemar, and Mann-Whithney tests were used for data analysis.

Results

In this study, 80 pregnant women were divided into intervention and control groups. During the study, 3 participants from the intervention group and 4 participants from the control group were excluded from the study due to non-return of the questionnaires. Finally, 73 pregnant women were analyzed. The results showed no significant difference between the two groups of intervention and control in terms of demographic characteristics including age, job, education, housing situation, ethnicity, insurance status, source of information on COVID-19 in pregnancy and frequency of pregnancy (P> 0.05) (Table 2). According to chi-square and Paired T-Test results, virtual training had a significant effect on the fear of COVID-19 in pregnant women. Thus, before the intervention, the level of fear of infected with COVID-19 in the intervention group ranged from 5.4% moderate fear and 94.6% severe fear to 86.5% moderate fear and 13.5% severe fear after the intervention. In contrast, before the intervention, the level of fear of infected with COVID-19 ranged from 13.9% moderate fear and 86.1% severe fear to 8.3% moderate fear and 91.7% severe fear in the post-test condition. There was no statistically significant difference between the two groups in term of fear of Covid-19 in pregnant women before the intervention (P = 0.21), but there was a statistically

significant difference in this regard between the two groups after the intervention (p <0.001)

(Table 3).

Table 1. Outline of virtual training to reduce the fear of COVID-19 pandemic in pregnant women

Session	Educator	The content of the sessions
1	midwife	informing pregnant mothers about how the disease transmit to the mother and fetus using the results of research and national guidelines
2	midwife	the necessary training on protective behaviors and disease prevention during pregnancy, childbirth and postpartum
3	midwife	Proper hand washing training was performed as a role play.
4	midwife	proper nutrition training for pregnant mothers.
5	midwife	weight control of pregnant women in quarantine condition.
6	midwife	How to care for mother and baby and control the transmission of infection to them in the hospital during childbirth by playing a role (to reduce maternal stress in terms of disease transmission)
7	midwife	Teaching breathing techniques during pregnancy and childbirth
8	midwife	Teaching relaxation techniques and reducing stress during childbirth.
9	midwife	teaching breastfeeding conditions and neonatal care to women with COVID-19

It should be noted that there was no level of mild fear of COVID-19 in the two groups before or after the intervention. Also, the mean fear of pregnant women from infection with COVID-19 (maternal, fetal and neonatal complications) before and after the intervention was assessed. Based on the results of Independent-Samples T-Test and paired t-test, the mean fear of mother's infection in the intervention group decreased from 51.37±5.9 before the intervention to 35.08± 6.93 after the intervention. In contrast, in the control group it increased from 48.08±7.74 before the intervention to 49.55±7.87 after the intervention. These results showed a statistically significant difference between the two groups in term of fear of infection in pregnant women after the intervention (P<0.001).

Also, the mean fear of infant's infection in the intervention group decreased from 44.43±6.15 before the intervention to 30.40±7.32 after the intervention. However, in the control group, it didn't change (42.72±6.33 before the test and 42.66±6.72 after the test). These results showed a statistically significant difference between the two groups in term of fear of neonatal infection after the intervention (P<0.001) (Table 4). There was no statistically significant difference in the results of before and after the intervention in each group in terms of the tendency to mode of delivery. Also, there was no statistically significant difference between the intervention and control groups in terms of mode of delivery. Also, 62.2% of women in the intervention group and 52.8% in the control group had vaginal delivery. Moreover, 27% of women in the intervention group and 36.1% in the control group had elective cesarean section. However, 10.8% of the intervention group and 11.1% of the control group had an emergency cesarean section.   The result showed that tendency to mode of delivery was not affected by the COVID-19 epidemic and fear of this disease (P< 0.05) (Table 5).

Table 2. Socio-demographic characteristics of participants in the study

Variables	Intervention group N=37	control group N=36	chi-square results, P-value
Age (years)	**N (%)**	**N (%)**	
20-29	23(62.2%)	14 (38.9%)	0.061
30-39	14 (37.8%)	22 (61.1%)	
Frequency of pregnancy			
FIRST pregnancy	14 (37.8%)	14 (38.9%)	0.920
Second pregnancy or more	23 (62.2%)	22 (61.1%)	
Ethnicity	**N (%)**	**N (%)**	
Persian	31 (83.8%)	26 (2.2%)	
Lor	6 (16.2%)	6 (16.7%)	0.102
Other	0 (0)	4 (11.1%)	
Education	**N (%)**	**N (%)**	
Diploma and under the diploma	11 (29.7%)	15 (41.7%)	0.283
University Education	26 (70.3%)	21(58.3%)	
Husband Education	**N (%)**	**N (%)**	
Diploma and under the diploma	18 (48.6%)	19 (52.8%)	0.106
University Education	19 (51.4%)	17 (47.2%)	
Job	**N (%)**	**N (%)**	
Housewife	33 (89.2%)	34 (94.4%)	0.410
Employee	4 (10.8%)	2 (5.6%)	
Husband Job	**N (%)**	**N (%)**	
Employee	10 (27%)	9 (25%)	
Worker	3 (8.1%)	3 (8.3%)	0.983
Self-employed	24 (64.9%)	24 (66.7%)	
Housing situation	**N (%)**	**N (%)**	
Personal	27 (73%)	25 (69.4%)	0.901
Rental	7 (18.9%)	7 (19.4%)	
Living with family	3 (8.1%)	4 (11.1%)	
Insurance	**N (%)**	**N (%)**	
Yes	30 (81.1%)	30 (83.3%)	0.803
No	7 (18.9%)	6 (16.7%)	
Source of receiving information about COVID 19 in pregnancy	**N (%)**	**N (%)**	
Doctor	0 (0%)	1 (2.8%)	
Midwife	9 (24.3%)	5 (13.9)	0.615
Friends	2 (5.4%)	3 (8.3%)	
Experience of other pregnant women	1 (2.7%)	2 (5.6%)	
Internet	25 (67.6%)	25 (69.4%)	

Table 3. Levels of Fear caused by COVID 19 pandemic in pregnant women

Variables	Intervention Group n=37 N(%)	Control group n=36 N(%)	Chi-square test results, P-value
The level of fear of COVID 19			
Pre Intervention			
Moderate	2 (5.4%)	5 (13.9%)	
Severe	35 (94.6%)	31 (86.1%)	0.213
Post Intervention			
Moderate	32 (86.5%)	3 (8.3%)	
Severe	5 (13.5%)	33 (91.7%)	0.001
Paired-Samples T-Test results, P-value	0.001	0.322	

Table 4. Mean score of pregnant women's fear of COVID-19

Variables	Intervention Group n=37 Mean ± SD	Control group n=36 Mean ± SD	Independent-Samples T- Test results, P-value
fear of COVID-19 in pregnant women			
Pre Intervention	95.81±11.21	90.80±12.94	P= 0.079
Post Intervention	65.48±12.50	92.22±14.03	t =1.76
Paired-Samples T-Test results, P-value	P= 0.001 t= 12.21	P= 0.25 t= 1.16	P= 0.001 t=8.59
Fear of infection in pregnant women			
Pre Intervention	51.37± 5.9	48.08 ± 7.74	P= 0.093
Post Intervention	35.08± 6.93	49.55± 7.87	t= 1.75
Paired-Samples T-Test results, P-value	P= 0.001 t= 12.05	P= 0.081 t= 1.80	P= 0.001 **t= 8.33**
Fear of neonatal infection			
Pre Intervention	44.43± 6.15	42.72± 6.33	P= 0.241
Post Intervention	30.40± 7.32	42.66± 6.72	t= 1.17
Paired-Samples T-Test results, P-value	P= 0.001 t= 9.03	P= 0.942 t= 0.076	P= 0.001 **t= 7.45**

Table 5. The frequency of birth methods chosen, before and after the virtual education in the groups as well as birth methods performance

Variables	Intervention group N=37 n (%)	Control group N=36 n (%)	Mann-Whitney U results, P-value
Pre-intervention			
Cesarean section	14 (37.8)	13 (36.1)	P= 0.871
Normal vaginal delivery	23 (62.2)	23 (63.9)	Z= -0.152
Post intervention			
Cesarean section	11 (29.7)	14(38.9)	
Normal vaginal delivery	26(70.3)	22 (61,1)	P= 0.412
McNemar's Test, P-value	P= 0.317 Z= -1.00	P= 0.317 Z= -1.00	Z= -0.819
Birth methods performance	**N (%)**	**N (%)**	
Vaginal delivery	23(62.2)	19(52.8)	
Elective cesarean section	10 (27)	13 (36.1)	P= 0.479
Emergency CS	4(10.8)	4(11.1)	Z= -0.717

Discussion

In the present study, an attempt was made to reduce the fear of pregnant women regarding maternal and neonatal infection to COVID-19 by virtual education. In this study, after virtual training, there was a significant difference between the mean scores of fear status caused by COVID-19 in pregnant women in the intervention and control groups. This difference indicates decreased fear of COVID-19 infection in the intervention group compared to the control group after virtual training. So virtual training was useful to improve the fear of COVID-19 in pregnant women. In this regard, one study examined the relationship between fear and anxiety about COVID-19 and concluded that it is important to specially pay attention to the mental health of pregnant women during the epidemic. It is also important to form virtual training groups to reduce the anxiety and concerns of pregnant women caused by the coronavirus (19).

In the present study, the level of fear of COVID-19 in pregnant women was assessed. The results showed that before the virtual training the highest level of fear in both intervention and control groups was at severe level and after the intervention the highest level of fear in the intervention group was at moderate level and in the control group was at severe level. In this regard, one study examined the level of stress and anxiety in pregnant women caused by COVID-19 pandemic. Their results showed that the highest level of stress and anxiety in pregnant women and postpartum period during the COVID-19 pandemic were at severe level. They recommended to identify and provide psychological support to pregnant women who are at greater risk for adverse psychological effects (20).

The present study examined the fear of pregnant women about themselves or their baby exposure to COVID-19. The mean fear of mother or infant infection significantly reduced after virtual education. In this regard, the study performed by Ravaldi examined the concerns of pregnant women about childbirth during the COVID-19 pandemic. One of their findings was the fear of pregnant women about giving birth in the COVID-19 pandemic. More than 80% of

women had fear for their health and the health of their baby after delivery (21).

Mental health plays an important role in pregnancy outcomes. The prevalence of COVID-19 negatively affects the mental health of pregnant women and leads to adverse birth outcomes. One researcher assessed the level of anxiety and depression in pregnant women before and after the COVID-19 epidemic (the pregnant women first trimester was before COVID-19 and their second trimester was during COVID-19 pandemic). The results of their study showed that the level of anxiety and depressive symptoms in pregnant women significantly increased during COVID-19 infection (22).

Fear of childbirth is a common problem. Now with the COVID-19 pandemic, other fears have been added to this fear. The researchers cited COVID-19 as a new source of fear among all pregnant women and their families. Some new concerns and fears of pregnant women in the COVID-19 pandemic include: cancellation of personal choices, uncertainty about the future, unknown and unpredictable delivery, exposure to risk and insecurity, non-participation in childbirth and parenting sessions, cancellation of some counseling during pregnancy, possibility of the lack of a companion during childbirth, and the fact that they cannot reunite with their families after birth (23). Distant education in the COVID-19 pandemic is essential for vulnerable groups such as pregnant women. In the present study, virtual education was used to educate pregnant women and reduce the fear of childbirth when they are at risk for COVID-19. Virtual education significantly reduced the fear of pregnant women. In this regard, a researcher conducted individual distance learning (interactive training and counseling provided through telephone calls, SMS and digital training booklet) for pregnant women in the intervention group for one week, which led to a significant reduction in fear, anxiety and worry in this group (24).

One of the concerns of pregnant women in the present study was the days of hospitalization for themselves and their infants in terms of exposure to the Corona virus. However, their tendency to mode of delivery was not affected by this concern, and they

preferred their delivery method due to fear of natural childbirth, obstetric indications, and the mode of delivery they had previously experienced. This type of delivery preference can be related to the type of intervention that is performed in distant education and also due to the main focus of virtual education on reducing the concerns of pregnant women about COVID-19, care methods during pregnancy, childbirth and breastfeeding during the COVID-19 pandemic.

One of the strengths of this study was the benefits of virtual education for pregnant women in reducing the fear and stress associated with the COVID-19 pandemic. During epidemics such as COVID-19, high-risk groups such as pregnant women refuse to visit the health centers in person, and the training process may not be done continuously and optimally, so online training can be done continuously. But one of the limitations of this research is the dependence of virtual education on the Internet. So that in the case of disconnection from the Internet, they will be deprived of information that is exchanged in groups as online, so we tried to send the necessary points to the participants outside the group and answer their questions.

Conclusion

Virtual education for pregnant women during pregnancy and informing them about the conditions of childbirth during COVID-19 pandemic reduces the fear of pregnant women about infection to COVID-19. Pregnant women should be screened for fear of COVID-19 and risky women should be identified and counseled, as they may refuse prenatal care due to the fear of being infected. Due to the effectiveness of virtual education, it is recommended to use this training method in a larger population and a larger geographical area in future studies.

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Conflicts of interest

Authors declared no conflicts of interest.

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