The Effect of a Web-Training Strategy on Mental, Personal, and Public Health Behavior during COVID-19 Pandemic

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Conflict of interest statement

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest

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Aziz Kamran: Investigation, Methodology, Writing – review & editing. Farhad Pourfarzi: Data curation, Investigation, Project administration, Supervision, Writing – review & editing. Jafar Mohammadshahi: Investigation, Writing – review & editing. Maryam Zare: Conceptualization, Data curation, Funding acquisition, Investigation, Methodology, Supervision, Writing – original draft, Writing – review & editing.

Keywords

Health Behavior, Public Health, Mental Health, COVID-19, training, female

Abstract

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Background: Recent studies indicated that web-training approaches may be required to support females to optimize their health behaviors during the COVID-19 pandemic. This study aimed to investigate the effect of empowering women through a web-training strategy on mental and personal health behavior to prevent COVID-19. This randomized controlled trial study was carried out on Iranian adult females including 152 women as the intervention group and 151 women as the control group. The intervention group was involved in a web-based training about mental and personal health behavior including eight one-hour sessions for 4 weeks. The control group was given general instruction through social media. Mental health, stress and anxiety, and personal health behaviors of the participants were assessed at baseline, at 4 weeks, and after 12 weeks. The mean score of stress and anxiety increased in the control group compared to the intervention group after intervention (P=0.009). Personal and public health behavior decreased in the control group compared to the intervention group (P=0.001). After adjustment for the **confounding variables, there was a significant increase in both groups in terms of mental health behavior (ß= -0.35, 95% CI:-0.46--0.23; P<0.001), and personal health behaviors (ß= -0.36, 95% CI:0.59-0.14; P=0.001).** Discussion: Empowering women through a web-training strategy may lead to lower levels of stress and anxiety and improved personal and public health behavior against COVID-19. Further studies are warranted.

Contribution to the field

Our findings suggest the women had improved mental health, i.e., less stress and anxiety and had a better status in terms of mental health behavior, and tended to adopt more personal and public health behaviors and preventive measures against COVID-19 after completing the web-based training course. A web-based lifestyle training intervention may have advantages not only for infectious diseases but also for chronic illnesses such as diabetes mellitus, chronic heart failure, or cancers. The findings indicate that personal and public health behaviors, mental health behaviors, and stress and anxiety intervention trough E-learning are readily available and applicable to the general population. Educational strategies focusing on lifestyle changes may reduce the incidence of life-threatening conditions and pandemics among women and empower them in the face of disasters. Further studies are warranted to confirm these findings and to discover the underlying mechanisms of the effect of empowering women through a web-training strategy on mental and personal health behavior to prevent COVID-19 and other chronic diseases.

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Running Title: Web-Training and Mental and Personal Health

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Abstract

Background: Recent studies indicated that web-training approaches may be required to support females to optimize their health behaviors during the COVID-19 pandemic. This study aimed to investigate the effect of empowering women through a web-training strategy on mental and personal health behavior to prevent COVID-19.

Methods: This randomized controlled trial study was carried out on Iranian adult females including 152 women as the intervention group and 151 women as the control group. The intervention group was involved in a web-based training about mental and personal health behavior including eight one-hour sessions for 4 weeks. The control group was given general instruction through social media. Mental health, stress and anxiety, and personal health behaviors of the participants were assessed at baseline, at 4 weeks, and after 12 weeks.

Results: The mean score of stress and anxiety increased in the control group compared to the intervention group after intervention (P=0.009). Personal and public health behavior decreased in the control group compared to the intervention group (P=0.001). After adjustment for the confounding variables, there was a significant increase in both groups in terms of mental health behavior (β= -0.35, 95% CI:-0.46--0.23; P<0.001), and personal health behaviors (β= -0.36, 95% CI:0.59-0.14; P=0.001).

Discussion: Empowering women through a web-training strategy may lead to lower levels of stress and anxiety and improved personal and public health behavior against COVID-19. Further studies are warranted.

Keywords: health behavior, public health, mental health, COVID-19, training, female.

1.Introduction

The COVID-19 outbreak occurred unexpectedly in the majority of countries worldwide as a pandemic (1). The primary cases in Iran were identified and reported on 19 February 2020 (2). The adjusted prevalence of COVID-19 in Iran until 20 August 2020 was estimated as 14.2% (95% uncertainty interval 13.3%–15.2%) (3). Due to the virus's rapid spread, several social, economic, and health-related issues have arisen worldwide (4, 5). The COVID-19 is highly contagious, and its initial clinical symptoms include fever, dry cough, and dyspnea, loss of taste or smell, and fatigue (6). Acute respiratory failure, Pneumonia, acute Respiratory Distress Syndrome (ARDS), acute liver injury, acute cardiac injury, secondary infection, acute kidney Injury, septic shock, and death are observed in severe cases of COVID-19 (5, 7). Some factors may influence the susceptibility for COVID-19 include genetics, infection history, vaccination history, illness, some medications, sex, and stage of the life course (e.g. pregnancy, infancy, old age). Lifestyle factors including stress, physical fitness, public hygiene, and diet also have critical roles in the risk of COVID-19 (8-12). Social distancing, reducing the predisposition of individual exposure and wearing a face mask, as well as maintaining personal hygiene and lifestyle changes are some strategies that should be implemented in most societies to control and prevent the transmission of the virus in both vaccinated and unvaccinated people (13).

One of the most important strategies for reducing coronavirus transmission are behavioral, focusing on mental and personal health behaviors (14). Additionally, personal health behavior is a low-cost technology that can significantly improve health outcomes (15). A novel approach to health behavior education may improve people's awareness of personal hygiene and help them avoid contracting viruses during pandemics (16). Moreover, the COVID-19 has been associated with mental health complications (17, 18). Lockdown and social isolation may result in loneliness, decreased income, and diminished family and social support (19). A social disadvantage is associated with increased stress and an unfavorable prognosis of the COVID-19 (20).

On the other hand, women play a critical role in changing family behaviors during pandemics (21). and a family function is critical in providing support for personal hygiene. Some studies reported that there is a link between women empowerment and community health (22). In addition, it seems that due to the widespread complications and high mortality rate of COVID-19 disease, personal and mental health behavior education and empowerment of

women in the family is essential in promoting family health. As a result of the COVID-19 pandemic, the importance of E-learning in education was highlighted significantly. The virtualization of education and learning and virtual learning are relatively new method of education (23). Women who receive mental and personal health behavior web training strategies may be less likely to develop COVID-19. However, there are few studies on the effects of web training on the COVID-19 related health behaviors. So, this study aimed to determine the effect of a web-training strategy on women's empowerment in the field of mental and personal health behavior to prevent COVID-19.

2. Materials and methods

2.1. Study design, setting, and sample

A randomized double-blind controlled trial was conducted on women who were not infected with COVID-19. The present study was conducted from August 15, 2020, till October 18, 2021 and the participants were recruited from several health centers in Ardabil, Iran. Participants who had inclusion criteria were selected from healthcare centers. A three-stage screening was implemented to identify eligible study participants. The first stage used data recorded on Integrated Health Record System (SIB system). In the second stage, women without COVID-19 symptoms in screening were identified. In the third stage, women screened who have Ig G or Ig M antibodies titers for COVID-19 ≤1.1 were recruited in this study.

The inclusion criteria were women with age 30 to 60 years, being literate, having access to the internet, and having a computer and/or smartphone. Individuals were excluded if they were in pregnancy or breastfeeding period, had Ig G or Ig M antibodies titers for the COVID-19 positive in baseline, were improved patients.

In total, 303 women who met the study's eligibility criteria and completed and signed a written informed consent form were participated this study. The participants were randomly assigned to the intervention group (n = 152) and the control group (n = 151) using Random Allocation Software (RAS). Because of the nature of this study, the analysts and evaluators were masked in group allocation and the allocations to the groups were performed by people outside the research team. The study groups were matched in terms of age during the random assignment. The intervention group received web-based mental and personal health behavior training. The control group received routine training via mass and social media.

2.2. The interventions

This study was conducted at three time points: baseline, post-intervention (4 weeks), and follow-up (12 weeks). The present study aimed to provide eight one-hour training sessions planned by psychologists including four training sessions focused on mental health behavior and four training sessions focused on personal health behaviors within 4 weeks. The contents of the sessions were developed based on a review literature search (24-27) (Box 1). The training sessions were conducted online and questions and answers were conducted during the sessions to ensure the attendance of the participants. A training website was created to make educational content available to the intervention group, including a home page, instructions, and the educational content of online classes which were protected by access codes for the exclusive use of the intervention group. After the training strategy, the intervention group was evaluated in terms of educational content. The control group received routine training via social media.

2.3. Data collected by the questionnaire and study variables

All questionnaires and assessments were completed by a Digestive Disease Research Center (DDRC) employee who asked the questions from each participant. All assessments were conducted face-to-face with social distancing, at three-time points in the study (baseline, post-intervention, and follow-up). Data on age, marital status, income, level of education, history of illness, type of disease, and involvement in and training for crisis and disaster situations was collected at baseline.

Mental Health Behavior

The lifestyle for prevention of infectious diseases questionnaire (LSPIDQ) which was validated for the Iranian population (26-30) was used to assess the lifestyle of the participants. This tool was established with 60 items and five domains in the field of personal and public health behaviors, healthy eating behavior, physical activity behavior, stress and anxiety, and mental health behavior. A panel of experts evaluated the content and face validity of LSPIDQ. Construct validity was done using exploratory factor analysis. The reliability and validity of the LSPIDQ were satisfying.

Mental health behavior about COVID-19 was assessed using 4 items of mental health behavior domain of LSPIDQ and the Likert scoring system. The Cronbach's alpha coefficient for total mental health behavior was 0.714, that is considered as reliable. LSPIDQ measures mental health behavior through different items such as managing stress by staying at home and family management of stress in isolation and lockdown. The current study employed the Likert scoring system, which assigns a score between 1 and 4. These questions included, never, sometimes, usually, and, always with each response receiving a score of 1 to 4. The

scoring system was as follows: "1= never "to "4= always." As a result, the range of scores in this section ranged from 4 to 16 points and a higher score indicated poorer mental health.

Furthermore, the 18-item stress and anxiety scale of LSPIDQ was used to assess stress, fear, and anxiety level about COVID-19. The Cronbach's alpha coefficient for this subscale was 0.960, indicated internal consistency. The scoring system ranged from "1" for never to "4" for always. The range of scores in this section ranged from 18 to 72 points and a higher score indicated that participants were experiencing higher anxiety and stress.

Personal and Public Health Behavior

Personal and public health behaviors associated with COVID-19 were assessed using nineteen items developed by the personal and public health behaviors domain of LSPIDQ. The total Cronbach's alpha of this domain was 0.787, which is considered as reliable. This subscale measures personal and public health behaviors through items about social distancing, wearing a face mask, personal hygiene, disinfectants, practicing proper coughing etiquette, hand washing, room ventilation, avoiding any direct contact with any infected person, and food hygiene. The Likert scale ranged from "1"= never to "4" =always and the range for total score of personal health behaviors was between 19 - 76 points. The higher score was associated with more favorable personal health behaviors for COVID-19 prevention.

Symptoms of COVID-19 Diseases

A physician examined the participants' physical condition during the study and diagnosed symptoms of COVID-19 diseases. Then, the physician completed a clinical examination questionnaire in which the symptoms such as fever, cough, fatigue, muscle pain, anorexia, diarrhea, nausea, and loss of smell and taste were recorded.

Furthermore, 10-ml of blood samples were collected from all participants before the study. Immunoglobulin (Ig) G and Ig M antibodies titers for COVID-19 were detected by enzyme-linked immune sorbent assay using kits (ELISA; Pishtaz, Iran) according to manufacturer instructions. Following the kit, IgG titers and Ig M titers ≥1.1 were positive.

2.4. Statistical Analysis

The sample size was collected considering a type 1 error of 0.05, type 2 error of 0.20, and success rate p1=0.25 and p2=0.40. Considering the sample loss rate of about 50%, the

minimum required sample size in each group was 151 people for each group (31). In total, 303 participants signed consent form and were screened for inclusion criteria and 125 participants of the intervention group and 123 participants of the control group completed this study (Figure1).

The normality of data distribution was assessed using the Kolmogorov-Smirnov test. The Chi-square test (or Fisher exact test) was used to compare qualitative factors between two groups. An independent sample t-test was used to compare quantitative variables among the groups. Cochran's Q test was used to determine if there are differences in the dichotomous dependent variables among the groups across time. The repeated measures ANOVA and Friedman test were used for continuous data in each group. A general linear model (GLM) with generalized estimating equations (GEE) approach was performed to assess the response variables changes after adjusting the confounding variables. All statistical analyses were performed using SPSS software version 25.0 (IBM, Chicago, Illinois, USA) and a P-value less than 0.05 was considered statistically significant.

3.Results

Socio-demographic characteristics of participants and comparison between the groups are presented in Table 1. The mean (SD) age of the intervention and control groups was 43.4(8.6) was 44.8(8.8) years, respectively (P=0.174). There was no significant difference in the socio-demographic variables marital status (P=0.462) and crisis training course (P=1.00). Monthly income and education level was significantly lower in the control group than in the intervention group (Both P<0.05). At baseline, most of the participants of the intervention and control groups were healthy (84.9% and 80.1%, respectively). There was no significant difference regarding disease history between the groups (P= 0.278 and P=0.233).

There was no significant difference in mental health behavior, stress and anxiety, and personal and public health behavior between the two study groups (Table 2). The mean score of mental health behavior was significantly changed during study (P<0.001). Furthermore, the score of stress and anxiety was lower in the control group at baseline. The score was higher in the control group compared with the intervention post immediately after the intervention. Finally, two groups had similar scores of stress and anxiety after follow-up. The findings of the Repeated Measure ANOVA test revealed that the mean personal and public health behavior questionnaire in both the intervention and control groups exhibited a

significant change over time (P=0.001). The control group had a lower mean score of the personal and public health behavior questionnaire.

The questionnaires' scores were scaled to the range 0-100, and based on dividing the scores into three categories: Low (Score ≤33), Medium (33<Score<66), and High (Score>66), the groups were compared. The score changes related to mental health behavior, stress and anxiety, and personal and public health behaviors during the study in the groups are presented in table 3. The Friedman test showed that there was a significant difference in three times of data collection on the scores of the mental health behavior in both groups (P<0.001).

From the baseline to the end of the study, the symptoms of COVID-19 diseases, including fever, cough, tiredness, muscle pain, anorexia, diarrhea, and vomiting had no significant differences between the groups and within group (Table4).

The evaluation of Mental Health behavior, Stress and Anxiety, and Personal health behaviors changes among the groups after adjusting the effect of confounding variables is summarized in table 5. After adjusting the confounding variables including age, salary, and education level, there were no significant differences in fever, cough, tiredness, and muscle pain among the groups. Also, there were no significant differences among the groups regarding mental health behavior, stress and anxiety, and personal and public health behaviors scores. A significant change was found in both groups in terms of mental health behavior (Beta= -0.35, 95% CI -.46 to -0.23; P<0.001), personal and public health behaviors (Beta= -0.36, 95% CI -0.59 to -0.14; P=0.001), and stress and anxiety (Beta=0.47, 95% CI -0.11 to 1.07; P= 0.112).

4. Discussion

The results of the present study revealed that the mean scores for mental health behavior items decreased after adjusted for age, salary, and education level. The score changes items of mental health behavior were declined within both groups during the study. In follow-up, the intervention group had higher scores of mental health behavior than the control group, although this difference significant. Obtaining a higher score of mental health behavior in the intervention group indicated that the status of participants in the intervention group was better during the study in terms of mental health behavior.

At baseline, the mean score of stress and anxiety was lower in the control group, was elevated during the intervention, and subsequently decreased in the follow-up. After adjusting for age, salary, and education level, the control group had higher stress than the intervention group. The mean score of personal and public health behaviors was reduced in the control group

than the intervention group. This result was indicated the status of personal and public health behavior was improved in the intervention group.

Symptoms of COVID-19 diseases were not significant during study between and within groups. In the intervention group, the fewer people had fever, cough, tiredness, and muscle pain symptoms than the control group in post-intervention, and follow-up, although the differences were not significant. The findings of this study were in line with the previous research demonstrating that reducing chronic psychosocial stress can help prevent infections and improve viral respiratory diseases (20). In a prospective study conducted in China, the mean mental stress score at baseline was 27.62 and decreased to 24.57 during five COVID-19 waves (32). Several studies indicated that stress management training programs have been shown to reduce stress effectively (33, 34). The present study was in agree with another study conducted by Accoto et al. regarding the beneficial effects of mindfulness-based stress reduction training on well-being in Italian women (35).

In this study, the intervention group was trained using curriculums to overcome stress and anxiety and progress in mental health behavior. Overall, the virtual educational planning in the intervention group improved certain aspects of mental health behavior and stress and anxiety, whereas the control group showed increased stress and anxiety.

In terms of the personal and public health behaviors questionnaire, our study findings corroborated those of Zhong et al., who discovered that knowledge score was significantly associated with COVID-19 prevention practices (7).

The intervention group received a personal sanitation behavior training strategy. Face masks effectively prevent or reduce COVID-19 transition and contraction, but they do not provide 100% protection (36). Improving behavioral change and maintaining a two-meter social distance can help to combat transmissible airborne viruses, including COVID-19 (37). According to the WHO, education, prevention, isolation, and transmission control are critical in preventing COVID-19 (38). A similar study demonstrated that masks, disinfectants, and hand washing effectively prevented COVID-19 (39). A single person's good personal sanitation behavior can save many lives, making this person a more effective fighter against COVID-19.

Increased knowledge of COVID-19 has resulted in people adopting a high level of prevention against coronavirus disease. Naturally, increased knowledge and an improved attitude could be gained from the training strategy program. On the other hand, disseminating false

information and unverified news via various social networking sites misleads people and leads them to abandon precautionary behaviors against COVID-19.

The exact mechanism of the effects of stress on COVID-19 is not clear. The skin and mucosae serve as defense mechanisms against microorganism entry. Stress can disrupt the cohesion of these cells, resulting in apoptosis (40). Microorganisms can enter the body when this barrier is damaged through psychosocial stress or acute and chronic stress (41). Moreover, stress increases noradrenergic in lymphoid organs, which inhibit the innate immune system's activity. The innate immune system is the body's first line of defense against viruses (42, 43). On the other hand, chronic stress has a negative effect on the production of antibodies against viruses in response to increased endogenous cortisol production during times of stress (44). In addition, improving health literacy and mental health behavior may result in changes in behavior and empowerment in overcoming problems and disasters (20).

However, this study had some limitations. First, the intervention was educational, and it was not possible to blind participants. Second, eligibility criteria such as having access to the internet, having a computer or smartphone, and familiarity with its use affected the study enrollment by privileging participants with higher socioeconomic status such as income and literacy. Third, the intervention group had fewer participants in a virtual class than expected due to their preference for offline courses. Lastly, the study period was only 16 weeks, and the short duration of the training strategy was due to the study not interfering with vaccinations.

5.Conclusion

Our findings suggest the women had improved mental health, i.e., less stress and anxiety and had a better status in terms of mental health behavior, and tended to adopt more personal and public health behaviors and preventive measures against COVID-19 after completing the web-based training course. A web-based lifestyle training intervention may have advantages not only for infectious diseases but also for chronic illnesses such as diabetes mellitus, chronic heart failure, or cancers. The findings indicate that personal and public health behaviors, mental health behaviors, and stress and anxiety intervention trough E-learning are readily available and applicable to the general population. Educational strategies focusing on lifestyle changes may reduce the incidence of life-threatening conditions and pandemics among women and empower them in the face of disasters. Further studies are warranted to

confirm these findings and to discover the underlying mechanisms of the effect of empowering women through a web-training strategy on mental and personal health behavior to prevent COVID-19 and other chronic diseases.

Data availability statement

The dataset analyzed during the current study is not publicly available due to legal and ethical constraints. Public sharing of participant data was not included in the informed consent of the study. All inquiries about access to data should be sent to the corresponding author. All requests to access data will be handled in accordance with the Ethics Committee of the Faculty of Ardabil University of Medical Sciences.

Ethics statement

This trial received approval from Ardabil University of Medical Sciences by the research ethics committee, IR.ARUMS.REC.1399.284, Approval code Irct.ir: IRCT20221228056969N1, 2023-01-21 and was published August 15, 2020. This study funded by the WHO Eastern Mediterranean Regional Office - Special Grant for Research in Priority Areas of Public Health 2020-2021 (COVID-19 research section), under grant no. RPPH 20-62. We confirm that all research was performed in accordance with relevant guidelines/regulations. The participants completed and signed a written informed consent form participated in this study.

Authors' contributions

All the authors have made an essential contribution to the article. Maryam Zare designed the study, secured the funding, designed curriculum training strategy of trial and site education and coordinated the study, analyzed data, and drafted the paper. Aziz Kamran designed the study, designed training strategy content of trial and held training the class, and drafted the

paper. Farhad Pourfarzi coordinated the study and drafted paper. Jafar Mohammadshahi contributed to the design of the trial and drafted a paper.

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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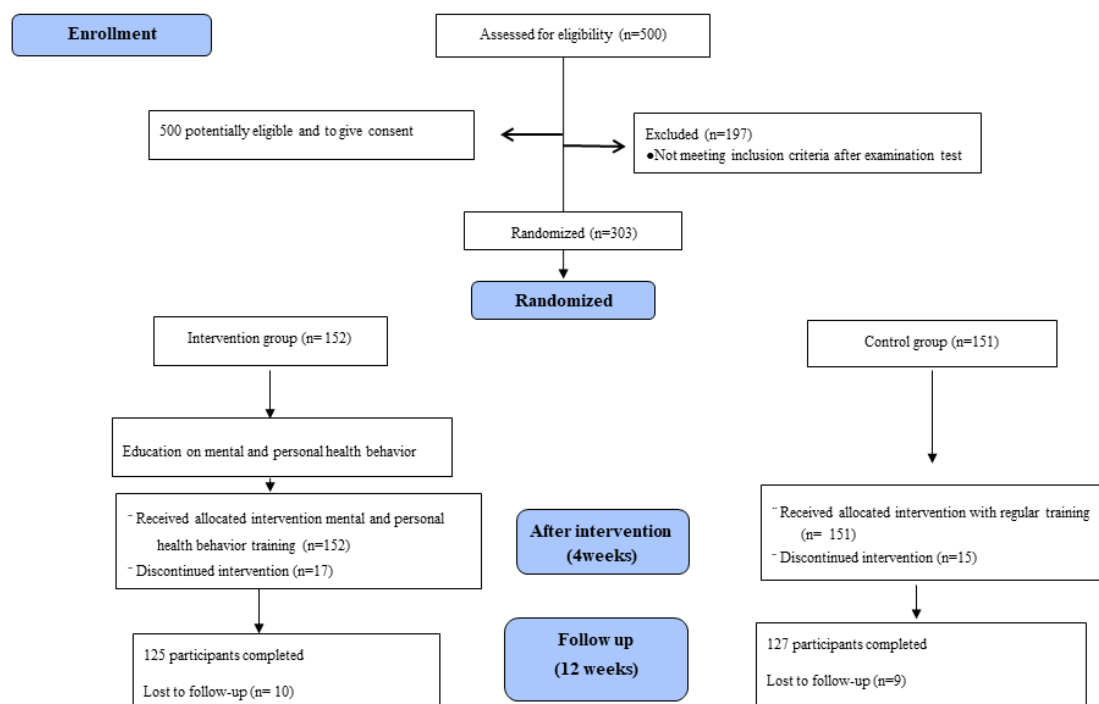
Figure 1.TIF

Fig 1. CONSORT Flow diagram of mental and personal health behavior for the prevention of COVID-19