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The Effect of E-learning on Knowledge, Attitude, and Practice Regarding COVID-19 in Heart Patients: A Quasi-experimental Study Without a Control Group

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Abstract

Background: The recent coronavirus disease 2019 (COVID-19) epidemic is the worst crisis since World War 2. Because no successful cure for this disease has been reported, efforts to improve knowledge, perspective, and performance in vulnerable groups, such as heart disease patients, are very important for managing this epidemic.
Objectives: The present study was conducted to determine the effect of e-learning on COVID-19-related knowledge, attitude, and performance in heart disease patients.
Methods: This was a quasi-experimental before and after study without a control group, which was conducted on 80 patients in Lorestan Heart Center (Shahid Madani Hospital, Khorramabad,) selected by random sampling method. The intervention included 10 15-minute educational sessions in 4 weeks, about COVID-19 prevention programs, such as general knowledge about COVID-19, disinfection methods, using facemasks and gloves, the correct way of washing hands, prescribed medication, and nutritional recommendations. Data collection tools were a demographic information questionnaire, a knowledge evaluation questionnaire, and a COVID-19-related performance questionnaire. The data were analyzed using SPSS 26 software by descriptive and statistical methods and paired *t*-test and analysis of variance (ANOVA).
Results: The patients' mean age was 55.22 ± 11.05 years. The mean knowledge of patients before the educational intervention was 13.25, and after the intervention was 17.42, and a significant statistical difference was observed (P = 0.00). Also, the patients' mean attitude and practice before the intervention were 38.32 and 11.79, respectively, and reached 40.90 and 13.51 after the intervention, and a meaningful statistical difference was observed (P = 0.00).
Conclusions: E-learning improves COVID-19-related knowledge, perspective, and practice in patients with heart disease. We suggest that some nurses should be educated in this area and, using the right equipment, vastly perform E-learning for groups susceptible to COVID-19.

Keywords: Learning, Knowledge, Attitude, Private Practice, COVID-19, Heart Disease

1. Background

The coronavirus disease 2019 (COVID-19) is caused by a new type of coronavirus, which was first reported in Wuhan, China, in 2019 (1). Later on, because of the increase in death rate and associated high morbidity and transmission speed, on March 11, 2020, it was introduced as a worldwide epidemic. By the beginning of March 2020, 67 countries were dealing with this disease, and 88340 positive cases of COVID-19 had been recorded, of which 3001 people died (mortality rate: 3.4%), and 42728 people were cured (treatment rate: 48.4 %) (2). This new virus could have dire consequences for at-risk patients, such as heart disease patients. It could also cause heavy routine costs, high mortality resulting in human resources reduction, psychological problems, etc. for the health system of the countries (3). The possible transmission method has not been fully understood yet. The most common means of transmission in human beings are droplets and saliva during coughing and sneezing, person-to-person transmission, and contact transmission when contacting mouth mucosa, eyes, and nose (4, 5). Indirect transmission happens through contaminated surfaces (metal, glass, and plastic), on which the virus can remain for days and can be a secondary reser-

voir (6). The evidence illustrates that heart diseases are common in hospitalized COVID-19 patients. It seems that heart disease patients are more susceptible to this virus and present more severe clinical signs when afflicted. In the published analysis of 1521 patients analyzed, 7.9%, 4.16%, and 1.17% had diabetes, cardiovascular disease, and hypertension, respectively. The overall mortality rate was 4.2%, while the mortality rate in patients afflicted with hypertension, diabetes, and cardiovascular disease was 6%, 7.3%, and 5.10%, which were meaningfully higher (7). In the studies carried out, the prevalence of heart diseases has been reported at 10 and 30% in patients with severe respiratory syndrome (SARS), and Middle East respiratory syndrome (MERS) (8, 9). Collections of reports related to the clinical characteristics of patients with COVID-19 also described similar findings (10).

Depending on the prevalence and severity of the conditions caused by the COVID-19 pandemic, countries face different challenges, such as educating people in the field of observing hygiene principles (washing hands frequently, using masks, avoiding face-to-face interaction, and social distancing) which facing each other (11). During the outbreak of this disease in Iran, considering the dangers of the physical presence of patients at risk in hospitals and clinics on the one hand, and the urgent need of patients for regular visits by specialists, on the other hand, the use of virtual space and distance learning and electronic visits to solve the lack of In-person visits to hospitals and clinics were discussed, and for the first time, it was found that the use of electronic medical and health education, monitoring the compliance with the therapeutic, nutritional, and physical regimen, and reducing the risk of contracting the disease of COVID-19 caused a decrease in referrals (12).

E-learning is the use of electronic information and communication technologies to provide health information and medical services. These services include electronic visits, virtual examinations, remote evaluation of recorded videos or recorded images, and telephone evaluation and management services (medical discussion and consultation) (13, 14). Online teaching and learning can be conducted by phone through virtual training. In a study conducted by Mehrotra et al., entitled "Rapidly converting to "virtual practices": outpatient care in the era of COVID-19", the results showed that care through education and electronic visits is increasing (15).

Since this is a new virus, the information on the pathogenesis of COV-SARS 2 and the means of controlling and curing it are limited; but currently, the best measure to take is to prevent it and stop the transmission (16).

Controlling a pandemic needs long-term strategies, such as countrywide quarantine, initial prevention efforts, such as regular washing of hands, social distancing, and complying with respiratory hygiene (covering nose and mouth while sneezing or coughing). Therefore, successful control of COVID-19 and minimizing the death rate requires behavioral change, a behavior that is monitored by the individuals' knowledge, perspective, and understanding. It is very important to understand the dangers of this disease, especially in patients afflicted with chronic diseases and the disease danger factors, and help to predict the consequences of planned behaviors in COVID-19 (11).

Knowledge, perspective, and performance are important predictors of hygiene behaviors (16); thus, improper knowledge, perspective, and performance directly increase the risk of affliction (17). Using appropriate interventions for improving the awareness and the perspective of heart disease and hypertension patients is recommended and could help control the disease. One of these interventions is hygiene education, which seems to improve knowledge, change the perspective and disease-associated beliefs, and correct behavior (18). The previous evidence about SARS, MERS, and Ebola shows that improving general knowledge, perspective, and understanding of the dangers has an important role in controlling epidemics (19, 20). Different educational methods are used for this purpose. With the development of technology and using the virtual network, education happens through the virtual network. Because of the COVID-19 epidemic and the necessity of isolation, home quarantine, social distancing, and reducing the danger of COVID-19 transmission, the effort for monitoring, evaluating, and distance education of these patients is very important (12).

2. Objectives

This study was conducted to determine the e-learning effect on COVID-19-related knowledge, attitude, and performance in heart disease patients.

3. Methods

3.1. Setting and Sample

This was a quasi-experiment before and after study without a control group, which was conducted on 80 patients in Lorestan Heart Center (Shahid Madani Hospital, Khorramabad). The sampling method was simple random sampling, and the samples were chosen from hospitalized patients in heart emergency, CCU, heart internal, POST CATH, and ICU-OH units. The criteria for entering the study included knowing how to read and write, the age range of 35 - 70 years, vital symptom stability for participating in the educational program, the ability to use a cell phone,

and having heart disease. The criteria for exiting the program were the physician's disapproval of the patient's participation and the patient's vital symptoms starting to fall out of normal range. In order to do the coordination and conduct the questionnaire, we used a nursery faculty member who had educational skills and was familiar with heart disease patients. In a briefing session, while complying with COVID-19 prevention measures, the patients' conscious consent was obtained, and the research groups were informed of the goals, stages, and duration of the study, information confidentiality, and voluntary participation in the study.

The study method was as follows: First, using social media on cell phones (WhatsApp and Telegram), a pretest with the knowledge, attitude, and performance (KAP) questionnaire was performed. In the next stage, the intervention was carried out in the form of 10 sessions of 15 minutes (over 4 weeks) with content related to the prevention programs for COVID-19, including a general introduction to COVID-19 (education about the nature, history, ways of spreading and transmission, ways to prevent the disease, its dangers for heart patients, disinfection methods, use of masks and gloves, the correct way to wash hands, and prescribed drugs and nutritional recommendations via mobile phone (WhatsApp, Telegram, and Instagram)). In addition, educational videos during each session and educational booklets related to the implemented educational sessions, which were compiled using valid scientific texts and guidelines for COVID-19, were approved by nursing specialists and cardiologists for the patients. Also, after 4 weeks, in the last meeting, a post-test was taken from all the patients participating in the study.

3.2. Instruments

Data collection tools included 2 sections: the first section was about demographic characteristics, which included information about age, sex, marital status, education, work, location, previous contact with COVID-19 patients, and the predisposing diseases. The second section was about COVID-19-related knowledge, perspective, and performance. The field related to knowledge had 19 questions with a three-choice scale of yes, no, and I don't know; the correct answer was scored 1 and the wrong and I don't know the answer was scored 0. The attitude section was composed of 11 questions scored on a Likert scale, which had 3 options: Yes, no, and I don't know; the right answer had 1 point, and the wrong answer and I don't know scored 0. The performance section was composed of 15 questions scored on a scale, which had 3 options: Yes, no, and I don't know; the correct answer had 1 point, and the wrong answer and I don't know scored 0. Coronavirus disease 2019-related knowledge, perspective, and performance were calculated based on the total point and converted to a percentage for better comparison. Bloom scale was used in all 3 areas; thus, the knowledge score of 80 - 100% (19 - 15.2) is considered well, 60 - 79 % (11.4 - 15.01) medium, and less than 60% (< 11.2) weak. For perspective, a score of 80 - 100% (44 - 35.2) is considered good, 60 - 79 % (26.4 - 35) medium, and less than 60% (< 26.4) weak. Regarding performance, a score of 80 - 100% (12 - 15) is considered good, 60 - 79 % (9 - 11.85) medium, and less than 60% (< 9) weak. This tool was used by Akalu et al. (11). For the validity determination of the questionnaire, we used the content method, which included giving the questionnaire to 10 nursery faculty members and evaluating questionnaire statements from simplicity and vividness perspectives and using them after the necessary corrections. The stability using the Cronbach alpha coefficient in knowledge, perspective, and performance was 0.8, 0.9, and 0.7, respectively. The total stability was also 0.78.

3.3. Data Analysis

The analysis of the data was executed using SPSS 26 and descriptive statistical methods (quantity, percentage, average, and standard deviation). In order to compare the before and after situations of the experiment, paired *t*-test was used. The analysis of variance (ANOVA) was also used to relate perspective, knowledge, and performance with demographic characteristics. The confidence level and meaningful level were considered 95% and 0.05, respectively.

4. Results

Eighty clients from the Lorestan Heart Center participated in the study. The patients' mean ± age was 52.22 ± 11.05 years. Also, 62.5% of the participating patients were male and the rest were female. Most of the patients (95%) were married, and 40% were able to read and write. In addition, 70% were living in the city and the rest in the village, and 72.5% of the studied patients had no contact with COVID-19. Also, 77.5% had heart disease (Table 1).

The mean knowledge score of the studied patients before and after the study was 13.52 and 17.42, respectively. The paired *t*-test showed that there was a significant difference between the mean knowledge of the patients before and after the study (P = 0.00) (Table 2).

The mean attitude score of the studied patients before and after the study was 38.32 and 40.90, respectively. The paired *t*-test showed that there was a significant difference between the mean attitude of the patients before and after the study (P = 0.00) (Table 3).

The mean practice score of the studied patients before and after the study was 11.79 and 13.51, respectively. The

Table 1. The Frequency of Demographic Variables of Patients Participating in the Study

Variables	No. (%)
Gender	
Male	50 (62.5)
Female	30 (37.5)
Marital status	
Married	76 (95)
Deceased wife	4 (5)
Education	
Illiterate	4 (5)
Reading and writing	32 (40)
Cycle	14 (17.5)
Diploma	18 (22.5)
Bachelor	12 (15)
Job	
Unemployed	8 (10)
Employee	14 (17.5)
Manual worker	6 (7.5)
Farmer	2 (2.5)
Non-governmental	20 (25)
Others	30 (37.5)
Location	
City	56 (70)
Village	24 (30)
Contact with a patient with coronavirus disease 2019	
Yes	22 (27.5)
No	58 (72.5)
Disease history	
Heart disease	62 (77.5)
Hypertension	16 (22.5)
Diabetes	2 (2.5)

paired t-test showed that there was a significant difference between the mean attitude of the patients before and after the study ($P = 0.00$) (Table 4).

One-way ANOVA showed that there was no significant statistical difference between knowledge and sex, marital status, occupation, and place of living ($P > 0.05$). There was a significant statistical relationship between knowledge and educational status, and age ($P < 0.05$). There was not a significant statistical difference between perspective and demographic characteristics ($P > 0.05$). There was also no significant difference between knowledge and sex, marital status, age, and place of living ($P > 0.05$). There was a significant statistical relationship between knowledge and educational status, and occupation ($P < 0.05$) (Table 5).

5. Discussion

The effect of e-learning on COVID-19-related knowledge, perspective, and performance in heart disease patients hospitalized at Lorestan Heart Center (Shahid Madani Hospital) was investigated in the present study. No significant relationship was observed in the average changes in knowledge score after the intervention according to some effective demographic variables of the patients, including sex, marital status, occupation, and place of living. Hosseinkhani et al. reported that the level of awareness of men was lower than that of women, but no significant difference was observed between marital status, occupation, place of residence, and knowledge scores (21).

There was a significant statistical relationship between educational status and age and knowledge so that old people had less knowledge. Akalu et al. and Xiong et al. showed that the average knowledge score decreases with an increase in age (11, 22), which complies with the results of this study, which may be due to physiologic changes of old age. Auditory and visionary capabilities reduce as age increases, and this could interfere with the ability to read and understand medical instructions. However, in the study conducted by Sadeghifar et al., there was no significant relationship between age and knowledge (23). In a study titled "Evaluating the effect of knowledge, attitude, and practice on self-management in type 2 diabetic patients on dialysis", Ghannadi et al. showed that with the increase in educational level, the average score of knowledge increases, which complies with the present study (24). Based on this study's findings, more effective education needs to be provided for people of old age and lower educational levels. We also showed that there was not a significant statistical relationship between perspective and demographic characteristics. This result contradicts the result of the study conducted by Sadeghifar et al. indicating that perspective scores are influenced by demographic coefficients (23). In a study conducted by Honarvar et al., there was a significant relationship between adult performance related to COVID-19 and sex, age, marital status, and place of living (25), but there was no significant relationship in the study conducted by Vaidya et al. (16). In the study conducted by Takoudjou Dzomo et al., titled "Knowledge, attitudes and practices regarding COVID-19 in N'Djamena, Chad", a better performance regarding COVID-19 prevention was observed (26), which is in line with the present study. After the e-learning intervention, the average knowledge, attitude, and performance in our heart

Table 2. Comparison of Mean Score of Knowledge Regarding Coronavirus Disease 2019 Before and After E-learning in Patients Participating in the Study

Variable	Number	Mean ± SD		Paired *t*-test	P-Value
		Pre-test	Post-test		
Knowledge	100	13.52 ± 2.62	17.42 ± 1.64	-14.32	0.00

Table 3. Comparison of Mean Score of Attitude Regarding Coronavirus Disease 2019 Before and After E-learning in Patients Participating in the Study

Variable	Number	Mean ± SD		Paired *t*-test	P-Value
		Pre-test	Post-test		
Attitude	100	38.32 ± 4.40	40.90 ± 2.95	-6.310	0.00

Table 4. Comparison of Mean Score of Practice Regarding Coronavirus Disease 2019 Before and After E-learning in Patients Participating in the Study

Variable	Number	Mean ± SD		Paired *t*-test	P-Value
		Pre-test	Post-test		
Attitude	100	11.79 ± 1.79	13.51 ± 1.53	-7.59	0.00

Table 5. The Relationship Between Knowledge, Attitude, and Practice Regarding Coronavirus Disease 2019 and Demographic Characteristics in the Studied Nurses

Variables	F	P-Value
Knowledge		
Sex	0.72	0.49
Marital status	1.92	0.17
Education	2.65	0.04
Job	1.04	0.41
Habitat	1.53	0.22
Age	2.93	0.02
Attitude		
Sex	0.00	0.93
Marital status	0.18	0.66
Education	1.47	0.23
Job	0.47	0.79
Habitat	0.22	0.80
Age	90.00	0.60
Practice		
Sex	1.18	0.28
Marital status	0.46	0.49
Education	6.07	0.00
Job	2.79	0.03
Habitat	1.65	0.20
Age	1.30	0.30

disease patients significantly increased compared to before the intervention, which shows that online education had a positive effect. The results of this study were in line with some other studies. Mohamadzadeh assessed a healthcare program and electrical drug monitoring to prevent COVID-19 and following a diet treatment in chronic heart disease patients, and showed that executing healthcare programs and electrical drug monitoring prevented COVID-19 and helped patients follow their treatment (12). In a semi-experiment study on type 2 diabetes patients, which was conducted by Noohi et al., they showed that e-learning significantly improved knowledge, attitude, and performance (27). While in the study conducted by Bidi et al. titled "Effectiveness of educational program on knowledge, attitude, self care and life style in patients with type II diabetes", the results showed that the educational program had no significant effect on the mean knowledge of the experimented group (28).

The illiterate people had a low level of knowledge about COVID-19, which was not far from the expectation, and it is necessary for the relevant officials to plan and act using the educational platforms available in society and mass media in order to improve the knowledge level of these people. Based on the findings of the present study, more effective education should be provided to older people with lower education.

Other results showed that there was no statistically significant relationship between attitude and demographic variables ($P < 0.05$). This result is contrary to the results of Sadeghifar et al., who stated that attitude scores are influenced by demographic variables (23). In the study by Ranjbar Roghani et al., no significant relationship was found between the attitude of medical students toward COVID-19 and demographic variables, which is in line with the present study (29).

Abbaszadeh et al. showed that educating myocardial

infarction patients had positive results; not only it increased awareness in these patients but also improved their attitude (30). In a study conducted by Brito et al., education improved patients' quality of life and knowledge, but it had no significant effect on their attitude (31). In another study conducted by Hosseini Fard et al., it was concluded that electronic visiting could allow precise monitoring of patient's status in the initial healthcare stage using cell phones, and implementing a form of prevention (32). By overcoming some challenges, such as the costs of creating telemedicine and educating patients, patients who live in distant areas with no easy access to healthcare services can easily be helped (32). In another study conducted by Jafari et al., they used an educational program to correct angioplasty patients' lifestyles (33). This study showed a meaningful difference in knowledge, attitude, and performance scores at the end of the intervention and 1 month after the intervention, which is in line with the current study (33). There are many studies indicating that more populations can be covered using electronic communications and assigning some of the caring efforts to the patients themselves (34, 35). In this method, the patients can communicate with their carer easily, and quickly, without considering time, location, or bank holidays, with no need to go out (34, 36, 37). This method is being used in advanced countries as the main part of health care. The slogan of the world health organization is to provide full health care for all patients, especially chronic disease patients, and use electronic communications as an appropriate channel between patients and their carers (38-40). One of the main and most important goals of the health system around the world is preventing COVID-19 prevalence, and it seems that social media is effective in executing COVID-19 prevention educational programs (12). Currently, because people have wide access to sources of news and social media, they receive a huge amount of information, and in the COVID-19 epidemic, paying attention to incorrect information from different sources, can have serious consequences for society, and on the other hand, these patients suffer from incorrect imaginations about COVID-19. Thus, executing educational health programs for covering endangered patients and groups is needed. Considering the results of this study and similar studies regarding the effectiveness of online education for patient knowledge, attitude, and performance, and the key role of nurses in these programs, nurses could be trained in this field, and by providing the supplies, people who have gone through the course and are capable, and also devoting enough time, e-learning can be executed in a broad range for high-risk COVID-19 groups.

One of the limitations of the present study was the inability of executing an online education program for illiterate people. Therefore, we suggest that other studies could be conducted using video calls and other online methods for educating endangered COVID-19 illiterate people.

5.1. Conclusions

The results of this study showed that e-learning improves knowledge, attitude, and performance regarding COVID-19 in heart disease patients. It is suggested that some nurses should be trained in this field, and by devoting enough time and also providing the supplies, e-learning can be executed in a broad range of eligible high-risk COVID-19 patients.

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Footnotes

Authors' Contribution: Mehran Naghibeiranvand conceived and designed the evaluation and drafted the manuscript, re-analyzed the clinical and statistical data, and revised the manuscript. Saeedeh Piri participated in designing the evaluation, performed parts of the statistical analysis, helped to draft the manuscript, collected the clinical data, interpreted them, and revised the manuscript. Zeinab Alipour re-evaluated the clinical data, revised the manuscript, performed the statistical analysis, and revised the manuscript. All authors read and approved the final manuscript.

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