The effect of the blended education program on treatment concordance of patients with hypertension: A single-blind randomized, controlled trial

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Poor treatment concordance is one of the major problems in patients with hypertension (HTN). An appropriate teaching method can help solving this problem. This study aimed to determine the effect of blended education program on treatment concordance in patients with HTN. This is a single-blind randomized controlled trial, and 60 patients with HTN who met inclusion criteria were selected by a convenience sampling and allocated into the control and intervention groups. A demographic information form and the questionnaires were used in this study. The questionnaires included questions addressing treatment concordance, which explored three dimensions: dietary adherence, medication adherence, physical activity plan. The blended educational intervention was carried out for 4 weeks in the intervention group. The control group only received traditional face-to-face education. The results showed that there was a significant increase in the total score of treatment concordance of the intervention group compared to the control group after the intervention (P < .001). In conclusion, using a blended education program is highly recommended to improve treatment concordance in patients with HTN. Consequently, it reduces patients' medical costs and enhances their health-related quality of life. (J Vasc Nurs 2019;37:250-256)

INTRODUCTION

Hypertension (HTN) has been recognized as one of the most serious risk factors of atherosclerosis, heart failure, stroke, and kidney failure in patients worldwide that requires inpatient treatment and health care costs.[1] The considerable global prevalence of HTN, as well as its detrimental effects on body organs, empha-

sizes the dangers of the disease as a major health-related problem in all societies.[2] Compared with healthy individuals, patients with HTN are 2 times more likely to develop coronary artery disease, four times more likely to experience congestive heart failure, and seven times more likely to suffer from cerebrovascular disease.[3]

The prevalence of HTN in developing countries has been showing a rising trend, and based on some predictions, 1.5 billion people out of the global population will experience HTN by 2025.[4] According to the results of study conducted by Mirzaei et al,[5] hypertension is one of the most common health problems in Iran. They reported the prevalence of HTN 22%, out of whom 23.6% are males and 23.5% are females. Timely diagnosis and control of HTN could reduce the risk of serious cardiovascular disorders such as stroke and myocardial infarction.[6] A combination of antihypertensive drugs has proven to be effective in decreasing blood pressure and cardiovascular mortality.[7] However, truly controlling HTN does not seem to have been very successful, given the high prevalence of the disease.[4]

Medication adherence is the most effective way of controlling HTN,[8] and the most important nonmedication method of controlling HTN is involving the patient in self-care activities.[9] Self-care, as a relative process, shapes a significant proportion of the disease control procedure, through which the patient purposefully directs his/her behaviors and makes the right choices; self-care also reflects an individual's attitudes and knowledge.[10] Engaging in self-care activities could improve HTN control, although patients normally do not tend to appreciate self-care behaviors, and they do not always act according to therapeutic diets specified for them.[11]

Over 50% of patients stop their treatment one year after their disease has been diagnosed, and only 1.3% of such patients reach

a normal rate of blood pressure, while the majority of them are in need of more than one type of HTN medication to normalize their blood pressure and maintain it.[12] A clear understanding of self-care advantages and of the obstacles to self-care could help encourage the patient to practice self-care activities.[9] The failure to use an appropriate patient education method may be the cause of poor treatment concordance in patients.[13] Educational interventions can improve the blood pressure status and prevent the development of HTN and the prevalence of related diseases (ie, heart attack and stroke) by raising patients' awareness of how the disease could develop and its effects; and correcting the patients' false beliefs about treatment, which could help them change their behaviors and remain more committed to their treatment plan.[14]

Blended education represents a new method in the field of medical training. It is the combination of traditional face-to-face and electronic educational tools.[15] The blended approach relies on the irreplaceable advantages of both of these methods to enhance the learning quality.[16] Given this importance, this study seeks to investigate the impact of blended education on treatment concordance in patients with HTN. Our hypothesis was that blended education might have an effect on the patient's self-care behaviors in controlling HTN and treatment concordance.

METHODS

Design and sample

This was a single-blind, randomized, controlled trial conducted from September 2017 to November 2017. The population under investigation included all patients with HTN who were referred to the Shahid Rasi hospital in the Shahin Dej city in Iran. Patients who met the inclusion criteria were considered to be the research samples. The inclusion criteria include patients aged 20–65 years old, HTN diagnosed by subspecialist, having a blood pressure higher than 140/90 and less than 180/110, willing to participate in the study, ability to read and write, ability to receive e-mails and text messages, and not having severe underlying diseases such as chronic kidney disease or heart problems that could impact the study. Not willing to participate in the study, having blood pressure higher than 180/110 in past 6 months, and having severe underlying diseases and not being able to receive e-mails and text messages were considered exclusion criteria. The result of a previous study conducted by Kazemnejad et al[17] was used to calculate sample size. Based on a type 1 error of 0.05 and a power of 0.08, the sample size was calculated to be 28 patients in each group. By considering the attrition rate, the sample size of 30 patients in each group was finally included (Figure 1).
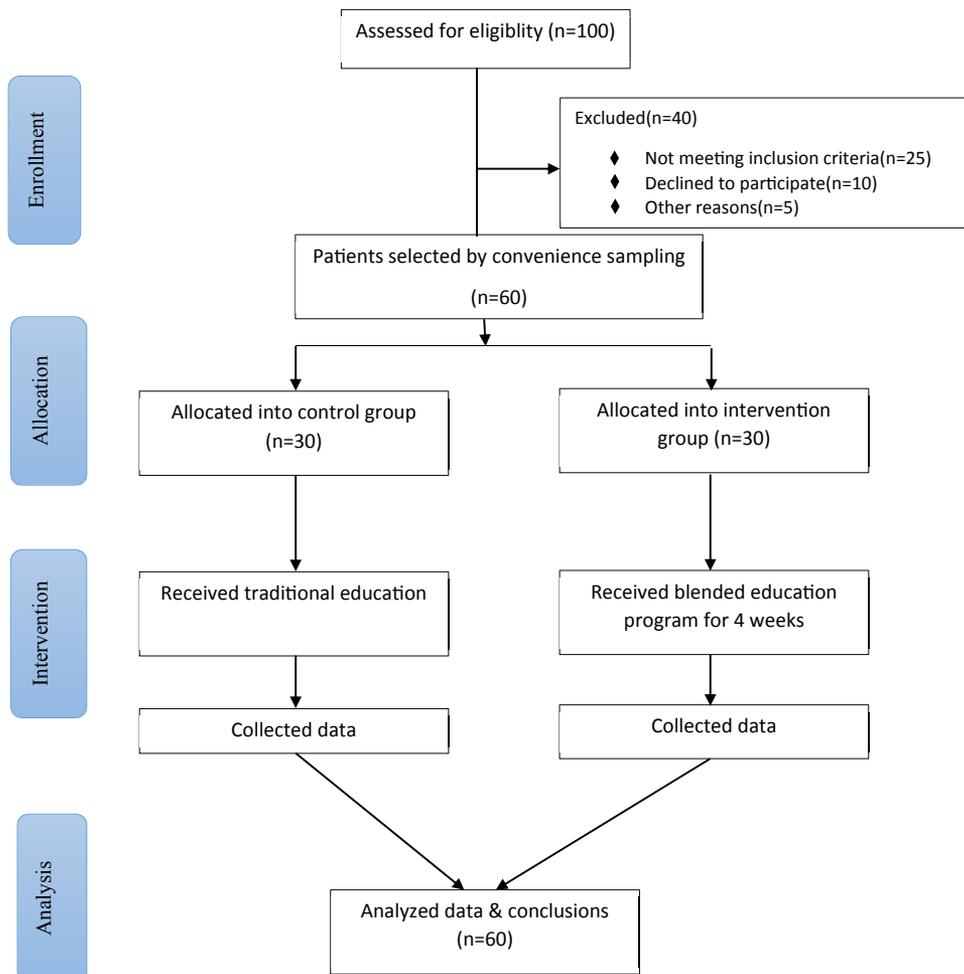

Figure 1. The flow diagram of the study based on Consort statement 2012.

Measures

To gather data, the study used a demographic information form and the questionnaires for evaluating adherence of the patients to treatment plans. The demography form recorded variables such as age, gender, marital status, education level, employment status, income, duration of disease, type of treatment, and the preferred resources for gaining information. The questionnaires included questions addressing treatment concordance, which explored 3 dimensions: dietary adherence (34 items), medication adherence (12 items), and physical activity plan (14 items).[18] The items were scored on a scale of 0–100. The final test result, as well as the status of each dimension, was represented according to a three-point scale: poor (below 50% of the total score); relatively good (50%–75% of the total score); and good (above 75% of the total score). The validity and reliability of the questionnaires were already confirmed by Sanaei et al who inspected face and content validity in a study conducted at the local university of medical sciences. They conducted a pilot study to examine the reliability of the questionnaires. Cronbach's alpha and intraclass correlation coefficient confirmed the reliability.[18]

Intervention

Before the study was operationalized, the necessary permits were obtained from the Institutional Review Boards of the medical center and university board of education. Next, clinical settings were identified for the investigation, and the potential participants were selected by using the convenience sampling method. The researchers then introduced themselves to every participant and explained the research purposes. The participants who decided to participate in the study signed the consent form and completed the questionnaires. We used randomization, allocation concealment, and blinding to reduce convenience sampling bias in this study. RandList software was used to randomly allocate the participants into intervention and control groups. The control group received traditional face-to-face education. The intervention group was exposed to educational intervention in the form of blended education, which included traditional face-to-face education along with online education (e-learning) via e-mail. The purpose of this style of training was to improve HTN self-care behaviors and to increase treatment concordance. In this study, HTN self-care behaviors are the ability of the participants in carrying out medical recommendations regarding adherence to treatment in three dimensions of diet, medications, and physical activities.

We used e-mail to educate the patients because it is the most popular e-learning method in our country. The patients in the intervention group received educational and instructive messages through e-mails during the intervention period. We installed and used the mailtrack service in our gmail account to ensure our e-mails were opened and read by patients. By this way, we reminded the patients in the intervention group about the instructed contents everyday. We also emphasized the goals of e-learning and encouraged them to follow diet, medication, and so on. Thus, we tried to influence the patient's self-care behaviors by highlighting the positive impact of treatment concordance and repeating the educational contents. Furthermore, the patients' questions would be answered after training sessions via phone calls or text message. Each session took 60 minutes and was regularly held on a weekly basis for four weeks. Two weeks after the training process was over, the participants completed the treatment adherence questionnaires one more time. After collecting the data, the participants in the control group also received the e-learning education package and their questions were answered.

Analytic strategy

Collected data were analyzed by the researcher who was blind to the data in IBM SPSS software (version 16.0; SPSS Inc., Chicago, IL) using descriptive (mean, standard deviation) and inferential (independent *t*-test and paired *t*-test, the chi-square test, and Fisher exact test) statistics. The chi-square test was used to investigate relationships between demographic variables and compare qualitative characteristics and *t*-test was applied to investigate quantitative data. All *P*-values were two tailed and significance level was considered less than 0.05.

RESULTS

The statistical analysis did not reveal any significant difference in terms of the demographic variables in the 2 groups.

The results showed that the total scores of treatment concordance were "relatively good" in most of the samples at the beginning of the study in the control and intervention groups. The results of the Fisher's exact test did not point to any significant difference between the 2 groups. However, after the intervention, the total score of treatment concordance remained "relatively good" for the majority of the samples in the control group, whereas the same measure in the intervention group revealed that treatment concordance showed a "good" status for about half of the participants. The results of the chi-square test showed that this difference was significant. As far as treatment concordance before and after the intervention is concerned, the z test results of the control group did not reveal any significant difference, although treatment concordance in the intervention group did show a statistically significant increase (Table 1).

The observations highlighted that the status of dietary adherence at the beginning of the study was "relatively good" for most of the participants in the control and intervention groups. According to the Fisher's exact test results, the 2 groups were not significantly different from each other in this respect. After the intervention, however, the status of dietary adherence for most control groups was either "poor" or "relatively good," whereas in the intervention group, this variable showed a "relatively good" or "good" status for all participants. The results of Fisher's exact test showed that this difference was significant between two groups. Furthermore, the z test did not reveal any significant difference in the status of dietary adherence before and after the intervention in the control group, although the degrees of dietary adherence underwent a significant increase in the intervention group (Table 2).

The finding also showed that the status of medication adherence at the beginning of the study was "relatively good" for most of the patients in the control and intervention groups. According to the Fisher's exact test results, two groups were not significantly different in this respect. Nonetheless, after the intervention, the status of medication adherence for most participants in the control group was either "poor" or "relatively good," whereas the status of the same variable was "relatively good" or "good" for most of the participants in the intervention group. The results of the Fisher's exact test revealed that the difference between two groups was statistically significant in this regard.

TABLE 1

TOTAL SCORE OF TREATMENT CONCORDANCE IN CONTROL AND INTERVENTION GROUPS BEFORE AND AFTER INTERVENTION

| | Control group | | | | | Intervention group | | | | |
| | Before | | After | | Before-after test | Before | | After | | Before-after test |
Treatment concordance	*N*	*%*	*N*	*%*		*N*	*%*	*N*	*%*	
Poor	10	33.3	12	40	Z = −0.82	4	13.3	0	0	Z = −3.31
Relatively good	20	66.7	18	60	P = .41	25	83.5	16	53.3	P = .001
Good	0	0	0	0		1	3.3	14	46.7	
Total	30	100	30	100		30	100	30	100	
Before test—between groups	Fisher: 3.98, *P* = .12									
After test—between groups	X^2 = 26.12, *P* < .001									

Moreover, the z test did not reveal any significant difference in the status of medication adherence before and after the intervention in the control group, although the medication adherence score underwent a significant increase in the intervention group (Table 3).

The results highlighted that the status of physical activity at the beginning of the study was "poor" for most of the patients in both groups. According to the Fisher's exact test, the 2 groups were not statistically different from each other. After the intervention, however, the status of physical activity for most of the participants remained "poor" in the control group, whereas the status of the same variable was "relatively good" in the intervention group which pointed to some increased activity in the patients of this group. Chi-square test results also showed that the difference between the groups was statistically significant in this regard. Furthermore, the z test did not reveal any significant difference in the status of physical activity before and after the intervention in the control group, whereas the degrees of physical activity underwent a significant increase in the intervention group (Table 4).

DISCUSSION

Based on the findings, the scores of treatment concordance (including the three dimensions of medication adherence, dietary adherence, and physical activity) revealed a significant difference in the control and intervention groups, after the intervention. More specifically, medication adherence scores of the intervention group underwent a significant increase compared to that of the control group. This considerable increase pointed to the positive impact of the blended education method used.

The findings of this study are in line with the results of Bernocchi et al and of Beune et al, who found the positive effect of

TABLE 2

DIETARY ADHERENCE IN CONTROL AND INTERVENTION GROUPS BEFORE AND AFTER INTERVENTION

| | Control group | | | | | Intervention group | | | | |
| | Before | | After | | Before-after test | Before | | After | | Before-after test |
Dietary adherence	*N*	*%*	*N*	*%*		*N*	*%*	*N*	*%*	
Poor	2	6.7	7	23.3	Z = −1	2	6.7	0	0	Z = −2.48
Relatively good	27	90	20	66.7	P = .32	26	86.7	12	40	P = .01
Good	1	3.3	3	10		2	6.7	18	60	
Total	30	100	30	100		30	100	30	100	
Before test—between groups	Fisher = 0.55, *P* = .99									
After test—between groups	Fisher = 20.51, *P* < .001									

TABLE 3

MEDICATION ADHERENCE IN CONTROL AND INTERVENTION GROUPS BEFORE AND AFTER INTERVENTION

| | Control group | | | | | Intervention group | | | | |
| | Before | | After | | Before-after test | Before | | After | | Before-after test |
Medication adherence	*N*	*%*	*N*	*%*		*N*	*%*	*N*	*%*	
Poor	2	6.7	6	20	Z = −0.63	5	16.7	1	3.3	Z = −3.45
Relatively good	23	76.7	17	56.7	*P* = .53	16	53.3	6	20	*P* = .001
Good	5	16.7	7	23.3		9	30	23	76.7	
Total	30	100	30	100		30	100	30	100	
Before test—between groups	Fisher = 3.57, *P* = .21									
After test—between groups	Fisher = 17.34, *P* < .001									

training on treatment concordance in patients with HTN.[19,20] Furthermore, the findings of this study confirm the observations of Tol et al, who investigated the impact of the blended education program on anxiety among patients experiencing orthopedic surgery. They found that the degree of anxiety in the treatment group was reduced after the blended education intervention; this decline in the rate of anxiety showed a significant difference between the 2 groups.[21] In the study by Saki et al, traditional face-to-face and electronic education had a similar effect on the anxiety level of patients who suffered a myocardial infarction and both methods were more effective compared to routine care.[22] Another previous study by Farahandi et al[23] showed that the blended educational intervention program improved HTN control in patients with diabetes type 2. The findings of these studies are consistent with our study. The positive impact

of blended education on nursing and medical students' learning performance was confirmed in previous studies.[24,25]

LIMITATIONS

There were some limitations in this study. The intervening period is relatively short and it was conducted in the specific region in Iran. The convenience sampling is another disadvantage of this study. Therefore, we should be cautious in interpreting and generalizing the results. We suggest further studies to be conducted in the longer intervention period in different educational systems so that the effect of blended education can be evaluated widely and used effectively in patients with chronic diseases. This study investigated the impact of blended education only on the hypertensive patients. Thus, evaluating blended education

TABLE 4

PHYSICAL ACTIVITY IN CONTROL AND INTERVENTION GROUPS BEFORE AND AFTER INTERVENTION

| | Control group | | | | | Intervention group | | | | |
| | Before | | After | | Before-after test | Before | | After | | Before-after test |
Physical activity	*N*	*%*	*N*	*%*		*N*	*%*	*N*	*%*	
Poor	27	90	26	86.7	Z = −1	27	90	18	60	Z = −2.48
Relatively good	3	10	4	13.3	*P* = .3	3	10	12	40	*P* = .007
Good	0	0	0	0		0	0	0	0	
Total	30	100	100	100		30	100	30	100	
Before test—between groups	Fisher = 0.50, *P* = .99									
After test—between groups	X^2 = 5.45, *P* = .04									

and comparing with traditional education was recommended for other chronic patients.

CONCLUSION AND IMPLICATION FOR PRACTICE

Given the findings of the present research, blended education could increase the effectiveness and desirability of the learning experience, while encouraging patients to proceed with their treatment regimen and adhere to recommendations. Thus, it could be concluded that blended education increases productivity, effectiveness, flexibility, accessibility, and cost-effectiveness of treatment.[26] Finally, using blended education program is highly recommended and needed to be used to enhance self-care behaviors and treatment concordance in patients with chronic diseases such as HTN and diabetes. Thus, it reduces patients' additional medical costs and enhances their health-related quality of life. The results of the present study can be used in clinical settings, nursing management, and future research projects to enhance treatment concordance in patients with HTN.

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