Original Article

Effect of Training through Short Message Service on Compliance and Mean Blood Pressure of Hypertensive Patients

Abstract

Background: Hypertension has been one of the early mortality and morbidity in human societies. Training and consequently compliance increase will lead to improve treatment progress and disease control. The study aimed at the effect of training through short message service (SMS) on blood pressure mean and compliance scale in hypertensive patients. Hypertension control is essential to prevent early mortality. **Methods:** This study is a randomized controlled clinical, uni-center, single-blinded. The study was managed in a health-care center subordinated to Medical University of Isfahan, Iran, in 2017. Sampling was a convenient method therefore the researchers implemented it for 188 hypertensive patients who were allocated randomly into two groups: SMS group and control group. First, all patients filled the compliance questionnaire, and their blood pressure was measured. Afterward, the intervention group would be texting daily for 1 month containing a training text. During 1 and 2 months after intervention, all patients' blood pressure will be measured, and then the questionnaire had been filled 2 months after intervention, again. **Results:** Systolic blood pressure mean decreased from 136.23 ± 15.91 to 121.70 ± 14.43 and diastolic blood pressure mean decreased from 91.95 ± 8.24 to 86.64 ± 7.86 in the intervention group according to analysis of variance through repeated measurement and is significantly different in comparison with control group ($P < 0.001$). Compliance scale increased from 72.95 ± 7.65 to 85.40 ± 5.62 based on dependent *t*-test which was significantly different with the control group ($P < 0.001$). **Conclusions:** SMS training would be an effective method to control hypertension.

Keywords: *Compliance, hypertension, short message service, training*

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Introduction

Hypertension is one of the most important reasons of early mortality and morbidity due to cardiovascular disease that can be prevented.[1,2] It alone is the essential factor of morbidity worldwide. To control and treat hypertension, it is necessary to change lifestyle as well as using drug treatment.[1,3] A healthy lifestyle to reduce blood pressure includes sufficient physical activity, stress management, losing weight, and a healthy diet such as taking less salt and fat, using less tobacco, decreasing alcohol drinking, and having more fruit, vegetables, and grains.[4,5]

Most of the hypertensive patients have been controlled insufficiently across the world.[2,6] Inadequate training and lack of following patients, which are the responsibilities of health cares, led to the absence of patients' compliance and adherence routinely in longterm. They are two of major factors in uncontrolled hypertension. Considering the aforementioned factors and low information of people on the issue, training in hypertensive patients is one of the most effective approach to control the disease.[3,7]

The aim of implementing training programs is to promote awareness, establish a positive trend, and to enable continuous appropriate function in healthy behavior.[8] Compliance to proper management of chronic disease is fundamental to accomplishing enhanced health results, quality of life, and profitable health care. Chronic diseases are gradually spreading worldwide, and the effect of noncompliance is growing more and more.

Cell phones are used increasingly in health care and public health practice (mHealth) aimed at patients' communication, monitoring, and training to facilitate

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compliance managing chronic diseases.[9] One of the practically effective method for changing behavior is texting short message service (SMS) through cell phones due to availability across the world, being cheap, and quick access. The study offers a summary on intervention of behavior change for managing and preventing disease with the help of SMS.[10] The current study researchers found some similar studies such as increase in the compliance of patients undergoing hemodialysis,[11] improvement of the quality of ambulatory care in patients with arterial hypertension,[12] promotion of self-control in asthmatic patients,[13] and compliance increase in patients with bioprosthetics heart valves.[14] The study aimed at the effect of training through SMS on blood pressure mean and compliance scale in hypertensive patients due to the importance of hypertension control and prevention from mortality and morbidity because of hypertension.

Methods

This study is a randomized controlled clinical trial, uni-center, single-blind study implemented on hypertensive patients in a health-care center subordinated to Medical University of Isfahan, Iran, in 2017. Inclusion criteria were as follows: hypertensive patients (with systolic blood pressure mean is equal to or higher than 140 mm Hg or diastolic blood pressure mean is equal to or higher than 90 mm Hg), 30-year-old or above, being literate, able to work with a cell phone, able to read the Persian SMS, signed informed consent form, and being officially satisfied to include in the study. The sampling method was a convenient one.

First, 200 people were selected in a convenient method among the hypertensive patient's list, identified, and registered from hypertensive national program screening. Afterward, these patients were allocated randomly into two groups using table of random numbers: SMS group and control group. Then, 12 patients were excluded from the study because of their dissatisfaction; therefore, the sample size became 188 patients with intervention group (97 people) and control group (91 people) (response rate = 94%). Before intervention, the patients' demographics were recorded such as age, gender, education, occupation, and systolic and diastolic blood pressures, and then, the self-made 18-question questionnaire was applied to measure compliance and its reliability was calculated 0.77 through Cronbach's alpha. Its validity was investigated, and the content and face validities were suitable. To evaluate the content validity, the questionnaire had been read by five experts involving an internist, cardiologist, social community physician, and two health education professionals. Researchers evaluated face validity, and the questionnaire had been filled by 20 hypertensive patients. The questionnaire questions have been scored based on five-choice scales including always, mostly, sometimes, hardly, and never. The questions with the positive meaning load take a score of 5 for the answer "always" and 1 for "never;" in addition, the questions with negative meaning load take the reverse scores. The maximum score of questionnaire was 90 and the minimum one was 18.

During the study, both intervention and control groups were trained equally and monthly by caregivers one by one or in the group according to hypertensive patients' care protocol in health center. Besides all the foregoing methods, intervention group received a daily Persian SMS that included a training text on hypertension definitions, signs and symptoms, complications, control methods, suitable medicine taking, side effects and its benefits, and training a healthy lifestyle (including salt-taking decrease; doing suitable physical activities; having fruit, vegetables, fiber and grain; fat-taking decrease; suitable weight; smoking rehabilitation; anxiety decrease; right choice of oil; and losing weight). The researchers implemented the WHO[15] and up-to-date[16] papers to form the content of theses short messages. They have been sending through an online SMS panel regularly at 10 a.m.

ALPK2 CE0123 mercury sphygmomanometer was applied to measure the blood pressure. We put the lower board of the cuff approximately 2.5 cm above the antecubital crease. Palpating the radial artery with fingers, we inflated the cuff quickly until the radial pulse could not been felt. Then, we read the same pressure number illustrated on the manometer and added another 30 mm Hg that illustrates the maximum amount of cuff inflation. After deflating the cuff quickly and completely, we inflated the cuff for 15–30 s to target level and then deflated the cuff with the speed of approximately 2–3 mm Hg/s. Now, the systolic blood pressure was on the level, we could hear the sounds of at least two sequential beats; and the diastolic blood pressure was when we cannot hear the sounds. After two or more minutes, the measurement had been repeated and the readings had been averaged.[17] Before intervention, 1 and 2 months after intervention, all patients' blood pressures were measured. The compliance questionnaires were filled for all patients before intervention and 2 months after intervention in the end of research. Regularly, the derived data were recorded from blood pressure and patients' compliance scale in both control and intervention groups. The caregivers – measuring patients' blood pressure, explaining and filling the questionnaire, and analyzing the data – were unaware of the groups.

The derived data were analyzed on 0.05 level by SPSS 16 (the Statistical Package for Social Sciences) for Windows developed by SPSS Inc., Chicago IL, US. To describe the data, researchers applied descriptive indices including frequency, cumulative frequency, mean, and standard deviation. To compare and evaluate the age, gender, and occupation distribution in both control and intervention groups, the researchers used independent *t*-test; to evaluate patients' education they used Chi-square, and to evaluate

compliance scale they applied dependent *t*-test. The current researchers applied to repeated measure ANOVA to evaluate people's blood pressure before intervention, 1 and 2 months after it. Finally, ANCOVA was used to adjust the effect of confounding factors in comparing blood pressure values between both intervention and control groups.

Results

In the study, 188 hypertensive patients participated randomly in two intervention (97 people) and control groups (91 people), while 60.8% of them were females and 39.2% were males. The patients' age range was 36–93 years old while the mean age of intervention group was 59.67 ± 0.95 and control group was 58.68 ± 0.94. The rest of demographic features have been shown in Table 1.

Moreover, there was no significant difference in participants' age (P = 0.46), gender (P = 0.13), and occupation (P = 0.08), but in the view of education (P = 0.009), it was significantly different in both groups. Therefore, the significant demographic factor was considered as effective factor covariance in analysis.

The comparative mean results have been presented on systolic and diastolic blood pressures before intervention and 1 and 2 months after intervention with control group [Charts 1, 2 and Table 2].

The comparative mean results of compliance score before intervention and 2 months after intervention with control group are given in Table 2.

Discussion

The main purpose of the study was impact of training through SMS on blood pressure mean and the compliance scale in hypertensive patients. The results showed that implementing training SMS resulted in decreasing systolic and diastolic blood pressures and increasing compliance scale in hypertensive patients. The results depicted that using of training SMS resulted in decreasing systolic and diastolic blood pressure and increasing compliance in hypertensive patients. There were so many studies in this regard concurrent with the current study result.

Bobrow *et al.* had managed a survey entitled the impact of two SMS training methods interactively and noninteractively for 12 months on hypertensive patients. In noninteractive group, the researcher had a one-way communication with patients while in interactive group; patients were communicated reciprocally through asking their questions and interacting researcher without

Table 1: A comparison of frequency distribution of hypertensive patients' demographic variation in control and intervention groups

Evaluated Factor		Frequency and percentage of intervention group	Frequency and percentage of control group	*P*
Gender	Female	57 (30.31%)	63 (33.51%)	0.13
	Male	40 (21.27%)	28 (14.89%)	
Education	Primary school	77 (40.95%)	86 (45.74%)	0.009*
	Junior high school	13 (6.91%)	1 (0.53%)	
	High school and above	7 (3.72%)	4 (2.12%)	
Occupation	Employed	37 (19.68%)	20 (10.63%)	0.08
	Housewife	57 (30.31%)	66 (35.10%)	
	Retired	3 (1.59%)	5 (2.65%)	

*Values on 0.05 level are significant

Table 2. Systolic and diastolic blood pressure mean before and one and two months after intervention, and compliance scale before and after intervention in both study groups

Variants		Intervention group (Mean±SD) *n*=97	Control group (Mean±SD) *n*=91	*P**
Systolic blood pressure	Before intervention	136.23±15.91	134.23±14.37	0.36
	a month after intervention	130.9±14.99	133.46±14.07	0.24
	Two months after intervention	121.70±14.43	133.73±12.77	0.000
	*P***		0.040	
Diastolic blood pressure	Before intervention	91.95±8.24	92.08±7.11	0.90
	a month after intervention	90.25±8.04	91.59±7.18	0.23
	Two months after intervention	91.59±7.18	91.64±6.87	0.000
	*P***		0.044	
Compliance scale	Before intervention	72.95±7.65	73.80±9.03	0.49
	Two months after intervention	85.40±5.62	73.32±5.83	0.000
	*P****	0.000	0.63	

*ANCOVA, **Repeated measure ANOVA, ***paired *t*-test

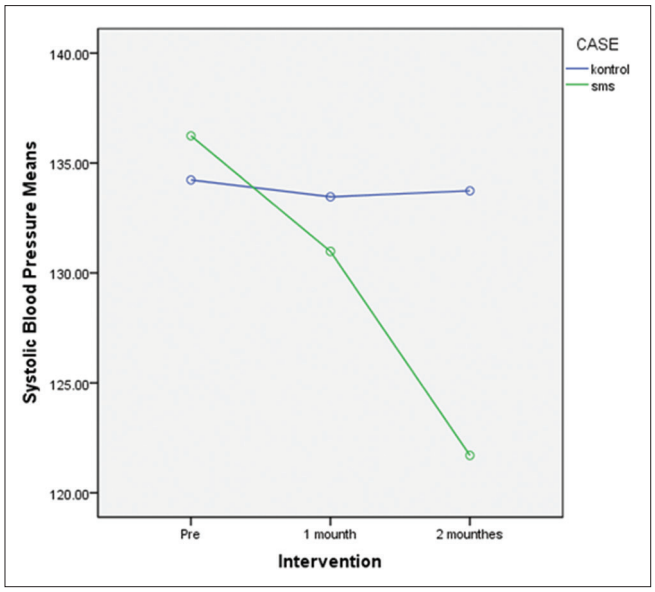

Chart 1: Basic Systolic blood pressures mean and during the follow-up period in both groups

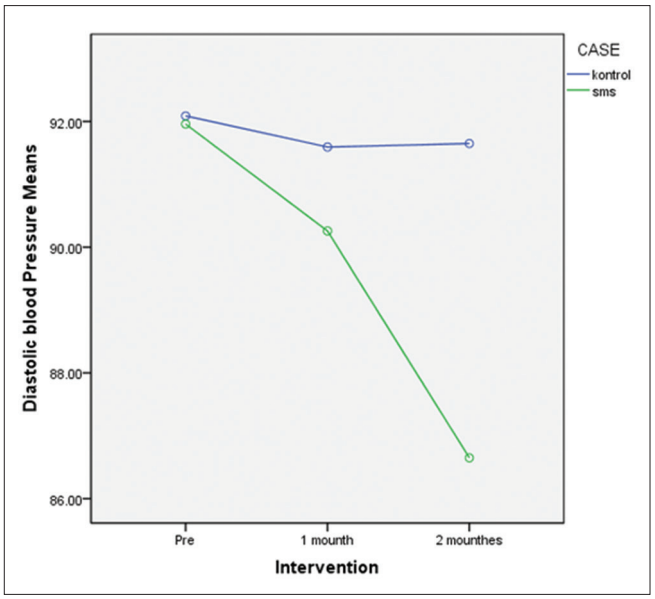

Chart 2: Basic Diastolic blood pressures mean and during the follow-up period in both groups

time limitations and 24 h. He concluded that systolic blood pressure in people who had received SMS in an noninteractive method decreased significantly in comparison with the control group.[18]

Carrasco *et al.* concluded from a study that receiving SMS by hypertensive patients would lead to decreasing blood pressure without alternative control program.[19] Maslakpak and Safaie had studied on hypertensive patients as follow: they applied six training SMS weekly during 3 months in a group and in another one, they used reminder cards during 3 months, afterwards they were compared with the control group. He concluded that there was a significant difference among the blood pressure of the three groups', but there was no significant difference between the group blood pressure who received SMS and the group who used reminding cards.[20]

Sedri *et al.* managed to conduct a survey on the impact of two training SMS methods for 3 months (interactive and noninteractive) on anticoagulant compliance in patients with prosthetic heart valves. After intervention, the scale mean of interactive group illustrated the most compliance under SMS effect in comparison with the other groups.[14] Peimani *et al.* studied the impact of SMS on self-care and some of diabetic patients' parameters. After 12 intervention sessions, the effectiveness scale mean increased significantly in the intervention group, but there was no significant difference in the HbA1c value.[21]

In Benhamou *et al.*[22] and Rami *et al.*,[23] there was no significant difference in HbA1c value in control and intervention groups after receiving training SMS. Different factors could have effects on the result of study, leading to ineffectiveness of training SMS on patients including patients' age, disease severity, other disease, sample size, study design, study strength, kind of intervention, and study duration.

According to the aforementioned study results and the current one, training through SMS can cause an increase in compliance scale and improve systolic and diastolic blood pressure mean in hypertensive patients.

The present training and follow-up method are more available, simpler, and less expensive than other methods; moreover, you can cover many patients in various geographical areas. There were some delimitations during the study including ad SMS blocking in spite of participants' satisfaction and signed form, in this case, the researchers sent SMS manually and through cell phone.

It is recommended to manage a study through interactive training SMS, social networking or email services to evaluate the impact on blood pressure mean and compliance scale in hypertensive patients. SMS is an effective training method to control blood pressure, and it can be used to train the patients in health-care centers.

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Conflicts of interest

There are no conflicts of interest.

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