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# Effectiveness of a self-management education program on hypertension control and contributing factors in older adults: An interventional trial

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**Effectiveness of a self-management education program on hypertension control and contributing factors in older adults: an interventional trial**

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**Abstract**

**Background:** One of the common disorders that can negatively affect the health status of old adults is hypertension. Self-management education is an effective method to control various disorders. This study was designed to assess the effectiveness of self-management education program on blood pressure, management of anthropometric measures, and some metabolic factors among elderly in Tabriz, Iran.

**Material and methods:** 227 eligible hypertensive elderly patients from three primary health care centers of Tabriz were participated in 12 sessions of self-management education intervention conducted in 6 months from April to October 2019. Systolic (SBP) and diastolic blood pressure (DBP), serum levels of fasting blood sugar (FBS), total cholesterol (TC), and triglyceride, as well as anthropometric indices were assessed both before and at the end of the intervention.

**Results:** The participated elderly had the mean ± SD age of 64.52 ± 5.76 years. After 6-month presence of subjects in the educational sessions, the SBP ($p = 0.038$), body weight ($p = 0.012$), BMI ($p = 0.021$), FBS (0.011), and TC (< 0.0001) were significantly decreased compared to baseline.

**Conclusion:** Self-management educations can improve compliance of elderly to controlling factors of blood pressure such as diet and exercise. Consequently, following a healthy lifestyle can be effective in reducing a number of the hypertension risk factors.

**Key words:** self-management; education; hypertension; metabolic; elderly; Iran

## Introduction

Elderly has been defined as a chronological age of 65 years old or older in most developed countries and the age of 60 years or above in many developing nations [1]. Elderly population can dramatically affect the community, as has many important social, economic, and health consequences. Aging presents challenges and concerns in the fields of public health, nutrition, nursing, and economic development [2]. Worldwide, the elderly population is living longer than the past years. The United Nations reported that worldwide the elderly population grew at an average rate of 2.5% from 1990-2010, and it is expected that 2 billion elderly will live in the world by 2050 [3]. Elderly forces the health care systems of every nations to planning more effective measures to provide suitable care and education for themselves to handle their health related complications and consequently have healthier lives [4].

One of the common disorders that can negatively affect the health status of old adults is hypertension, which its prevalence increases by aging [5, 6]. Hypertension is a condition in which the blood vessels have persistently raised pressure to higher and consequently resulted to harder pumping the heart [7]. The World Health Organization (WHO) and International Society

of Hypertension (ISH) guidelines are consider optimal systolic and diastolic blood pressure (BP) as less than 120 and 80 mm Hg, respectively [8]. It is a major preventable risk factor for heart disease and stroke, which are leading prevalent causes of death among this population [9, 10]. It was reported that the control of hypertension is inadequate in both developed and developing nations, which it deserves a special attention to prevention and treatment strategies especially in developing countries [11].

Abnormal levels of metabolic factors including dyslipidemia and subtle increase in blood glucose have been found in about 30–40% of hypertensive patients. The modified metabolic factors increases the risk of hypertension-induced cardiovascular disease [12].

There are multiple treatment options for hypertension, which adopting a healthy lifestyle is complementary to every therapies [13]. Self-management education is an effective method to control various disorders and consists of various components including providing the way of interaction among patients and health care providers, recommendations to adhering to treatment, improving psychological health, and monitoring health status [14]. Adopting a healthy diet along with more physical activity are two main requirements of self-management in hypertension, which the patients usually found the adherence to these recommendations most difficult [15].

Today's healthcare systems in most of the nations are more advanced, more prepared, and more capable than ever before. In Iran same as the many countries, the primary care of hypertension is delivered through public health care centers at no cost. The education sessions with the content of hypertension control also delivered to the Iranian elderly [16]. This study was delivered a new method of elderly health care education in primary health care centers of Tabriz, Iran. To the best of our knowledge, there is not any study that evaluated the effects of self-management education program on BP and metabolic control, as well as anthropometric status among the Iranian hypertensive elderly in Tabriz city, Iran. Therefore, the current study was designed to assess the effectiveness of a self-management education program on blood pressure control, management anthropometric measures and some metabolic factors among elderly at primary health care centers in Tabriz, Iran.

## Material and methods

### *Participants*

The study participants were recruited by convenience sampling method from the elderly people who attended to three public health centers affiliated to the Tabriz University of Medical Sciences, Tabriz, Iran. The inclusion criteria were being elderly (age > 60 years), hypertension diagnosed at least 12 months before the data extraction date (SBP ≥ 140 and DBP ≥ 80 mm Hg) [17], and taking anti-hypertensive drugs. Exclusion criteria were a diagnosis of sever disorders including cancer, dementia or Parkinson disease, resident in nursing home or receiving home health care, hospitalization, or participant in another blood pressure control study. People who have history of smoking and alcohol consumption were also excluded from the study. All the participants signed an informed consent. The study was approved by the ethical committee of Tabriz University of Medical Sciences, Tabriz, Iran (reference number: IR.TBZMED.REC.1397.1018). Recruitment and follow-up took place from February through March 2019.

***Study design and intervention***

All the eligible patients participated in 6-months self-management education sessions. As seen in Table 1, multiple factors were delivered to the participants. The general components of the intervention were as follows: hypertension signs and symptoms, disease control, social support, patients' relationships with their health care providers, mental improvement, and home BP monitor. The complementary components of the sessions were healthy diet as the trainers focused on improving adherence to the Dietary Approaches to Stop Hypertension (DASH) dietary pattern [18], reduced sodium intake and increased potassium intake [19], weight reduction [20], and greater physical activity with medium intensity [21, 22].

The intervention was delivered by a nutritionist during face to face group sessions. All information was presented in an easily understood format in Turkish language which is the common language in Tabriz. The sessions were held twice per month duration 6 months that finally 12 educational sessions were done successfully. The average duration of each session was 45 minutes with a number of 15 participants in each class. The classes were held separately in 3 public health care centers from April to October 2019.

***Demographic and anthropometric measurements***

Medical history, socio-demographic variables such as age, sex, marriage and occupation status, and medications were asked by the nutritionist at baseline of the study. Body weight of every participant was measured before and after the intervention using a balance-beam scale, with no shoes. Height was measured using a secured stadiometer. Body mass index (BMI) was calculated by dividing weight (in kilograms [kg]) to height (in meters squared [$m^2$]).

### *Biochemical and blood pressure measurements*

A trained and certified nurse collected peripheral venous blood samples after 12–14 hours fasting from each subject and centrifuged 10 min at 300 ×g to separate the serums. Serum fasting blood sugar (FBS), total cholesterol (TC), and triglyceride (TG) were measured before and after the intervention.

Blood pressure was also measured twice (before and after the intervention) in the resting state using an Omron digital blood pressure monitor (Omron Healthcare, Inc, Lake Forest, Illinois).

### *Statistical analysis*

Normally distributed variables were represented by mean± standard deviation (SD) and categorical factors were shown as frequency (percentages). Chi-square was used to analysis group differences for categorical factors. The differences between baseline and after 6 months were assessed using paired *t* test. Data were analyzed using the SPSS (version 18.0; SPSS Inc., Chicago, IL, USA). Statistical significance was made at 5% level of significance.

## Results

According to the Figure 1, 1022 hypertensive elderly were identified using the individual health files archived in three studied health care centers. The researcher made telephone calls to all the identified old adults, and finally 249 subjects participated in self-management educational sessions. 22 individuals were excluded due to 21 subjects lost the follow-up, and another patient died before study completeness, thus totally 227 participants end the study process.

Baseline characteristics of the patients were shown in Table 2. Mean ± SD age of the patients was 64.52 ± 5.76 and 71% of them were female. Most of the participants were married (95.2%) and housekeeper (70.8%). All the patients were taken anti-hypertensive tablets (Methoral or Losartan).

Changes of blood pressure, anthropometric measures, and metabolic factors during treatment have been shown in Table 3. The participants of the study experienced significant reductions of SBP (–2.64 ± 19.11) and DBP (–0.77 ± 12.26) levels through self-management education program, which the reduction of SBP was significant ($p = 0.038$). The mean ± SD amount of weight loss at the end of the intervention was –0.89 ± 5.33 kg compared to baseline ($p < 0.012$). FBS concentrations also decreased by –3.11 ± 18.26 mg/dL at the end of the study ($p = 0.011$). Six months educational intervention was also led to desirable effects on BMI ($p = 0.021$), and TC (< 0.0001). The serum levels of TG were not significantly changed after the intervention.

Table 4 is shown the differences of study variables between patients with controlled and uncontrolled BP. The BP of 10 patients improved after the intervention. At the baseline, SBP and DBP were significantly differed between two groups. At the end of the study, TG levels of patients with uncontrolled BP increased compared to the baseline, and they had a significant difference with controlled BP group.

Of the all participants, at the baseline, 121 elderly (53.30%) had abnormal FBS level (>100 mg/dl) that was reduced to 97 subjects (42.73%) after the education. This is suggested that effectiveness of the self-management education program on the management of FBS level was 10.57%. The efficiency of the education program on management of serum TC and TG levels, and BMI of the subjects were 3.5%, 0.4%, and 1.1%, respectively. 10 participants with uncontrolled blood pressure levels also experienced normal blood pressure under the intervention, as they (4.4%) were successful on management of their blood pressure.

**Discussion**

This study was aimed to identify the effectiveness of a self-management education program on blood pressure control, anthropometric measures, and some metabolic factors in the hypertensive elderly patients in primary health care setting. The major findings of the study are that the six-month self-management education intervention (1) significantly reduced the body weight and

BMI, (2) significantly reduced serum FBS and TC levels, and (3) significantly reduced SBP among elderly subjects.

The self-management education program can significantly reduce anthropometric factors including body weight and BMI among hypertensive elderly. In line with our study, Turkish adults had lower BMI and body weight after six-month education, monitoring and counseling sessions [23]. A meta-analysis study also demonstrated that the hypertensive patients had clearly lower body weight after educational interventions [24]. Further, an Internet educational program among diabetes adults produced a weight loss of 4.4 kg after one year intervention, contributed to behavioral counseling and self-management training [25]. Furthermore, higher levels of education were associated with lower BMI in another research [26]. Weight control is likely to have a large impact on the burden of hypertension and consequently, cardiovascular diseases [27]. A self-management education is an effective way to make weight loss as an important contribution to treatment of the hypertension.

The self-management education program also had positive effects on serum levels of TC and FBS reduction. It was reported that the serum TC of healthy people should be less than 200 mg/dl to have lower risk of coronary artery disease (CAD) [28]. Although, the patients of current study did not reach the optimal blood levels of TC but their serum levels decreased significantly, which is suggested that their continuous adherence to educational components could help them to improve control on their lipid profile. A study in Italy also had shown lower LDL and TC levels after 3-months educations compared to baseline [29]. A 4-month educational program on diabetic adults also had a good effect on disease outcomes especially for lipid profile [30]. The efficiency of the education on FBS and Tchol were 10.57% and 3.50%, respectively.

In current study, the intervention program had significantly reduced SBP, but not DBP of the participants. In agreement with current study, the educational sessions of hypertensive patients significantly decreased SBP to below hypertension limits (140 mm Hg) in other researches [31–33]. Further, most of the randomized controlled studies reported significantly reduction of SBP and DBP in patients who had received self-management education programs [34–37], which a meta-analysis study was also suggested that [13]. Against the mentioned findings, other study by Lee, has shown that self-care educations was not successful on BP control among community-dwelling elderly subjects [38]. This is consistent with a previous study that was done in health

care center [39]. These studies had similar design (quasi-experimental) with current study. A systematic-review study has also reported that the non-pharmacological treatments among hypertensive patients had not a net large reduction in BP [40]. Considering the results of current study and recent researches apart from the duration of an educational program, the content, tools, and components of the intervention have main effects on providing knowledge and skills and influencing on behavior to control the disease symptoms.

Although, the educational intervention can effectively reduce the serum levels of assessed metabolic factors, anthropometric measures, and SBP among elderly subjects but they were not yet reached controlled values. It is suggested that there is need for additional supplementary programs, including appropriate physical activity and diet programs. As well as, it is suggested that standard and ongoing assessments should be consider at primary health care centers to ensuring that elderly people are adhered to the educating components provided for them.

## Conclusion

It is concluded that the lifestyle modifications by self-management educations can improve compliance of hypertensive elderly to positive behaviors such as healthy diet and exercise. Consequently, following a healthy lifestyle can be effective in reducing a number of the risk factors for hypertension. It is suggested that a national policy and program should be designed for hypertensive patients using self-management education approach at primary health care setting.

### *Competing interests*

The authors reported no conflict of interest.


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**Figure 1.** Flowchart of the study

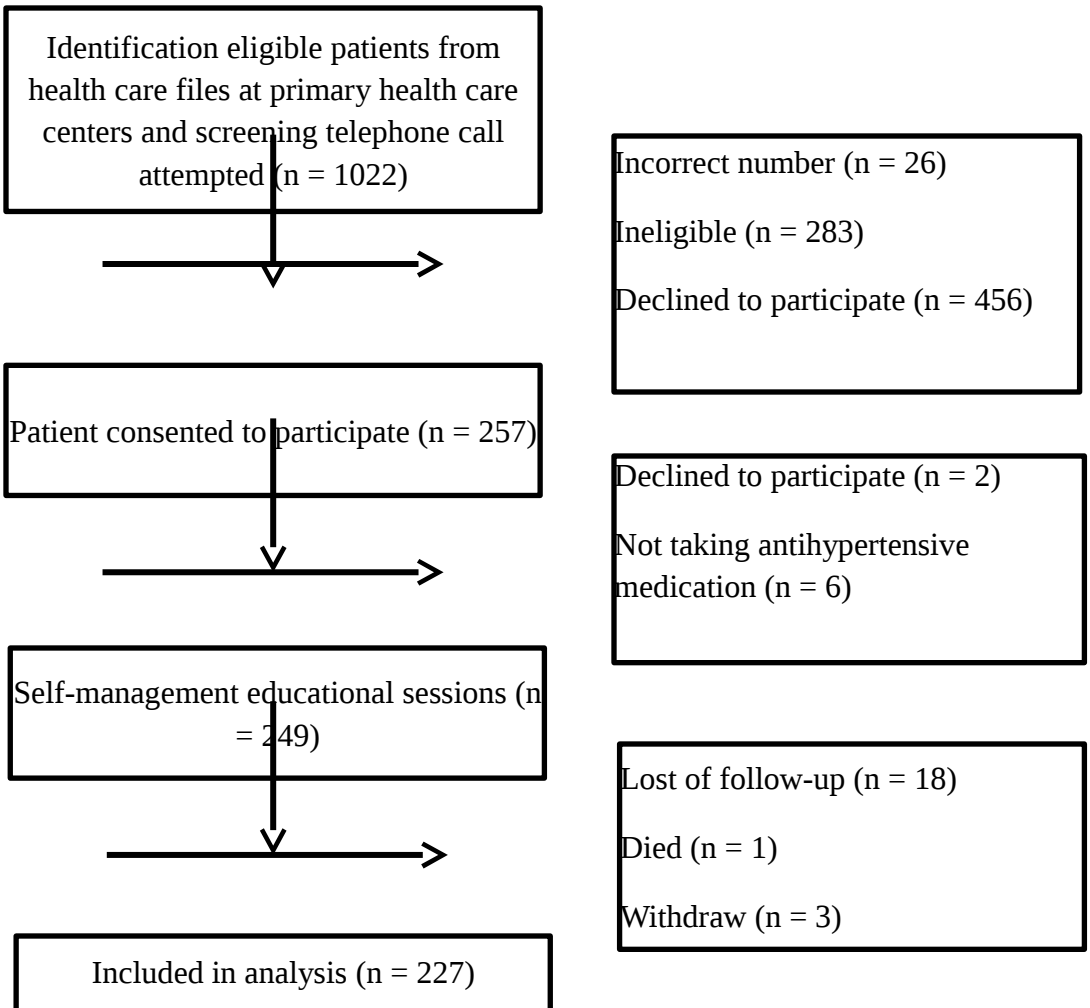

**Table 1.** Class format for self-management education intervention

| **Activity** | **Description** |
|---|---|
| **Session 1** | |
| Introducing the intervention and main goals, data collection | Collection of anthropometric indices and metabolic factors, gathered 24-h recalls, and create individualized activity goals |
| **Session 2** | |
| Raising motivation | Targeting attitude and self-efficacy of the participants, introducing the participants to each other and highlighting their common ground |
| **Session 3** | |
| Training general components | Hypertension signs and symptoms, common anti-hypertensive drugs and their mechanisms |
| **Session 4** | |
| Training general components | Patients' relationships with health care providers |
| **Session 5** | |
| Training general components | Role of the friends and family on disease control, social support, mental improvement |
| **Session 6** | |

| | |
|---|---|
| Training general components | Mental improvement and review on BP monitoring |
| **Session 7** | |
| Behavioral modification | Behavioral modification techniques, interactive activities to reinforce educational content |
| **Session 8** | |
| Nutrition education | Introducing DASH diet, food pyramid, and healthy portion sizes |
| **Session 9** | |
| Physical activity | Introducing the positive effects of participation in moderate aerobic activity sessions, emphasizing on weight reduction |
| **Session 10** | |
| Nutrition education | Training the healthful snack and new healthy foods |
| **Session 11** | |
| Listening | Participants share their struggles and victories in making behavior changes. |
| **Session 12** | |
| Goal setting | Participants set goals for activity, diet, and blood pressure monitoring for each session and discuss them with the group. |

| **Table 2. Baseline characteristics of patients (n = 227)** | |
|---|---|
| **Age [year]** | 64.52 ± 5.76 |
| **Height [cm]** | 157.83 ± 8.20 |

| | |
|---|---|
| **Sex, n (%)** | |
| **Female** | 161 (71) |
| **Male** | 66 (29) |
| **Marriage, n (%)** | |
| **Single** | 11(4.8) |
| **Married** | 216 (95.2) |
| **Occupation** | |
| **Housekeeper, n (%)** | 160 (70.8) |
| **Employee, n (%)** | 12 (5.3) |
| **Self-employment, n (%)** | 18 (8) |
| **Retired, n (%)** | 4 (1.8) |
| **Drugs, n (%)** | |
| **Methoral** | 79 (34.8) |
| **Losartan** | 148 (65.2) |

**Table 3. Changes in anthropometric measures, blood pressure and metabolic factors**

| **Variable** | **Before (n = 227)** | **After (n = 227)** | **Mean changes** | **p-value[1]** |
|---|---|---|---|---|
| Weight [kg] | 73.72 ± 12.49 | 72.82 ± 12.26 | –0.89 ± 5.33 | 0.012 |
| **BMI [kg/m$^2$]** | 29.58 ± 4.59 | 29.25 ± 4.72 | –0.33 ± 2.17 | 0.021 |
| SBP [mm Hg] | 129.07 ± 18.02 | 126.43 ± 19.27 | –2.64 ± 19.11 | 0.038 |
| DBP [mm Hg] | 79.42 ± 12.41 | 78.65 ± 10.41 | –0.77 ± 12.26 | 0.346 |
| FBS [mg/dL] | 109.71 ± 43.09 | 106.60 ± 46.90 | –3.11 ± 18.26 | 0.011 |
| TG [mg/dL] | 132.52 ± 77.51 | 130.94 ± 73.78 | –1.58 ± 28.81 | 0.409 |
| TC [mg/dL] | 245.84 ± 78.63 | 226.70 ± 63.61 | –19.13 ± 43.99 | < 0.0001 |

**SBP — systolic blood pressure; DBP — diastolic blood pressure; FBS — fasting blood sugar; TG — triglyceride; TC — total cholesterol; all data reported as mean ± SD; p-value[1] are for comparison within group by paired t-test**

**Table 4. Differences between study variables among subjects with controlled blood pressure (BP) and uncontrolled BP**

| Variables | Before | | | | | After | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Controlled BP subjects (n = 144) | | Uncontrolled BP subjects (n = 83) | | p-value* | Controlled BP subjects (n = 154) | | Uncontrolled BP subjects (n = 73) | | p-value* |
| | Mean | SD | Mean | SD | | Mean | SD | Mean | SD | |
| FBS | 109.53 | 44.77 | 110.04 | 40.29 | 0.181 | 108.10 | 51.70 | 103.45 | 34.80 | 0.301 |
| TC | 248.46 | 77.17 | 241.30 | 81.40 | 0.626 | 225.34 | 64.03 | 229.57 | 63.09 | 0.754 |
| TG | 126.83 | 67.90 | 142.41 | 91.47 | 0.086 | 123.51 | 65.85 | 146.62 | 86.63 | 0.012 |
| Weight | 73.40 | 12.21 | 74.28 | 13.01 | 0.548 | 72.49 | 12.26 | 73.52 | 12.33 | 0.502 |
| BMI | 29.68 | 4.28 | 29.42 | 5.12 | 0.286 | 29.03 | 4.53 | 29.73 | 5.11 | 0.208 |
| SBP | 119.01 | 9.30 | 146.53 | 16.07 | <0.001 | 118.54 | 13.01 | 143.07 | 19.82 | 0.156 |
| DBP | 74.27 | 7.35 | 88.34 | 14.26 | 0.031 | 74.60 | 7.53 | 87.19 | 10.52 | 0.040 |

FBS — fasting blood sugar; TC — total cholesterol; TG — triglyceride; BMI — body mass index; SBP — systolic blood pressure; DBP — diastolic blood pressure; *based on Independent sample T-test