Determinants of Hypertension Self-management Behaviors: An Application of the Intervention Mapping Approach

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Mehdi Mirzaei-Alavijeh
Kermanshah University of Medical Sciences

Farzad Jalilian
Kermanshah University of Medical Sciences

Seyyed Nasrollah Hosseini
Tehran University of Medical Sciences School of Allied Medical Science

Mohammad Esmaeil Motlagh
Ahvaz Jondishapour University of Medical Sciences

Mohhamad Fatahi
Kermanshah University of Medical Sciences

Laleh Solaimanizadeh
Kerman University of Medical Sciences

Mohammad Mahboubi 📧 mm59m1393@gmail.com
Ahvaz Jondishapour University of Medical Sciences Abadan Faculty of Nursing and Midwifery Abadan
Corresponding Author

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Abstract

Background

Hypertension is one of the key risk factors for several diseases; can be followed several complications. The aim of this study was determine the determinants of hypertension self-management behaviors based on intervention mapping approach.

Methods

A cross-sectional study was conducted among 800 hypertension patients in the in southwestern Iran, during 2018 which was systematic random sampling selected for participation in this study. A structured questionnaire was applied for collecting data and data were analyzed by SPSS version 16 using t-test, the ANOVA, bivariate correlations and linear regression analysis.

Results

The mean age of respondents was of 58.25 years (SD: 12.10), ranged from 30 to 74 years. These results suggest that the assessed constructs explained 51% of the variance in hypertension self-management behaviors. The best predictors for hypertension self-management behaviors were barriers, outcome expectations and self-efficacy.

Conclusion

The current study provides support for the use of intervention mapping approach in predicting hypertension self-management behaviors. These findings have implications for the evidence based design of hypertension self-management behaviors promotion interventions.

Background

Hypertension is one of the key risk factors for atherosclerosis, stroke and heart and kidney failure in many countries [1]. About 40% of adults in the world have hypertension,
and this high prevalence is a serious threat to public health throughout the world; hypertension is considered the most important preventable risk factor of morbidity and premature deaths [2]. This condition is responsible for over 15% of all deaths, including nine million deaths, 7.6 million premature deaths and 7% disability-adjusted life years [3]. According to the reports published by the World Health Organization in the last four decades, the prevalence of hypertension has reduced in high-income countries but increased in low-income countries, such as Southern Asia and Sub-Saharan Africa [4, 5], and is anticipated to increase by 60% to reach 1.56 billion worldwide by 2025 [6]. Studies conducted in Iran reveal a high prevalence of hypertension, and the results of a study by the Endocrinology and Metabolism Center of Tehran showed that hypertension has a prevalence of 22% in the 20- to 69-year-old age group [7]. Without interventions to control hypertension, achieving the UN Sustainable Development Goals of reducing premature deaths due to Non-Communicable Diseases (NCDs) by 30% seems unlikely [8]. Reducing systolic blood pressure by 5 mmHg is estimated to lead to a 14% reduction in stroke-related deaths, 9% reduction in deaths due to coronary artery diseases and 7% reduction in all-cause mortality [9, 10]. This strategy is thus cost-effective for reducing cardiovascular complications, premature deaths and the burden of diseases as it uses up the scarce healthcare resources available [11]. It has now been widely accepted that hypertension can be prevented or controlled by changes in lifestyle [12]. The most important measures that can be taken with regard to lifestyle in patients with hypertension include weight loss, increased physical activity, refraining from smoking, complying with a healthy diet rich in fruits and vegetables and reduced sodium intake [13–15]. Moreover, hypertension-controlling interventions often target one behavior, which may not suffice for the control of hypertension, and studies have thus recommended the development of lifestyle-promoting interventions targeting
hypertension [16]. Studies have shown that knowledge of the cognition of people at risk is essential for the development of preventive strategies [17, 18]. Although identifying all the determinants affecting the performance of health behaviors is complicated, identifying some of them facilitates making predictions and helps health-promotion experts develop health-promoting interventions and programs [19]. The results of a systematic review study conducted by Holmes et al. showed that using a theory or model can predict treatment adherence as a behavior only to a limited degree, and combining behavioral models and their constructs may provide a strengthened theoretical basis for the development and evaluation of interventions affecting treatment adherence [20]. Meanwhile, the intervention mapping approach is one of the most popular frameworks for planning health promotion programs and explaining behaviors and has become widely popular in the scientific community over the last three decades [21]. This approach has also been used in health studies on the same subject as the present study, i.e. the self-management of chronic diseases [22–25].

The present study was therefore conducted to investigate the determinants of performing self-management behaviors in patients with hypertension in southwestern Iran using the intervention mapping (IM) approach.

Methods

Study design, setting and participants
This cross-sectional study was conducted between May and November 2018 on the rural population of Shadegan in Khuzestan Province in southwestern Iran. Shadegan is located 120 Km south of Ahvaz and 971 Km south of Tehran (the capital of Iran) and has a desert warm climate and a population of about 138 thousand, who are mainly Arab. Shadegan township has six villages, with a rural population of 49 thousand [26]. The population of this study consisted of 30-year-old to 74-year-old patients with hypertension who were
permanently living in the region at the time of this study. A total of 4552 patients in Shadegan had medical records showing a diagnosis of hypertension. Cluster sampling was performed with an appropriate allocation method, and three villages were randomly selected from all the villages of Shadegan. The sample size per cluster was determined according to the number of households in each village. Then, 800 cases were selected out of the 4552 patients by systematic random sampling. To this end, out of the patients whose records showed hypertension in the health house of each village, one household was randomly selected from the first five boxes using a table of random numbers. Then, every third household from the initial box was systematically selected until the required sample size was reached.

The study inclusion criteria were: A confirmed diagnosis of hypertension for over six months, age >30 years and the use of at least one antihypertensive medication. The patients who returned incomplete questionnaires or had dementia were excluded.

Eventually, 730 questionnaires were analyzed. The response rate was 91.2%.

**Data collection and study tools**

Data were collected through face-to-face interviews with the participants using written questionnaires. Four health care providers working in the health centers of the region were trained on how to collect the data.

**Data collection tools**

Before the main study, a pilot study was conducted on the target group to assess the questionnaire's reliability using Cronbach's alpha coefficient. The questionnaire's validity was confirmed by an expert panel, which consisted of 12 people, including two PhDs in health services management, two PhDs in health education and promotion, two health policy experts, two health care experts, two internal medicine physicians and two social psychologists. The questionnaire contained a total of 41 items.
The data collection tool consisted of a three-part written questionnaire. The first part contained six items on demographic information, including age (year), gender (female, male), marital status (married, single, widowed), number of years of education (year), household size (person) and economic status (poor, medium, and good).

The five-item second part dealt with hypertension self-management behaviors, including smoking, physical activity, proper food regimen, weight control and medication adherence. Each self-management behavior was assessed by one item. For example, ‘Do you comply with the recommended physical activity, i.e. 30 minutes per day, five days per week?’ (Never, occasionally, very little, often, always) or ‘What is your smoking status?’ (More than one cigarette a day, one cigarette a day, I smoke occasionally, I have quitted, I do not smoke at all). Each behavior was scored from 0 to 4, making the total score between 0 and 20 points. Higher scores were indicative of better hypertension self-management behaviors. Cronbach’s alpha was calculated as 0.81 for the hypertension self-management behavior questionnaire.

The third part assessed the items of the constructs under study with 30 items. The research team developed the questionnaire using the results of previous studies on the socio-cognitive factors affecting hypertension self-management behaviors [22-25 and 27-34] as well as the first and second steps of the intervention mapping approach [21]. The participants answered the constructs’ items on a Likert scale from 1 to 5 (very little, little, somewhat, much, and very much). Higher scores indicated a better attitude toward the benefits of performing hypertension self-management behaviors, outcome expectations toward these behaviors, their perceived barriers, subjective norms encouraging the performance of these behaviors and the perceived self-efficacy of their performance.

**IM Constructs**
(a): Attitude toward the benefits of performing hypertension self-management behaviors included five items; for example, ‘I believe that taking the prescribed hypertension medications at the specified time has a significant effect on my hypertension control’.

(b): Outcome expectations of performing hypertension self-management behaviors included five items; for example, ‘Performing the recommended physical activity helps prevent the complications of the disease’.

(c): Perceived barriers to performing hypertension self-management behaviors included seven items; for example, ‘I have no information about the appropriate diet for patients with hypertension’.

(d): Subjective norms encouraging hypertension self-management behaviors included seven items; for example, ‘My family supports me in medication adherence’.

(e): Perceived self-efficacy in performing hypertension self-management behaviors included five items; for example, ‘I am capable of taking the hypertension control medications at the specified time’.

The Cronbach’s alpha test showed the favorable reliability of the studied constructs. The constructs' reliability was found as follows: Attitude=0.72, outcome expectations=0.78, perceived barriers=0.88, subjective norms=0.79 and perceived self-efficacy =0.70.

**Data Management and Analysis**

The statistical analysis of the data was carried out in SPSS-16. The continuous data were expressed as mean and standard deviation (SD) and the categorized data as absolute and percentage values. The continuous data were analyzed using the t-test and the ANOVA. The relationship between the dependent and independent variables was assessed using the backward linear regression analysis. The correlation between the socio-cognitive constructs was analyzed using the bivariate correlation test. The reliability of the study tool was assessed by Cronbach's alpha test.
Ethical Approval

The present study was approved by the Ethics Committee of Abadan School of Medical Sciences. The questionnaire began with an introduction to the study objectives and participants' voluntary consent.

Results

Participants’ age ranged from 30 to 74 years and had a mean of 58.25 years and SD=12.10 years. A total of 46.6% of the participants were middle-aged (30 to 60 years old) and 53.4% were older adults (over age 60). Moreover, 57.7% (n=421) were female and 42.3% (n=309) were male. In terms of marital status, 5.2% (n=38) were single, 69.9% (n=510) were married, and 24.9% (n=182) were widowed. In terms of education, 24.5% (n=179) were illiterate, 40.1% (n=293) had primary school education, 17.5% (n=128) had junior high school education, 12.6% (n=92) had high school diploma, and 5.2% (n=38) had university education. The household size was 1 or 2 in 12.6% (n=92) of the participants, 3 to 5 in 79.7% (n=582) and over 5 in 7.7% (n=56). Economic status was reported as poor in 21.1% (n=154), medium in 61.6% (n=450), and good in 17.3% (n=126).

Table 1 presents the mean, standard deviation, score range and maximum obtainable score of and correlation between the studied constructs. The results showed that hypertension self-management behaviors had the highest correlation with barriers, self-efficacy, outcome expectations, subjective norms and attitude, in respective order. All the correlations were significant at the 0.01 level.

Table 1: The mean, standard deviation, score range and maximum obtainable score of and correlation between the studied constructs
Table 2 shows the results of the backward linear regression analysis for assessing the determinants of hypertension self-management behaviors. These results suggest that the assessed constructs explained 51% of the variance in hypertension self-management behaviors. The model was finalized in the third stage, and barriers, outcome expectations and self-efficacy were identified as the strongest constructs affecting the prediction of hypertension self-management behaviors in the study groups.

Table 2: The determinants of hypertension self-management behaviors

| Model | Unstandardized Coefficients | Standardized Coefficients | t |
|-------|-----------------------------|---------------------------|---|
| 1     | (Constant)                  | 1.899                     | 1.420 | 1.337 |
|       | Attitude                    | 0.049                     | 0.037 | 0.038 | 1.330 |
|       | Outcome Expectancies        | 0.377                     | 0.038 | 0.292 | 9.858 |
|       | Barrier                     | -0.225                    | 0.028 | -0.314 | -8.006 |
|       | Subjective Norms            | 0.014                     | 0.024 | 0.019 | 0.597 |
|       | Self-efficacy               | 0.315                     | 0.047 | 0.248 | 6.742 |
| 2     | (Constant)                  | 2.330                     | 1.222 | 1.906 |
|       | Attitude                    | 0.050                     | 0.037 | 0.038 | 1.357 |
|       | Outcome Expectancies        | 0.382                     | 0.037 | 0.296 | 10.244 |
|       | Barrier                     | -0.232                    | 0.025 | -0.324 | -9.192 |
|       | Self-efficacy               | 0.313                     | 0.047 | 0.247 | 6.721 |
| 3     | (Constant)                  | 2.760                     | 1.181 | 2.337 |
|       | Outcome Expectancies        | 0.389                     | 0.037 | 0.301 | 10.490 |
|       | Barrier                     | -0.233                    | 0.025 | -0.325 | -9.222 |
|       | Self-efficacy               | 0.328                     | 0.045 | 0.259 | 7.254 |

Table 3 presents the relationship between the underlying variables and hypertension self-
management behaviors. According to the results, the mean score of hypertension self-management behaviors was significantly higher in the women and also in the patients with a larger household size.

Table 3: The relationship between the underlying variables and hypertension self-management behaviors

| Variable             | Mean (SD)    | P  |
|----------------------|--------------|----|
| Age                  |              |    |
| Middle-age           | 8.44 (4.34)  | 0.382 |
| Elderly              | 8.15 (4.43)  |    |
| Sex                  |              |    |
| Women                | 8.69 (4.25)  | 0.004 |
| Men                  | 7.74 (4.52)  |    |
| Marital Status       |              |    |
| Single               | 8.60 (4.44)  | 0.200 |
| Married              | 8.15 (4.36)  |    |
| Education            |              |    |
| Illiterate           | 8.10 (5.06)  | 0.119 |
| Primary school (5 grades) | 8.21 (4.37) |    |
| Secondary school (8 grades) | 8.96 (3.60) |    |
| High school (12 grades) | 7.59 (3.96) |    |
| Academic (16 grades) | 9.18 (4.26)  |    |
| Family Member Size   |              | < 0.001 |
| 1-2 number           | 6.43 (1.86)  |    |
| 3-5 number           | 8.45 (4.59)  |    |
| More than 5 number   | 9.66 (4.35)  |    |
| Economic Status      |              |    |
| Poor                 | 7.61 (4.30)  | 0.074 |
| Middle               | 8.39 (4.51)  |    |
| Good                 | 8.73 (3.96)  |    |

Discussion

The present study was conducted to identify the most important determinants of self-management behaviors to control hypertension in patients with hypertension in southwestern Iran. The results showed attitude, outcome expectations, perceived barriers, subjective norms and perceived self-efficacy were the most important determinants of hypertension self-management behaviors. The participants obtained 41.4% of the maximum obtainable score for hypertension self-management behaviors, which is less than half of the obtainable score. In one study, Mellen et al. reported food diet adaptation in hypertension patients as 33.4% [27]. Similarly, Leon et al. reported this adaptation as 20% in these patients [28]. The study conducted by Bane et al. on 109 patients with hypertension showed that 20.9% of these patients did not adhere to their antihypertensive
medication regimen [29]. In another study conducted in Turkey by Uzun et al. on patients with hypertension, 35% did not have a proper treatment adherence or comply with their lifestyle recommendations [30]. The results of a systematic review study conducted by Kawan et al. showed a generally poor food diet adherence in patients with hypertension [31]. These studies show the poor adherence of patients with hypertension to self-management behaviors, which can be alarming for health planners and show the need for identifying the determinants of hypertension self-management behaviors to develop behavioral interventions.

The present findings showed that the socio-cognitive constructs studied were able to explain 51% of the variance in hypertension self-management behaviors. In one study, Yang et al. showed that the self-efficacy of hypertension control, general knowledge of hypertension and social support were able to explain 41% of the variance in hypertension self-care behaviors in older women in South Korea [32]. Peters et al. conducted a study to assess the constructs of the Theory of Planned Behavior (TPB) in predicting hypertension self-care behaviors in 306 African American patients. Their results showed that the TPB constructs were able to predict 18% of the variance in hypertension self-care behaviors [33]. Bane et al. showed that attitude, perceived behavior control, subjective norms and behavior intention explained 41% of the variance in adherence to antihypertensive medication [29]. The present findings also showed that barriers, outcome expectations and perceived self-efficacy were the strongest determinants of hypertension self-management behaviors, which is largely in agreement with the results of several other studies.

Cultural expectations and values (for example, consuming traditional foods as a symbol of one’s ethnicity) create significant barriers to engaging in hypertension prevention behaviors [34]. Peters et al. showed that attitudes and beliefs were the key constructs
predicting hypertension self-care behaviors [33]. Bane et al. also conducted a study to
determine patients' adherence to antihypertensive medication in Northern Ireland and
showed that patients with greater adherence had a significantly higher self-efficacy [29].
Yang et al. showed that self-efficacy of hypertension control is the strongest predictor of
hypertension self-care behaviors in older women with a low income in South Korea [32].
The results obtained by Lewis et al. in their study of African Americans showed that
patients perceived the positive behavioral outcomes of adherence to treatment, but also
reported that the side-effects of medications and the lifestyle changes needed for
treatment adherence were regarded as significant barriers to adherence to the treatment
of hypertension [35]. Fongwa et al. reported financial resources and stressful settings as
barriers to adherence to treatment in women with hypertension. It can be concluded that
dietary modification strategies and hypertension control and prevention behaviors in
general should be compatible with cultural expectations and norms in relation to the
importance of social interactions.
Another finding of the present study was women's higher mean score of hypertension self-
management behaviors compared to men. In one study, Yosten and Samson showed that
salt intake, as one of the most important hypertension control and prevention behaviors,
was significantly lower in women compared to men [37]. In contrast to the present
findings, the results obtained by Leon et al. in a hospital in Benin in the west of Africa
showed that dietary adaptation was significantly higher in men with hypertension than in
women with this condition [28]. In this regard, previous studies have shown that women
are generally more attentive to their health, which might lead to their better health care
behaviors [38, 39]. Addressing the role of gender in these issues might be beneficial for
developing health behavior promotion interventions.
Another finding of the present study was the higher mean score of hypertension self-
management behaviors in patients with higher household sizes. Moreover, subjective norms (family and friends) had a positive and significant correlation with hypertension self-management behaviors in the studied group. Other studies have also emphasized the importance of household size and family support in adopting preventive behaviors [40-45]. For example, in one study, Mirzaei-Alavijeh et al. showed that cancer screening behaviors were significantly higher in patients with larger household sizes [40]. Moreover, Ogedegbe et al. investigated African-American men’s experiences of living with hypertension and argued that having social support (for instance, from the family) facilitates adherence to treatment [41]. Rose et al. [42] reported that their participants found having a supportive family member a facilitator for adherence to treatment. In their study on women with hypertension, Fongwa et al. reported that the participants found social support (from the family and group interaction with others) as a facilitator of hypertension treatment recommendations [36]. The approval and support of the family and friends is strongly associated with adherence to treatment in patients with hypertension [43, 44]. Support groups help people interact with each other and share experiences of how to deal with perceived stressors as barriers to their adherence to treatment [45]. The facilitating role of family members in relation to hypertension patients involves joining the patient in their doctor visits, discussing matters with the doctors outside the visits and reminding the patients to use their medications, which can be further emphasized in the interventions developed for the prevention and control of hypertension.

The present study was conducted in a sole group of patients with hypertension from southwestern Iran and may not be easily generalized beyond the study sample. In addition, the participants were mostly low-income rural residents, who cannot represent the larger population of patients with hypertension in Iran, and their experiences may not reflect those of other patients with hypertension.
Conclusion

The present findings identified attitude, outcome expectations, perceived barriers, subjective norms and perceived self-efficacy as the determinants of performing hypertension self-management behaviors. Given the results obtained from the outcome expectations construct, it can be concluded that these patients receive proper health messages about hypertension. Nevertheless, the barriers to the patients’ continuation of their former lifestyle as a result of having to perform hypertension self-management behaviors were found to be a concern in this group. Health care providers are recommended to enhance their ability to deal with these barriers in patients. The present findings can be used for the better understanding of hypertension self-management behaviors and the development of interventions to improve adherence to treatment and the control of hypertension.

Abbreviations

| Abbreviation | Description                          |
|--------------|--------------------------------------|
| IM           | Intervention Mapping                 |
| NCDs         | Non-Communicable Diseases            |
| SD           | Standard Deviation                   |
| TPB          | Theory of Planned Behavior           |

Declarations

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Authors’ contributions
MM, MMA and FJ contributed to the conception and design of the research; MMA, MEM, SNH and MM contributed to the acquisition and analysis of the data; FJ contributed to the analysis and interpretation of the data; LS, MMA, and MF contributed to the acquisition, analysis, and interpretation of the data; All authors approved the final manuscript.

**Ethics approval and consent to participate**

The Ethics Committee of Research of the Abadan Faculty of Medical Sciences (IR.ABADANUMS.REC.1395.038) had approved the study protocol and had monitored the research process. Further, the participants had been given the participant information statement and had signed the written consent form. Individual personal information was kept confidential.

**Consent for publication**

Not applicable.

**Competing interests**

The authors have no conflicts of interest to declare.

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