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Factors predicting nutritional knowledge, illness perceptions, and dietary adherence among hypertensive middle-aged women: Application of transtheoretical model

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Abstract:

BACKGROUND: Healthy dietary adherence might be one of the effective and modifiable factors for hypertension (HTN) control; therefore, empowering patients for self-care management including healthy food patterns play a key role in guiding their care, in partnership with health care providers. This study aimed to identify the factors predicting nutritional knowledge, illness perceptions, and adherence to a diet based on transtheoretical model (TTM) among hypertensive middle-aged women.

MATERIALS AND METHODS: A cross-sectional survey was conducted on 164 patients with HTN attending west health centers of Tehran, Iran, in 2020. Simple random sampling was used. Sociodemographic characteristics of the respondents were collected, a valid and reliable measure on nutritional knowledge, illness perceptions, and adherence to diet, and a researcher-made measure based on TTM constructs through in-person interview was applied. Descriptive statistics and general linear model were utilized for data analysis using SPSS version 25. The significance level was considered less than 0.05.

RESULTS: Mean and standard deviation of participants was 50.82 ± 8.77 years. Multivariate regression analysis indicated that family income ($P < 0.001$) and body mass index ($P < 0.001$) predicted nutritional knowledge and adherence to diet, respectively. Decisional balance and self-efficacy constructs predicted nutrition knowledge and illness perceptions ($P < 0.001$). In adherence to diet, overcoming the temptation construct was indicated as the only predictor ($P < 0.001$).

CONCLUSION: Study findings highlighted the necessity of tailoring and implementing interventions based on TTM using appropriate strategies to promote quality of HTN management approach in nutritional knowledge, illness perceptions, and dietary adherence.

Keywords:

Dietary adherence, hypertension, illness perceptions, middle-aged women, nutritional knowledge, transtheoretical model

Introduction

Hypertension (HTN) is one of the most important causes of morbidity and mortality worldwide.^[1,2] It has received increasing attention in terms of chronic disease prevention.^[2] High blood

pressure (BP) affects about 40% of adults aged 25 years and older.^[3] Most of the time, high BP has no obvious symptoms to indicate that something is wrong so, HTN is often called the "silent killer."^[4] Today, noncommunicable diseases included 43% burden of all diseases.^[5] Literature review

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revealed that the prevalence HTN in aged between 15 and 64 years old is 26.6% in Iran.^[6-8] Due to rapid social, economic, and cultural transition, HTN is a major public health problem in the world.^[3] Urbanization and the associated lifestyle change including inappropriate dietary knowledge and practices can increase the risk of high BP.^[9]

Uncontrolled BP is a major risk factor for cardiovascular complications and responsible for up to 70% of cardiovascular disease burden in the Asia-Pacific region.^[10]

Evidence-addressed uncontrolled HTN can lead to stroke and renal failure which cause 33% and 10%–15% of deaths, respectively.^[11]

The World Health Organization emphasized that HTN is one of the diseases that can be effectively controlled by promoting self-care activities.^[12,13] Importance of self-care in HTN is for gaining adequate knowledge about the disease and its symptoms, BP monitoring at home, better adherence to treatment, and adopting a healthy lifestyle.^[14,15]

It seems that lack of patients' knowledge is one of the factors influencing selection and adoption of this health-promoting behavior.^[16-18]

The transtheoretical model (TTM) developed from the psychotherapy field as the most popular model in health education research and practice.^[19] TTM has been extensively used in behavioral research, primary and secondary prevention. This model is best known for its staging paradigm and has been applied to several unhealthy behaviors such as smoking, obesity, drug use, and HTN. This model is an integrative model of intentional change consisting of stages of change. It suggests that people move through five change stages from pre contemplation (not thinking about change) to contemplation (thinking about change over the next six months), to preparation (thinking about change in the next month), to action (having made but not completed meaningful change in the past six months), and finally to maintenance (healthy behavior gaining for 6 or more months).^[19]

Three major constructs of the TTM including decisional balance, self-efficacy, and overcoming temptations are thought to contribute significantly toward moving individuals to adopt behavioral change process. Decisional balance addresses when an individual accepts the advantages (pros) or opposed to the disadvantages (cons) of behavior change. Self-efficacy defines the confidence when a person has the ability to follow a behavior. Temptation refers to the desire to

engage in unhealthy behavior when confronted and challenged with a difficult situation.^[19]

Based on the mentioned concepts of TTM, this study tried to draw a conceptual framework to clarify which variables and construct of TTM can predict nutrition knowledge, illness perceptions, and dietary adherence outcomes. This instruction might serve as new gateways to support hypertensive patients through tailoring appropriate promotive interventions in further studies. This study aimed to identify the predictors of nutritional knowledge, illness perceptions, and dietary adherence based on TTM among hypertensive middle-aged Iranian women.

Materials and Methods

Design and study population

This cross-sectional study was performed on 164 Iranian middle-aged women with HTN attending west health centers of Tehran, Iran, in 2020. The sample size was calculated based on the outcome variables as Kamran *et al.* study.^[20] Simple random sampling was used. Inclusion criteria were female, middle age (30–59) years old based on the WHO definition,^[21] HTN confirmation by a physician at least 140/90 mmHg, and those who willing to participate in the study. Confirmed psychological disorders by specialist, comorbidity accompanied with HTN, and moving from the study geographical area were set as exclusion criteria.

Data collection

First, we created a questionnaire that consists of 10 sociodemographic characteristics of the respondents. A valid and reliable nutritional knowledge, illness perceptions, and dietary adherence measure was utilized. Moreover, a researcher-made tool based on TTM constructs was applied through an in-person interview by a trained interviewer. Anthropometric (height, weight) and BP measurements were assessed. BP was measured by an automated validated device with proper adult cuff sizes. To assess the BP, participants respected in a sitting position after 15 min resting to achieve validate BP.

Sociodemographic information concerning age, educational level, employment status, economic status, spouse status, and HTN duration time was collected by the questionnaire devised for the study.

The study outcome measures included nutritional knowledge (10 items), illness perceptions (14 items), and dietary adherence (5 items). The subjects were given a nutritional assessment to test their nutritional knowledge as true = 1 and false = zero. Questions numbers 1, 3, 5, and 8 were calculated reversely. The scores were then

determined depending on the number of correct answers. The range of answers was 0 to 10. Higher scores indicated higher knowledge about nutrition. Furthermore, illness perceptions were determined by asking participants to rate different statements with answer categories ranging from “strongly agree” (1) to “strongly disagree” (4). Questions numbers 1, 3, 7, and 12 were calculated reversely. The range of answers was 14–56, higher scores indicating higher illness perceptions.

Dietary adherence was evaluated with answer categories ranging from always to never.

The range of answers was 5–25; the higher score, the higher level of adherence to a diet. To consider proper compare results based on the weight of domains, in all three mentioned outcomes, answers were calculated from 0 to 100. All reverse items were recoded. Validity and reliability of 10-item nutritional knowledge, 14-item illness perceptions, and 5-item dietary adherence were confirmed by Kamran *et al.* study.^[22]

The 25-item TTM measure of this study contains four subscales: (a) the stages of change, (b) decisional balance, (c) self-efficacy, and (d) overcoming temptation for the stages of change; the respondents chose the one best representing their current stage of diet adherence for HTN management as pre contemplation, contemplation, preparation, action, and maintenance.

For decisional balance, there were 10 questions; 5 questions addressed perceived advantages, and 5 questions addressed disadvantages, all on a 5-point Likert-type scale (1–5).

Self-efficacy was measured by 5 items on a Likert-type scale (1–5). Possible scores range from 5 to 25, with higher scores indicating greater self-efficacy for nutrition knowledge and practice. Items on this scale asked the respondents how confident they were (1 = not all confident to 5 = extremely confident) would be able to obtain/use nutrition knowledge every time.

Overcoming temptation was measured by 5 items on a Likert-type scale (1–5). Possible scores range from 5 to 25, with higher scores indicating greater overcoming temptation for the desire to engage in unhealthy behavior when confronted with a difficult situation. Items on this scale asked the respondents that they would know going through a difficult situation (1 = never to 5 = always).

The validity was confirmed by 10 experts in nutrition, cardiology, and health education and promotion fields. They were consulted on the necessity, relevance, clarity, and simplicity of each item. In this study, content validity index = 0.70 and content validity ratio = 0.79

were calculated. Reliability of the questionnaire was computed using test–retest in period of 2 weeks. Test–retest reliability for the questionnaire was evaluated for a sample of 50 individuals attended in west health centers of Tehran. These participants did not contribute to the main study. Cronbach’s alpha was calculated for decisional balance, (0.65), self-efficacy (0.79), values expectation (0.96), self-efficacy (0.85), and overcoming temptation (0.87). The total Cronbach’s alpha was calculated at 0.84.

Definition

In this section, we tried to clarify all the objective and subjective concepts used in this study. HTN was confirmed when the mean systolic BP ≥ 140 mmHg and mean diastolic BP ≥ 90 mmHg.^[23]

Body mass index (BMI) as an anthropometric index was evaluated by the formula of weight divided by height squared (kg/m^2). Commonly accepted BMI ranges are underweight (under $18.5 \text{ kg}/\text{m}^2$), normal weight ($18.5\text{--}25 \text{ kg}/\text{m}^2$), overweight ($25.1\text{--}30 \text{ kg}/\text{m}^2$), and obese (over $30 \text{ kg}/\text{m}^2$).^[23]

Nutritional knowledge

Nutritional knowledge generally refers to knowledge of concepts and processes related to nutrition and health including knowledge of diet and health, diet and disease, foods representing major sources of nutrients, and dietary guidelines and recommendations.^[24]

Illness perceptions

Illness perceptions define as organized cognitive representations/belief that patients have about their illness. These perceptions represent important determinants of behaviors and are associated with a number of important outcomes related to their general health.^[25]

Adherence to diet in terms of counseling is defined as a supportive process to set priorities, establish goals, and create individualized action plans that focus on responsibility for self-care. Nutritional behavior modification revealed helpful results in weight control and preventive packages for cardiovascular diseases.^[26]

Statistical analysis

Statistical analysis was performed using the SPSS for Windows statistical software version 22 (SPSS, Inc., Chicago, IL, USA). Descriptive statistics were conducted. Mean score and standard deviation (SD) were tested for continuous and proportions for categorical variables. Multivariate regression analysis was conducted between BP to explore associations and their predictive factors. $P < 0.05$ was considered statistically significant.

Ethics

The research was approved by the Ethics Committee of Tehran University of Medical Sciences (IR. TUMS. SPH. REC.1398.024). Confidentiality of the participants' identity and response was ensured. Informed consent was obtained prior to the interview from the participants.

Results

The study sample size consisted of 164 Iranian middle-aged women with HTN aged 30–59 years (mean and SD = 50.82 ± 8.77 years). The mean and SD values of systolic and diastolic BP were 144.71 ± 8.13 and 97.95 ± 4.82, respectively. Seventy participants ($n = 70$, 42.7%) reported 2–7 years of HTN duration. One hundred and two participants were overweight and obese ($n = 102$, 86.6%).

Sociodemographic factors are reported in Table 1. Item analysis of stage of change indicated that 26.2% ($n = 43$) were in pre contemplation, 4.3% ($n = 7$ in contemplation, 4.9% ($n = 8$) in preparation, 10.4% ($n = 17$ in action, and 54.2% ($n = 89$) in maintenance stages. Table 2 illustrates a

Table 1: Demographic characteristics of the study participants ($n=164$)

Characteristics	n (%)
Age (years)	
<40	31 (18.9)
40-60	133 (81.1)
Educational status	
Illiterate	21 (12.8)
Up to diploma	88 (53.7)
Diploma	38 (23.2)
University	17 (10.3)
Economic status	
High	36 (22.6)
Moderate	124 (75.6)
Low	3 (1.8)
Employment status	
Household	153 (93.3)
Employed	11 (6.7)
Hypertension duration (years)	
<2	54 (32.9)
2-7	70 (42.7)
>7	40 (24.4)
BMI (kg/m^2)	
Normal	22 (13.4)
Overweight	61 (37.2)
Obese	81 (49.4)
Systolic blood pressure (mmHg)	
<140	105 (64)
>140	59 (36)
Diastolic blood pressure (mmHg)	
<90	26 (15.9)
>90	138 (84.1)

BMI=Body mass index

descriptive analysis of factors predicting HTN including nutritional knowledge, illness perceptions, adherence to diet, and TTM constructs. Multivariate regression analysis indicated that economic status ($P < 0.001$) and BMI ($P < 0.001$) predicted nutritional knowledge and adherence to diet, respectively. Decisional balance and self-efficacy constructs predicted nutrition knowledge and illness perceptions ($P < 0.001$). In adherence to diet, overcoming temptation construct was indicated as the only predictor ($P < 0.001$) [Table 3].

Discussion

The growing incidence of HTN in the world is, in part, due to the aging population as most adults now live long enough to develop chronic diseases. Moreover, rapid social, economic, and cultural transition, followed by lifestyle change including inappropriate dietary practices, can increase the risk of high BP. Epidemiology studies have identified HTN as a major risk factor for cardiovascular disease.

Comprehensive HTN management focuses on reducing clinical complications, undesirable health outcomes, and economic burden of disease. This study aimed to identify the factors predicting nutritional knowledge, illness perceptions, and adherence to diet based on TTM among hypertensive middle-aged women in Iran in 2020.

The study findings revealed economic status can be a predictor of nutritional knowledge. This finding was in line with Fateh *et al.* study which performed to identify social and economic inequality about HTN.^[27] They concluded low socioeconomic status level may result in an increased prevalence of HTN. Furthermore, this condition can also impose cost burdens on individuals, families, and health system.^[23]

The important point achieved from this study was a better economic situation that can predict better nutritional knowledge. It might be that individuals with better nutritional knowledge may improve nutrition through an increase in the consumption of healthy foods and stress management which, in turn, resist diseases and have better prospects to manage HTN and delay HTN complications.

One of the cost-effective strategies to support women for food choice decisions as they are responsible for buying and preparing food for themselves and their families is informing and educating them for obtaining healthy foods, making them healthier choices and easier choices. As Vargas-Meza *et al.* study approved.^[28] Promoting women nutritional knowledge allowed low- and middle-income women to make nutrition-quality-related decisions.

Table 2: Descriptive analysis of nutritional knowledge, illness perceptions, adherence to diet, and transtheoretical model constructs of the study participants

Characteristics	Mean±SD	Minimum score	Maximum score	Lower limit	Higher limit
Nutritional knowledge	70.65±11.37	30	100	0	10
Illness perceptions	66.73±10.42	30.95	92.86	14	56
Adherence to diet	65.5±35.38	0	100	5	25
Systolic blood pressure	144.71±8.13	130	180	130	180
Diastolic blood pressure	97.95±4.82	80	100	80	100
Decisional balance	82.98±13.13	40	100	5	25
Self-efficacy	10.38±5.15	2	100	5	25
Overcoming temptation	68.15±35.34	20	100	5	25

SD=Standard deviation

Table 3: Multivariate regression analysis of nutritional knowledge, illness perceptions, adherence to diet, and transtheoretical model constructs with blood pressure of the study participants

Outcome variables	Variables	Groups	β	CI 95%		P
				Lower limit	Higher limit	
Nutritional knowledge	Family income	High	23.29	11.93	34.56	<0.001
		Moderate	21.86	10.74	32.98	<0.001
	Decisional balance	0.17	0.05	0.29	<0.001	
Illness perceptions	Self-efficacy		-1.00	-1.40	-0.60	<0.001
	Decisional balance		0.15	0.04	0.25	<0.001
	Self-efficacy		0.71	1.07	0.34	<0.001
Adherence to diet	BMI	Normal	22.61	6.56	38.66	<0.001
		Overweight	16.22	4.90	27.54	<0.001
	Stage of change	Pre contemplation	-27.26	-36.38	-18.14	<0.001
		Contemplation	-19.20	-35.51	-2.88	0.02
		Action	16.12	26.58	5.66	<0.001
Overcoming temptation		0.23	0.13	0.33	<0.001	

BMI=Body mass index, CI=Confidence interval

The study results highlighted that self-efficacy and decisional balance constructs can be as predictors of nutritional knowledge. The positive role of self-efficacy in the mentioned condition was in accordance to Katch *et al.* study which assessed the role of self-efficacy in self-management cardiovascular disease. In this case, self-efficacy can affect patient’s ability to manage the symptoms, treatment protocol, physical and mental outcomes, and lifestyle modification related to living with a chronic disease. Furthermore, Katch *et al.* study noted that self-efficacy promoted clinical outcomes (including BP) of cardiovascular disease during endorsing self-management skills.^[29]

This study, to our knowledge, is the only one that has applied the TTM on nutritional knowledge, illness perceptions, and dietary adherence and HTN. This issue could consider as a novelty of the present study, but it is difficult to compare it with another study. However, Shahroodi *et al.* could show the effect of the decisional balance construct on HTN control.^[30] They reported that decisional balance can manage BP in a physical activity intervention.

Patients’ illness perceptions as a better understanding of HTN, more concerns about associated risks, and

more knowledge of the chronic nature of HTN related to some cognitive domains. Illness representations as the perceived consequence, is personal and treatment control, emotional representations are related to knowledge and understanding of patients.^[31]

The study findings revealed BMI (normal and overweight) can be a predictor of adherence to diet. This finding was in line with Janghorbani *et al.* study which performed to identify risk factors of high BP among the Iranian population. Their Multivariate analysis, age, low educational attainment, overweight, obesity, abdominal obesity, and high cholesterol and blood glucose were strongly associated with HTN in both genders. They suggested that prevention and treatment strategies are urgently needed to address the health burden of pre/HTN to prevent prehypertensive people from developing HTN and cardiovascular disease.^[32]

Result analysis of the stage of change construct revealed that more than half of participants were in maintenance stage. The result demonstrated that on the average, adherence to treatment was acceptable, but based on the importance of HTN control in lifelong, the effort to promote this variable seems crucial. On the other hand, about one-third of participants were in precontemplation

stage which means they were not thinking about the change in diet pattern. This amount also represented that our hypertensive women did not adopt any healthy dietary practice.

This important result imposes emphasizing dietary HTN management. Women need to empower to make healthy decision for their diet and her family members. Stockford *et al.* (2007) noted illness perceptions and its association with preparedness for change in eating disorder was in line with the present study.^[33] Motlagh *et al.* study revealed that changing in stage of change construct was one of the positive criteria in intervention effectiveness in managing HTN which is in line of our study.^[34] Furthermore, Rodriguez *et al.* revealed that distribution of studied hypertensive patients in stage of change construct posed to action and maintenance stages after TTM nutritional intervention^[35] which was accordance to our study. Overcoming temptation construct was identified as another predictor of adherence to diet in our study. Hassan *et al.* assessed the direct effect of conflict, temptation, and control on diet preferences.^[36] This can explain why Appelhans *et al.* in their study noted that using appropriate temptation management and resistance strategies might aimed at overcoming temptation in obesity treatment. This important issue can be supportive to set proper behavioral intervention to prevent adopting nonadherence dietary habits.^[37] Evidence supports the impact of TTM interventions in changing among middle-aged women with chronic diseases.^[38] This effectiveness was presented in progress through stages of change, higher decisional balance scores, and increased self-efficacy scores. These results are in line with our study that mentioned constructs were highlighted as predictors of the nutritional outcomes.^[38] Moreover, Rodriguez *et al.* (2019) suggested a that TTM-based tailored interventions on dietary pattern can increase hypertensive patients' dietary adherence.^[35] Kavookjian *et al.* study also approved stages of change, decisional balance, and self-efficacy that can be useful to make appropriate decisions on individually tailored interventions for adherence to diet among diabetic patients with cardiovascular complications.^[39] It seems that investing several resources on improving women health based on modification of health-promoting behaviors among girls worth for saving lifelong.^[40,41]

The present study has some limitations that should be recognized. First, we tried to focus on women and taking them into consideration and second study conducted in a specific geographic part of Tehran; therefore, the results of this study should not be generalized to all Iranian, middle-aged population. Third, despite measuring BP, height, and weight by a skilled health-care provider, the questionnaire results were based on participation self-reported perceptions. There is always at least some

unreliability in self-report measures. However, our main study measures were found to be reliable (total $\alpha = 0.84$).

Conclusion

This study emphasized the importance of clarifying predictors of nutrition and cognitive factors to enhance HTN management to avoid undesirable HTN complications. The study results suggested the necessity of tailoring and implementing promotive interventions based on TTM using appropriate strategies to promote quality of HTN management approach in nutrition knowledge, disease perceptions, and diet adherence among hypertensive middle-aged women. This study can be as an initiative research to design and implement intervention studies which support integration of the nutrition outcomes and merge them with health education and promotion concepts. Considering HTN related illness and treatment perceptions can highlight how individuals understand personal costs/benefits of self-managing of their general health. Tailoring and testing nutrition family-based interventions with appropriate theories suggested to achieve a family healthy lifestyle.

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Conflicts of interest

There are no conflicts of interest.

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