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Determinants of medication adherence among hypertensive patients using the Pender's health promotion model

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Abstract:

BACKGROUND: Poor adherence in treatment and medication is a global issue in curing the chronic diseases such as hypertension. The present study was conducted to identify the factors related with medication adherence among hypertensive patients referred to the health centers of Borujerd based on the Pender's Health Promotion Model (HPM).

MATERIALS AND METHODS: This cross-sectional study was conducted on 463 patients who were referred to the comprehensive health centers of Borujerd city by cluster sampling method in 2019. The data were collected using a questionnaire including demographic variables and Pender's HPM constructs. Data were analyzed by SPSS 18 software using Pearson correlation coefficient and linear regression.

RESULTS: The mean and standard deviation of the participants' age was 63.29 ± 11.2 years. The results showed that hypertensive patients had a relatively desirable level of medication adherence behavior. Perceived barriers (β = –0.169), perceived self-efficacy (β = 0.196), activity related affect (β = 0.232), and following medication regimen (β = 0.225) were the best predictors of performing the medication adherence behavior. In total, different structures of the HPM explained 42.2% of the variation of medication adherence behavior changes.

CONCLUSIONS: According to the findings, the design of educational programs using HPM is recommended to increase the medication adherence among hypertensive patients.

Keywords:

Adherence, health promotion model, hypertension

Introduction

Noncommunicable diseases (NCDs) such as hypertension have been introduced as the main challenge of sustainable development by 2020. One of the goals of the Global Action Plan is to reduce the rate of hypertension by 25%, in order to prevent and control NCDs. A review of the current status shows that the number of adults with hypertension has increased from 594 million in 1975 to 1.13 billion in 2015, which is mainly attributable to low-income and middle-income countries. According to the World Health Organization (WHO) statistics, the prevalence of hypertension in age group over 18 in 2015 in Iran is reported <20% in women, between 20 and 24.9% in men, and <20% in both.[1]

According to the WHO, adherence to treatment is defined as the correspondence level of a person receiving medication, following a prescriptive diet, or implementing lifestyle changes due to the recommendations of health care providers.[2] A part of the adherence to treatment is drug compliance. Thus, drug compliance should described as the extent to which a patient or care recipient follows the treatment behaviors recommended by health care providers, paying attention to the order, amount, and

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frequency of drug use.[2-4] Methods for evaluating the adherence to treatment of patients with hypertension are mainly divided into two groups of direct and indirect. Direct methods such as direct observation, measurement of drug or its metabolites in serum, measurement of biological markers, or use of electronically chip-based microparticles[5] provide documentations that accurately measure patient drug receiving and adherence to treatment. Indirect methods of adherence to treatment are widely performed using research methods such as interviewing, tablet counting, the patient's diary observation, questionnaire, and measurement of physiological markers.[6]

It is estimated that 40%–60% of people with hypertension do not follow prescriptive treatments due to many causes including diseases asymptomatic nature, difficult treatment regimens requiring lifestyle changes, medication side effects, high costs, and difficulty in healthcare access.[7] There are several barriers in hypertensive patients' adherence to treatment such as poor communication, low motivation, complexity of treatment, acute and delayed side effects, decreased long-term motivation, and inappropriate habits.[6] These factors are not only related to the patient, the health care providers with informational and appraisal support also play a key role in adherence to treatment.[8]

The WHO classifies factors affecting adherence to treatment in hypertensive patients to groups of patient-related factors, social conditions, economic conditions, therapeutic factors, and health care provider-related factors.[9] Patient-related factors include health literacy, health beliefs, health care satisfaction, relationships between service providers and patients, and satisfaction of treatment which influence treatment adherence.[2]

According to WHO statistics, long-term adherence to treatment in chronic diseases in developed countries is averagely 50%, and in developing countries is lower than this.[10] Nonadherence in developing countries is worse due to poorer economic conditions and disproportionate distribution of health services.[11]

There are various theories and patterns to plan in order to change unhealthy behaviors. One of them is the Pender's Health Promotion Model (HPM) [Figure 1]. This model comprises three group of factors; individual characteristics and experiences, behavior-specific cognition and affect, and behavioral outcome. The behavior-specific cognition and affect is the core group of the Pender's HPM, which has interferable modifiable constructs that include perceived benefits of action, Perceived barriers of action, perceived self-efficacy, activity-related affect, interpersonal influences, and situational influences that can lead to the incidence or result no occurrence of health promotion behaviors in competition with immediate competing demands and

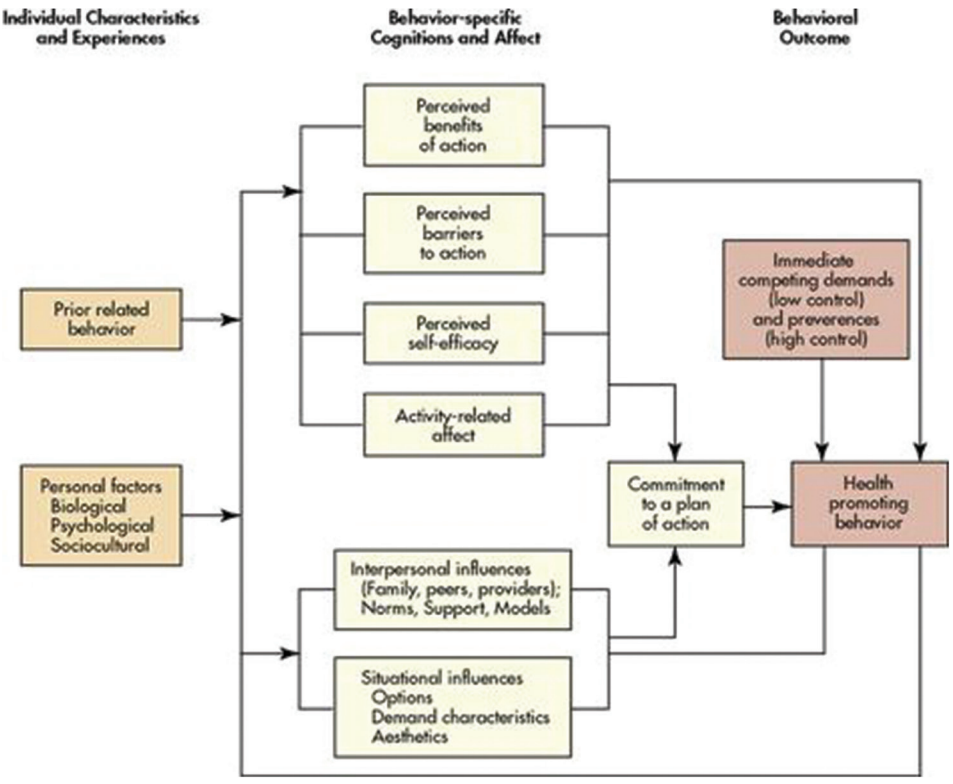

Figure 1: Pender's health promotion model framework

preferences. Measurement of these structures is needed to assess their impact on the results of intervention on behavior change.[12] The reason for the use of the Pender's model in various studies of the constructs extent and model concepts was regarding personal, cognitional, emotional, and situational factors which all are effective in performing healthy behavior, especially adherence to hypertension treatment.[13-17] On the other hand, since studies on adherence to hypertension treatment have been mainly conducted due to other patterns of individual and interpersonal behavior change, which in most cases have a great diversity in reporting factors affecting adherence, this study has been employed using the Pender's model based on the ecological factors' effect on adherence to treatment.

Materials and Methods

Participants

This cross-sectional study was conducted on 463 hypertensive patients in Borujerd, Lorestan, Iran in 2019. Participants were selected by cluster sampling method. For this purpose, each region of the city was considered as a section (4 regions). Then, three comprehensive health centers were randomly selected from each section using random numbers table (12 centers out of 23 centers). After comprehensive health centers had been recruited, list of hypertensive patients with health records was extracted. Finally, 40 patients were selected through simple sampling method from each center. This included a total sample of 480 of which 463 patients participated voluntarily in this study (response rate about 96%). The inclusion criteria were as follows; people with primary hypertension, over 30 years old, patients with health information in the integrated health system, at least 6 months of hypertension medication, Ability to communicate and patients who were interested to participate in the study, and lack of vision and hearing disorders. The exclusion criteria were the incomplete completion of the questionnaires by the participants and pregnant women.

Measure

The data gathering tool was a questionnaire consisting of three parts that was completed using the self-report method. The first section included demographic variables such as age, gender, education level, insurance, family history of hypertension and so on. The second section included Persian Version of Medication Adherence Scale (PMAS-8). In this scale, the response categories are yes/no for seven items with dichotomous response options and a five-point Likert scale response option for the last item. The scores for the eight items were summed to create an overall adherence score ranging from 0 to 8, with higher scores indicating better adherence. The recommended cutoff point of 6 was used. An PMAS-8 score <6 indicated low adherence, a score = 8 was considered high adherence, and a score ≥6 and <8 indicated moderate adherence.[18] It was validated in a group of hypertensive patients, and the results showed good reliability and good validity.[18]

The third part included the HPM constructs: HPM constructs were modified from scale of Kamran *et al*.,[15] and 52 items were composed under eight constructs: (a) perceived benefits; (b) perceived barriers; (c) perceived self-efficacy; (d) activity-related affect; (e) interpersonal influences; (f) situational influences; (g) commitment to a plan of action; and (h) following medication regimen.

Perceived benefits, perceived benefits of medication adherence behavior included 8 items, which were rated on a 5-point scale ranging from 1 *(strongly disagree)* to 5 *(strongly agree)*. Higher scores indicated more patients' perceived benefits of adhering to the medication regimen (Cronbach's α in pilot study = 0.871).

Perceived barriers, 9 items were designed to measure the barriers to adherence of medication. The items were rated on a 5-point scale ranging from 1 *(strongly disagree) to 5 (strongly agree)*. Obtaining the higher score reflects more barriers to adherence to medication regimens among patients (Cronbach's α in pilot study = 0.874).

Perceived self-efficacy, 8 items were designed to measure the self-efficacy related with medication adherence behavior. The items were rated on a 5-point scale ranging from 1 *(strongly disagree) to 5 (strongly agree)*. Obtaining the higher score indicated higher self-efficacy regarding adherence to medication (Cronbach's α in pilot study = 0.910).

Activity-related affect, the feeling related with medication adherence behavior included 6 items, which were rated on a 5-point scale ranging from 1 *(never)* to 5 *(always)*. Higher scores indicated positive feelings about adherence to medication regimens (Cronbach's α in pilot study = 0.832).

Interpersonal and situational influences; Interpersonal and situational influences on adherence to the medication regimen were each measured with 4 items, which were rated on a 5-point scale ranging from 1 *(never)* to 5 *(always)*. Obtaining the higher score indicated more interpersonal and situational influences on adherence to medication regimens (Cronbach's α in pilot study for each construct = 0.750).

Commitment to a plan of action; 8 items were designed to measure patients' commitment to adherence of medication regimens. The items were rated on a 5-point scale ranging from 1 *(never) to 5 (always)*. Obtaining

the higher score indicated higher commitment to adherence of medication regimens (Cronbach's α in pilot study = 0.922).

Following medication regimen; follow-up to medication regimen was measured with 5 questions, which were rated on a 5-point scale ranging from 1 *(never)* to 5 *(always)*. Higher score indicates better follow-up of medication among patients (Cronbach's α in pilot study = 0.937).

The content validity of the questionnaires was confirmed based on the comments of 10 health education and promotion specialists. For this purpose, content validity ratios and Content Validity Index were estimated and approved.

All patients were informed about the quality of the implementation of the project, confidentiality of the information and the purpose of the project, and if they would like, they include to the study. Participants indicated their informed consent by clicking the "I Agree" button before completing the questionnaire. This study was conducted with approval from Hamadan University of Medical Sciences' institutional review board and ethical committee (ID: IR.UMSHA.REC.1396.910).

Data analysis

Data were analyzed by SPSS software version 18 (Inc, chicago, IL, U.S.A) using the Pearson correlation and linear regression. The significance level of the tests was considered to be 0.05.

Results

The mean and standard deviation of the participants' age was 61.29 ± 11.2 with a range of 30–92 years. 329 persons (71.1%) of the students were male and 353 persons (76.2%) of them were married. 71.9% of the participants had a family history of hypertension in first-degree relatives. More details of demographic characteristics of the participants are shown in Table 1.

Descriptive statistics (means, standard deviation and range of scores) of HPM constructs presented in Table 2. According to results, all constructs of HPM except perceived barriers was evaluated at a relatively desirable level. Also, the medication adherence behavior with 77.8% of the obtainable score was evaluated at a relatively desirable level.

Pearson correlation coefficients of HPM constructs are shown in Table 3. All HPM constructs except perceived barriers had significant positive correlation with each other ($P < 0.01$). Medication adherence behavior barriers was positively correlated with all HPM constructs, but there was a significant negative correlation with perceived barriers construct ($P < 0.01$).

Table 1: Summary statistics for characteristics of study participants (*n*=463)

Variables	Frequency (%)
Age (years)	
30-40	20 (4.3)
41-50	60 (13)
51-60	128 (27.6)
≥61	255 (55.1)
Gender	
Male	134 (28.9)
Female	329 (71.1)
Marital status	
Single	55 (43)
Marriage	73 (57)
Degree	
Illiterate	214 (46.2)
Under diploma	158 (34.1)
Diploma	68 (14.7)
Academic degrees	23 (5)
Occupation	
Clerk	17 (3.7)
Worker	20 (4.3)
Retired	95 (20.5)
Housewife	264 (57)
Self-employed	43 (9.3)
Unemployed	15 (3.2)
Other	9 (1.9)
Insurance	
Yes	400 (86.4)
No	63 (13.6)
BMI, kg/m^2	
≤19.99	12 (2.6)
20-24.99	103 (22.2)
25-29.99	200 (43.2)
≥30	148 (32)
Systolic BP, mmHg	
<140	322 (69.5)
≥140	141 (30.5)
Diastolic BP, mmHg	
<90	347 (74.9)
≥90	116 (25.1)
Drug use	
Regular	378 (81.6)
Irregular	80 (17.3)
No used	5 (1.1)
Drug change	
Yes	181 (39.1)
No	282 (60.9)

* BMI=Body mass index, SD=Standard deviation, BP=Blood pressure

Linear regression analysis was used to predict the medication adherence among hypertensive patients [Table 4]. According to the results, activity related affect (β = 0.232, $P < 0.001$), regimen follow-up (β = 0.225, $P < 0.001$), perceived barriers to action

(β = −0.169, $P < 0.001$) and perceived self-efficacy (β =0.196, $P < 0.001$) predicted medication adherence behaviors. In total, different constructs of the HPM explained 42.2% of the variance of the medication adherence behaviors changes.

Discussion

This study was conducted with the aim of investigating the factors affecting adherence to drug treatment regimen in hypertensive patients in Boroujerd city based on the Pender's HPM. The findings of the present study about the constructs status of the Pender's HPM, showed that the medication regimen follow-up structure had the highest frequency with 88.2% out of a maximum achievable score, and the perceived barriers of action had the lowest frequency with the score of 39.1%. Overall, most of the model structures in this study were evaluated at a relatively desirable level. Furthermore, participants of this study having a mean score of 32.9 out of a maximum score of 40, indicated that adherence to treatment was relatively favorable in this study. These findings are consistent with numerous studies such as the study of Tilea *et al*.,[19] Yassine *et al*.,[20] Mekonnen *et al*.,[21] Yue *et al*.,[22] Amaral *et al*.,[23] and Kamran *et al*. study.[14]

Table 2: Mean, standard deviation, and range of scores and percentage of mean from maximum obtainable score for Health Promotion Model constructs (*n*=463)

Variables	Mean±SD	Range of scores	Percentage
Perceived benefits	34.58±4.98	8-40	83.1
Perceived barriers	23.08±8.11	9-45	39.1
Perceived self-efficacy	34.23±5.71	8-40	81.9
Activity related affect	22.35±5.41	6-30	68.1
Interpersonal influences	17.84±2.85	4-20	86.5
Situational influences	17.21±3.09	4-20	82.5
Commitment to plan of action	35.26±5.96	8-40	85.1
Following medication regimen	22.64±3.71	5-25	88.2
Medication adherence behavior	32.90±6.85	8-40	77.8

SD=Standard deviation

Also, some studies reported the therapeutic adherence and drug compliance behavior of hypertensive patients at an undesirable level. We can mention the study of Meinema *et al*.,[24] Al-Ramahi *et al*.,[10] Yang *et al*.,[11] and Obirikorang *et al*.[25] as those ones. This difference in treatment adherence behaviors in studies can be attributed to different methods and tools of measurement.

Based on the findings of the present study, when we were evaluating the relationship between medicine adherence behavior status with demographic and clinical variables, we found that there was a significant relationship between medicine adherence of the participants with no tobacco and regular drug use. In other words, people with no history of tobacco use and patients who took their medicine regularly reported better adherence to medication compared to patients who had abnormal drug use. Different results about the relationship between medicine adherence and demographic variables are reported in various studies. In Osamor and Owumi study, people with primary education had more self-report adherence to treatment. Furthermore, having a history of hypertension was another potential factor affecting therapeutic adherence.[26] In the study of Meinema *et al*., people with less economic problems had higher drug adherence.[24] In Al-Ramahi *et al*. study, the one-way ANOVA showed that factors associated with poor drug adherence included younger age, living in the countryside or camps, low income, daily intake of more drugs, and no other chronic diseases.[10] In addition, in Nguyen *et al*. study, patients with older age had better drug adherence. But, there was no difference between male and female drug adherence.[27] In the study of Yang *et al*., adherence was significantly higher in older participants, people having insurance, and those with a higher level of awareness about hypertension.[11] Also, in the study of Amaral *et al*., there was a relationship between longer disease duration and adherence to treatment.[23] In addition, Yue *et al*. found that older age, longer duration of hypertension, longer duration of antihypertensive drugs use, and platelet aggregation drugs, in combination with antihypertensive drugs,

Table 3: Pearson correlation coefficients among the constructs of Health Promotion Model (*n*=463)

Variables	1	2	3	4	5	6	7	8	9
1. Perceived benefits	1								
2. Perceived barriers	−0.199**	1							
3. Perceived self-efficacy	0.469**	−0.291**	1						
4. Activity related affect	0.320**	−0.497**	0.444**	1					
5. Interpersonal influences	0.223**	−0.143**	0.287**	0.187**	1				
6. Situational influences	0.270**	0.408	0.385**	0.121**	0.322**	1			
7. Commitment to plan of action	0.305**	−0.208**	0.624**	0.388**	0.277**	0.381**	1		
8. Following medication regimen	0.282**	−0.135**	0.620**	0.368**	0.235**	0.422**	0.799**	1	
7. Medication adherence behavior	0.253**	−0.378**	0.516**	0.501**	0.170**	0.193**	0.429**	0.503**	1

**$P<0.01$

Table 4: Linear regression analysis to predict the medication adherence behavior based on the constructs of the Health Promotion Model

Independent variables	*B*	SE	β	*P*	Adjusted R^2 (%)
Perceived benefits	−0.037	0.057	−0.027	0.512	42.2
Perceived barriers	0.143	0.035	−0.169	<0.001	
Perceived self-efficacy	0.235	0.064	0.196	<0.001	
Activity related affect	0.294	0.057	0.232	<0.001	
Interpersonal influences	−0.045	0.093	−0.019	0.630	
Situational influences	−0.035	0.093	−0.016	0.708	
Commitment to plan of action	0.097	0.072	0.084	0.178	
Following medication regimen	0.416	0.116	0.225	<0.001	
Constant	11.461	2.688	-	<0.001	

n=128. *B*=Unstandardized regression coefficient, SE=Standard error

were significantly associated with higher adherence to therapy. No statistically significant relationship was seen between drug adherence with gender, education, family membership, distance to hospital, health insurance, income, medical expenses, number of concurrent diseases, number of medicines, and group of medications.[22]

According to another part of this study's findings, among the constructs of the Pender's HPM, perceived barriers of action, perceived self-efficacy, activity-related affect, and pharmaceutic diet follow-up had a significant role in explaining the variance of medicine adherence behavior among hypertensive patients. Among these variables, the activity-related affect was the strongest predictor of behavior. Overall, the model constructs used in this study explained 42.2% of the variance in drug adherence behavior. In this regard, the findings of the study done by Mirkarimi *et al*., showed that activity-related affect structures, situational influences, perceived self-efficacy, and perceived barriers of action predicted the commitment to plan of action in nutrition, respectively.[16] In Mohamadian *et al*. study, also the constructs of activity-related affect and perceived self-efficacy had the highest predictive power of teen girls' quality of life.[28] Perhaps, this is due to the positive feeling and satisfaction from doing the right thing. But, there are also studies reporting other structures as the strongest predictor of behavior. So that, in Kamran *et al*.'s study, the overall predictive power of the Pender's HPM for systolic blood pressure changes was 71.4%, and perceived barriers of action was the main predictor of patients' blood pressure.[14] This discrepancy may be because people tend to focus on the obstacles and negative factors justifying their unhealthy behavior. Yang *et al*. study also found that in the health belief model, perceived self-efficacy was the most important moderating variable affecting medicine adherence in hypertensive patients.[11] In the study of Kurnia *et al*., also the results showed that perceived self-efficacy and situational influences were the most significant predictors of self-management behavior in diabetic patients.[29] According to the mentioned points, different studies have reported variable structures affecting adherence behavior. This diversity may be due to the use of different patterns of behavior change with different structures or evaluation of different treatment adherence behaviors and other methodological factors.

Limitations of this study include the self-report nature of the questionnaire, the subjective nature and the semantic affinity of some of the questionnaire questions in different Pender's model constructs and the low literacy of some under study units.

Strengths and weaknesses of the study

The strengths of this study were the application of Pender's HPM, which provides the possibility of studying the different determinants of behaviors. This model focuses on the following three areas: individual characteristics and experiences, behavior-specific cognitions and affect, and behavioral outcomes. Another strength of this study was the focus on hypertensive patients covered by urban health centers, as most studies in this area have so far been conducted only among patients covered by rural health centers. One of the weaknesses of this study was the lack of attention to hypertensive patients receiving treatment from private health centers.

Innovation of the study

In previous studies conducted on the treatment adherence of the hypertensive patients without using the theories and models of behavior and behavior change in Iran, whereas the present study is the first one in Iran that had studied medication adherence among hypertensive patients using psychosocial models.

Conclusions

The results of this study indicate the good predictive power of the Pender's HPM regarding treatment adherence behavior of hypertensive patients. So, it is suggested that the future researches be done by performing some interventions regarding the impact of education on factors affecting the adherence to pharmacological and nonpharmacological treatment in patients with hypertension and other chronic diseases based on the Pender's model constructs.

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Conflicts of interest

There are no conflicts of interest.

References

1. World Health Organization. Hypertention USA: World Health Organization; 2019. Available from: https://www.who.int/news-room/fact-sheets/detail/hypertension. [Last accessed on 2019 Sep20].
2. Al-Ruthia YS, Hong SH, Graff C, Kocak M, Solomon D, Nolly R. Examining the relationship between antihypertensive medication satisfaction and adherence in older patients. Res Soc Adm Pharm 2017;13:602-13.
3. Baggarly SA, Kemp RJ, Wang X, Magoun AD. Factors associated with medication adherence and persistence of treatment for hypertension in a Medicaid population. Res Soc Adm Pharm 2014;10:e99-112.
4. Krzesinski JM, Leeman M. Practical issues in medication compliance in hypertensive patients. Res Rep Clini Cardiol 2011;2:63-70.
5. Axelsson M, Ekerljung L, Lundbäck B. The significance of asthma follow-up consultations for adherence to asthma medication, asthma medication beliefs, and asthma control. Nurs Res Pract 2015;2015:1-6.
6. Hameed MA, Dasgupta I. Medication adherence and treatment-resistant hypertension: A review. Drugs Context 2019;8:e212560.
7. Black JM, Hawks JH. Working together to grow libraries in developing countries. In: Medical Surgical Nursing: Clinical Management for Positive Outcomes. 8th ed. USA: Saunders; 2009.
8. Gupta M, Gupta DD, Sood A. Impact of awareness about hypertension on compliance to antihypertensive medication. Int J Basic Clin Pharmacol 2018;7:244-51.
9. Zhang Y, Li X, Mao L, Zhang M, Li K, Zheng Y, *et al*. Factors affecting medication adherence in community-managed patients with hypertension based on the principal component analysis: Evidence from Xinjiang, China. Patient Prefer Adherence 2018;12:803-12.
10. Al-Ramahi R. Adherence to medications and associated factors: A cross-sectional study among Palestinian hypertensive patients. J Epidemiol Glob Health 2015;5:125-32.
11. Yang S, He C, Zhang X, Sun K, Wu S, Sun X, *et al*. Determinants of antihypertensive adherence among patients in Beijing: Application of the health belief model. Patient Educ Couns 2016;99:1894-900.
12. Pender NJ, Murdaugh CL, Parsons MA, Ann M. Health Promotion in Nursing Practice. 4th ed. Upper Saddle River, N.J.: Prentice Hall; 2006.
13. Centers for Disease Control and Prevention. Vital signs: Awareness and treatment of uncontrolled hypertension among adults – United States, 2003-2010. MMWR Morb Mortal Wkly Rep 2012;61:703-9.
14. Kamran A, Azadbakht L, Sharifirad G, Mahaki B, Mohebi S. The relationship between blood pressure and the structures of Pender's health promotion model in rural hypertensive patients. J Educ Health Promot 2015;4:29-29.
15. Kamran A, Sharifirad G, Shafaeei Y, Azadbakht L. Sodium intake prediction with health promotion model constructs in rural hypertensive patients. Indian J Public Health 2015;59:102-8.
16. Mirkarimi SK, Maghsoudloo M, Ozouni-Davaji RB, Raeisi V, Charkazi A, Raeis M. The determinants of hypertension and commitment to implementing a nutrition program: Application of pender health promotion model. J Health Lit 2018;3:50-60.
17. Zare M, Asadi Z, Shahroodi MV, Bahrami-Taghanaki H. investigating the relationship between components of Pender's health promotion model and self-care behaviors among patients with smear-positive pulmonary tuberculosis. Evid Based Care J 2017;6:7-17.
18. Moharamzad Y, Saadat H, Nakhjavan Shahraki B, Rai A, Saadat Z, Aerab-Sheibani H, *et al*. Validation of the persian version of the 8-item morisky medication adherence scale (MMAS-8) in iranian hypertensive patients. Glob J Health Sci 2015;7:173-83.
19. Tilea I, Petra D, Voidazan S, Ardeleanu E, Varga A. Treatment adherence among adult hypertensive patients: A cross-sectional retrospective study in primary care in Romania. Patient Prefer Adherence 2018;12:625-35.
20. Yassine M, Al-Hajje A, Awada S, Rachidi S, Zein S, Bawab W, *et al*. Evaluation of medication adherence in Lebanese hypertensive patients. J Epidemiol Glob Health 2016;6:157-67.
21. Mekonnen HS, Gebrie MH, Eyasu KH, Gelagay AA. Drug adherence for antihypertensive medications and its determinants among adult hypertensive patients attending in chronic clinics of referral hospitals in Northwest Ethiopia. BMC Pharmacol Toxicol 2017;18:27.
22. Yue Z, Li C, Weilin Q, Bin W. Application of the health belief model to improve the understanding of antihypertensive medication adherence among Chinese patients. Patient Educ Couns 2015;98:669-73.
23. Amaral O, Chaves C, Duarte J, Coutinho E, Nelas P, Preto O. Treatment adherence in hypertensive patients – A cross-sectional study. Procedia Soc Behav Sci 2015;171:1288-95.
24. Meinema JG, van Dijk N, Beune EJ, Jaarsma DA, van Weert HC, Haafkens JA. Determinants of adherence to treatment in hypertensive patients of African descent and the role of culturally appropriate education. PLoS One 2015;10:e0133560.
25. Obirikorang Y, Obirikorang C, Acheampong E, Odame Anto E, Gyamfi D, Philip Segbefia S, *et al*. Predictors of noncompliance to antihypertensive therapy among hypertensive patients Ghana: Application of health belief model. Int J Hypertens 2018;2018:e4701097.
26. Osamor PE, Owumi BE. Factors associated with treatment compliance in hypertension in southwest Nigeria. J Health Popul Nutr 2011;29:619-28.
27. Nguyen TP, Schuiling-Veninga CC, Nguyen TB, Vu TH, Wright EP, Postma MJ. Adherence to hypertension medication: Quantitative and qualitative investigations in a rural Northern Vietnamese community. PLoS One 2017;12:e0171203.
28. Mohamadian H, Ardebili HE, Foroushani AR, Taghdisi MH, Shojaiezade D. Evaluation of Pender's health promotion model for predicting adolescent girls' quality of life. Sci J Sch Public Health Inst Public Health Res 2011;8:1-3.
29. Kurnia AD, Amatayakul A, Karuncharernpanit S. Predictors of diabetes self-management among type 2 diabetics in Indonesia: Application theory of the health promotion model. Int J Nurs Sci 2017;4:260-5.