Patient Preference and Adherence

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ORIGINAL RESEARCH

Factors Influencing Self-Care Practices and Blood Pressure Among Individuals with Uncontrolled Hypertension: A Cross-Sectional Study

Pawitra Jariyasakulwong[1], Doungrut Wattanakitkrileart[1], Kanaungnit Pongthavornkamol[1], Noppawan Piaseu[2], Weranuj Roubsanthisuk[3]

[1]Department of Medical Nursing, Faculty of Nursing, Mahidol University, Bangkok, Thailand; [2]Ramathibodi School of Nursing, Faculty of Medicine, Ramathibodi Hospital, Mahidol University, Bangkok, Thailand; [3]Division of Hypertension, Department of Medicine, Faculty of Medicine Siriraj Hospital, Mahidol University, Bangkok, Thailand

Correspondence: Doungrut Wattanakitkrileart, Department of Medical Nursing, Faculty of Nursing, Mahidol University, Bangkok, Thailand, Email doungrut.wat@mahidol.ac.th

Introduction: Self-care practices are crucial for optimizing blood pressure control and are influenced by multilevel factors.

Objective: To examine the influences of multilevel factors on hypertension self-care practices among individuals with uncontrolled hypertension and to determine the relationship between hypertension self-care practices and blood pressure.

Methods: The study was conducted in primary, secondary, and tertiary care settings in Bangkok, selected for convenience, where individuals with uncontrolled hypertension were recruited using a convenience sampling method based on specific inclusion criteria. Data were collected using a demographic questionnaire, the Hypertension Knowledge Level Scale, the Newest Vital Sign, the Self-Efficacy to Manage Hypertension Scale, the revised Thai Multidimensional Scale of Perceived Social Support, the Communication Assessment Tool-Nurse, the Neighborhood Scales, and the Hypertensive Self-Care Activity Level Effects. The Cronbach's alpha coefficients were 0.82, 0.84, 0.81, 0.92, 0.96, 0.73, and 0.72 to 0.96, respectively. Data were analyzed using descriptive statistics, logistic regression, and Pearson's correlation.

Results: A total of 326 participants were included and 80.1% of them had poor hypertension self-care practices. Individuals with moderate social support were 2.23 times more likely to have poor hypertension self-care practices compared to those with high social support (OR = 2.23; 95% CI = 1.11, 4.49; p-value < 0.05). Each unit increase in poorer resources was associated with a 1.05 times higher likelihood of poor hypertension self-care practices (OR = 1.05; 95% CI = 1.02, 1.09; p-value < 0.05). Four out of six domains of hypertension self-care practices—medication adherence, physical activity, smoking status, and alcohol consumption—were significantly associated with diastolic blood pressure ($r = -0.17$, $p < 0.01$; $r = -0.11$, $p < 0.05$; $r = 0.23$, $p < 0.01$; and $r = 0.15$, $p < 0.05$, respectively).

Conclusion: Hypertension self-care practices could be improved through multilevel factors, including social support and neighborhood resources.

Keywords: uncontrolled hypertension, self-care, social support, neighborhood resource

Introduction

Hypertension poses a major global health challenge, affecting approximately 31.1% of adults worldwide, which equates to about 1.39 billion people, and contributing to 9.4 million deaths annually.[1] In Thailand, hypertension prevalence increased from 24.7% in 2013 to 25.4% in 2021.[2] Despite treatment efforts, only about half of those with hypertension receive treatment, and more than 75% of treated patients cannot control their blood pressure effectively.[2] The central region, which includes Bangkok, showed a significant association with elevated rates of uncontrolled hypertension ($p < 0.001$).[3] In Bangkok, the capital and a highly populated urban area, the prevalence of uncontrolled hypertension reached a concerning level of approximately 60%.[4] Uncontrolled hypertension is characterized by an average systolic blood pressure (SBP) of ≥140 mmHg and/or diastolic blood pressure (DBP) of ≥ 90 mmHg.[5,6]

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Uncontrolled hypertension increases the risk of severe complications, such as cardiovascular diseases, chronic kidney disease, and premature death.[7–9] It also exacerbates mental health issues, including depression, particularly in individuals with coexisting cardiovascular conditions or a history of stroke.[10,11] Beyond the physical and mental burden, the healthcare and economic burdens of hypertension are substantial. Untreated, undetected, or uncontrolled hypertension is likely to result in more expensive treatments for its complications.[12–14]

Lifestyle modifications, a non-pharmacological approach to managing hypertension, are supported by substantial evidence. Recommended changes include weight reduction, reducing dietary sodium, increasing physical activity, following the dietary approaches to stop hypertension (DASH) diet eating plan, moderating alcohol consumption, and avoiding tobacco.[15,16] These lifestyle changes need to be sustained over a lifetime for optimal blood pressure control.

While lifestyle changes form the foundation for managing hypertension, they are often most effective when combined with proper medication adherence. Medication adherence is crucial for effective blood pressure management and involves patients taking medications as prescribed. This adherence is influenced by factors such as demographics, health profiles, social support, cognitive aspects, healthcare system features, and medication-specific issues.[17–19] Targeted interventions to improve medication adherence have been shown to enhance health outcomes and control blood pressure.[20–23]

Effective lifestyle modifications, such as weight reduction, can lower blood pressure by 5–20 mmHg per 5 kilograms lost; engaging in physical activity, like 30 minutes of brisk walking daily, can reduce blood pressure by 4–9 mmHg; and reducing sodium intake to less than 2.4 grams per day can lower systolic blood pressure by 2–8 mmHg.[15,16] Moderating alcohol consumption can reduce systolic blood pressure by 2–4 mmHg, while avoiding tobacco is crucial, as smoking increases both blood pressure and cardiovascular risk.[24–26]

Several studies have explored hypertension self-care practices, including medication adherence and lifestyle modifications among hypertensive patients. These studies identified factors associated with hypertension self-care, mostly focused on personal factors and interpersonal factors.[27–29] Despite the presence of effective practices and numerous studies,[20–23] uncontrolled hypertension remains a widely recognized public health concern, and sustaining these effective practices is challenging. This suggests that there may be gaps in our understanding of uncontrolled hypertensive patients. To improve both our understanding and self-care practices for these patients, it is necessary to explore a broader range of factors. However, fewer studies have examined multi-level factors simultaneously within the uncontrolled hypertensive population. Therefore, exploring these multi-level factors is crucial for gaining a comprehensive understanding of hypertension management and developing effective, cost-efficient interventions.

The ecological model of human development, proposed by Bronfenbrenner (1994), provides a framework for understanding behavior change by identifying multiple levels of influence, including individual and environmental factors.[30] McLeroy et al (1988) adapted this model to focus on individual and social environmental factors in health promotion, positing that changes in the social environment can lead to changes in individual behavior. The model includes five levels of influence: intrapersonal, interpersonal, institutional/organizational, community, and public policy.[31]

Individual behaviors are influenced by personal characteristics such as knowledge, literacy, and self-efficacy. Interactions with family members, colleagues, and friends play a key role in shaping these behaviors. Additionally, relationships within organizations, institutions, and informal networks where individuals live and work impact their behaviors. Furthermore, public health aspects, including regulatory policies, procedures, and laws, create a framework that influences individual health behaviors.[31]

Hypertension knowledge, health literacy, and self-efficacy were selected to represent the intrapersonal level. Knowledge about hypertension and self-efficacy were found to improve recommended behaviors.[32,33] While the majority of studies indicate that knowledge positively influences self-care,[34,35] some research has reported contrasting findings, suggesting that knowledge may not have a significant relationship with self-care behaviors.[36] As mentioned, self-efficacy has been predominantly found to influence self-care practices.[32] However, fewer studies have examined self-efficacy concurrently with factors across various levels within the framework of the ecological model. An integrative review of health literacy and health outcomes in hypertension showed consistent evidence between health literacy and knowledge, but inconsistent between health literacy to clinical outcomes, and behavior outcomes.[37] Knowledge and literacy are closely related terms, but they are different. Hypertension knowledge refers to understanding facts related to hypertension, including its definition, medical treatments, medication adherence, lifestyle modifications, dietary considerations, and

potential complications.[38] On the other hand, health literacy is defined as the ability of individuals to acquire, process, understand, and communicate health-related information needed to make informed decisions about their health.[39,40]

Patient-nurse communication and social support from family, friends, and significant individuals were selected to represent the interpersonal level, as these groups maintain close relationships with patients. Social support has been shown to influence self-care behaviors among hypertensive patients.[41] However, limited research has focused on social support simultaneously with factors across multiple levels of the ecological model framework. Additionally, effective patient-provider communication plays a crucial role in fostering motivation and serves as an impactful strategy for influencing patients' health behaviors.[42] However, fewer studies have examined the impact of patient-nurse communication on self-care practices among patients with uncontrolled hypertension in Thailand.

Neighborhood resource was selected to represent the community level due to their relevance to physical activity and a healthy diet, both of which are essential for lifestyle modification in hypertensive patients. Research indicates that the neighborhood environment is associated with hypertension self-care.[43] For example, the availability of parks and a safe environment has been linked to improved physical activity outcomes.[44] Similarly, another study found an association between the neighborhood food environment and the risk of hypertension.[45] Nevertheless, only a limited number of studies have considered neighborhood environmental factors in relation to self-care practices among individuals with hypertension within the Thai context.

The health insurance scheme was selected to represent the policy level in Thailand. Thailand's health insurance schemes are different from other nations. Under the Universal Coverage Scheme, all Thai citizens are entitled to basic health coverage, which ensures free access to essential healthcare services. Furthermore, individuals may transition to alternative insurance schemes depending on their employment status or organizational affiliation. One study found that health insurance schemes influence health outcomes and the quality of care for individuals with hypertension.[46] However, limited evidence exists regarding the impact of health insurance schemes on self-care practices, which are crucial for hypertensive patients.

The application of the ecological model in the context of Thailand is indeed worth exploring further to ensure its appropriateness. These investigations would provide valuable insights into how the model aligns with the cultural, social, environmental, and healthcare systems of the country. This approach would enhance our ability to address the complexities of hypertension and identify specific adaptations or modifications required for improving outcomes among patients with uncontrolled hypertension in Thailand's context.

Objective

To examine the influences of hypertension knowledge, health literacy, self-efficacy in managing hypertension, patient-nurse communication, social support, neighborhood resources, and health insurance schemes on hypertension self-care practices among individuals with uncontrolled hypertension at multiple levels (personal, interpersonal, community, and policy) and to determine the relationship between hypertension self-care practices and blood pressure.

Method

Research Questions

1. Do hypertension knowledge, health literacy, self-efficacy to manage hypertension, patient-nurse communication, social support, neighborhood resources, and health insurance schemes predict hypertension self-care practices of individuals with uncontrolled hypertension?
2. Does the relationship between hypertension self-care practices and blood presssure exist?

Study Design and Setting

This was a cross-sectional study. The study population included hypertensive patients who came for follow-up visits and received treatment at three different hospital settings in Health Region 13 (Bangkok, Thailand): primary care (Primary Care Unit, Siriraj Hospital), secondary care (Ratchaphiphat Hospital), and tertiary care (Siriraj Hospital). Data were collected from January 2020 to May 2020.

Participants

The sample for this study consisted of 326 participants, using a convenience sampling method with refined inclusion and exclusion criteria including both male and female patients with uncontrolled hypertension. Eligible participants need to meet the following inclusion criteria: those who had been diagnosed with primary (essential) hypertension and were aware of their condition for more than six months; those having uncontrolled hypertension, defined as a systolic blood pressure of 140 mmHg or higher and/or a diastolic blood pressure of 90 mmHg or higher; those taking at least one type of antihypertensive medication; those able to read, write, and verbally communicate in Thai.

Participants were excluded from the study if they were older than 60 years and scored less than 3 points on the Mini-Cog screening for cognitive impairment.[47] Those with limitations for physical activity, such as arthritis, injury, or post-surgery conditions, were also excluded. Furthermore, individuals with severe illnesses, comorbidities, and complications, including end-stage renal disease and advanced-stage cancer, as documented in their medical records, were not included in the study.

The study was conducted following the ethical principles outlined in the Declaration of Helsinki, focusing on the autonomy of participants, the balance of benefits and risks, and the protection of participants' privacy and confidentiality. Participants were fully informed about the study and provided their consent before participation. All responses were kept strictly confidential. To ensure anonymity, each participant was assigned a unique code number, and no personal names were reported.

Data Collection

Data collection began after obtaining each hospital's Institutional Review Board (IRB) approval. Nurses announced the project, and eligible patients were screened based on inclusion criteria. The researcher informed participants about the study and their rights to withdraw from the study at any time, assuring them that their decision to participate would not impact their care or treatment. After providing consent, participants completed the questionnaires. The researcher managed any health-related symptoms and reviewed OPD cards or medical records for supplementary information. Participants were thanked after completing the process.

Measures

Demographic Information

Demographic information includes gender, age, health insurance schemes, education, occupation, income, marital status, and household members. Health information encompasses blood pressure, height, weight, body mass index, duration of hypertension, comorbidities, complications, and details of antihypertensive medication prescribed (name, dose, and frequency). Healthcare setting information was categorized into three levels: primary care, secondary care, and tertiary care.

Predictor and Outcome Variables

The multilevel predictor factors include hypertension knowledge, health literacy, self-efficacy in managing hypertension, patient-nurse communication, social support, neighborhood resources, and health insurance schemes. The outcome variables are hypertension self-care practices and blood pressure.

Hypertension Knowledge

Hypertension knowledge refers to the facts, information, and skills about hypertension that an individual with uncontrolled hypertension acquires through experience or education. The Hypertension Knowledge Level Scale (HK-LS)[38] was used to evaluate this knowledge. The scale consists of 21 items divided into six sub-dimensions. Examples of items include statements such as: "High diastolic or systolic blood pressure indicates increased blood pressure" and "If individuals with increased blood pressure change their lifestyles, there is no need for treatment". The participants respond to each item by selecting "correct", "incorrect", or "do not know/not sure". Possible scores range from 0 to 21, with each correct response earning 1 point. Total scores are classified into three levels based on Bloom's cutoff points: good, moderate, and poor levels of hypertension knowledge. A higher score indicates a greater level of knowledge about hypertension. The instrument demonstrated good internal consistency, with a Cronbach's alpha coefficient of 0.82.[38]

Health Literacy

Health literacy refers to the ability to understand, interpret, and use health information of individuals with uncontrolled hypertension in ways that promote and maintain good health. The Newest Vital Sign (NVS) instrument was used to assess health literacy.[48] This instrument includes a nutrition label followed by six questions related to the information on the food label. For instance, "If you eat the entire container, how many calories will you eat?" and "If you are allowed to eat 60 grams of carbohydrates as a snack, how much ice cream could you have?". Each question is scored as either correct or incorrect, with possible scores ranging from 0 to 6. A higher score indicates a higher level of health literacy. The NVS instrument demonstrated high internal consistency, with a Cronbach's alpha of 0.84.[49]

Self-Efficacy to Manage Hypertension

Self-efficacy to manage hypertension refers to the perception of individuals with hypertension about their ability to engage in the recommended behaviors for managing their condition. The Self-Efficacy to Manage Hypertension Scale was used to assess this concept.[50] This scale consists of five items, with scores ranging from 1 to 10. Examples of the items include questions such as: "How confident are you that you can do all the things necessary to manage your high blood pressure on a regular basis?" and "How confident are you that you can judge when changes in your high blood pressure mean you should visit a doctor?". A higher score reflects greater perceived self-efficacy in managing hypertension. The instrument demonstrated good reliability, with a Cronbach's alpha coefficient of 0.81.[50]

Social Support

Social support refers to the extent to which individuals with uncontrolled hypertension feel their support needs are met by significant others, family, and friends. Social support was assessed using the revised Thai Multidimensional Scale of Perceived Social Support (r-T-MSPSS) questionnaire.[51] This questionnaire measures perceived social support from three sources: significant persons, family, and friends. It consists of 12 items including statements such as: "There is a special person who is around when I am in need", "My family is willing to help me make decisions", and "I can talk about my problems with my friends". Each item was rated on a 7-point Likert scale. Scores range from 1 to 7, with higher scores indicating greater perceived social support. The r-T-MSPSS demonstrated high internal consistency, with a Cronbach's alpha of 0.92.[51]

Patient-Nurse Communication

Patient-nurse communication refers to the perception of individuals with uncontrolled hypertension about the effectiveness of their communication with individual nurses. It was assessed using the Communication Assessment Tool for Nurses (CAT-N).[52] This tool employs a 5-point scale (poor, fair, good, very good, excellent) to measure participants' perceptions of nurses' interpersonal and communication skills. Examples of items include statements such as: "The nurse greeted me in a way that made me feel comfortable" and "Informed me about my plan of care". Scores range from 1 to 5, with the developers of CAT recommending dichotomized scoring based on the percentage of "excellent" responses. The tool demonstrated good internal consistency, with a Cronbach's alpha of 0.96.[52]

Neighborhood Resources

Neighborhood resources refer to the availability and support for individuals with uncontrolled hypertension within their local environment, including factors such as walkability and the availability of healthy foods. Neighborhood resources were assessed using the Neighborhood Scales.[53] Responses for each item on the scale ranged from 1 to 5, with higher scores indicating poorer neighborhood resources. Examples of items include statements such as: "My neighborhood offers many opportunities to be physically active", "In my neighborhood, it is easy to walk places", and "A large selection of fresh fruits and vegetables is available in my neighborhood". The Neighborhood Scales demonstrated acceptable internal consistency, with a Cronbach's alpha coefficient of 0.73.[54]

Health Insurance Scheme

Health insurance scheme refers to the healthcare coverage options available to individuals with uncontrolled hypertension. This right is categorized into three schemes: the Universal Coverage Scheme (UCS), the Social Security Scheme (SSS), and the Civil Servant Medical Benefit Scheme (CSMBS). Information on health insurance schemes was collected from the demographic data sheet.

Hypertension Self-Care Practices

Hypertension self-care practices refer to healthcare activities performed by individuals with hypertension that align with recommended behaviors based on guidelines such as the Thai guidelines on hypertension treatment and the Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure (JNC 7). These practices encompass six aspects: medication adherence, low-salt diet, physical activity, smoking cessation, weight management, and alcohol consumption. Hypertension self-care practices were evaluated using the Hypertension Self-Care Activity Level Effects (H-SCALE).[55] The questionnaire consists of six domains, which capture the number of days in the past week that an individual engaged in activities such as taking anti-hypertensive medication and doing at least 30 minutes of physical activity. Each item in weight management domain is rated on a 5-point Likert scale, which includes statements such as: "In order to lose or maintain my weight, I am careful about what I eat". Each domain is scored separately, and adherence or non-adherence to self-care practices is interpreted accordingly. Participants who responded affirmatively to four or more domains of the H-SCALE were considered to have good hypertension self-care practices; otherwise, their practices were classified as poor.[27] The internal consistency of the subscales was demonstrated by Cronbach's alpha values ranging from 0.72 to 0.96 for the domains of medication, weight management, physical activity, tobacco exposure, alcohol consumption, and salt diet, respectively.[55]

Blood Pressure

Blood pressure refers to the average values of systolic blood pressure (SBP) and diastolic blood pressure (DBP), based on the average of three properly taken measurements. Blood pressure was evaluated using values from the medical record and re-measured by the researcher. Uncontrolled blood pressure in individuals with hypertension is defined as an average SBP of $\geq$ 140 mmHg and/or an average DBP of $\geq$ 90 mmHg.[56] The classification of uncontrolled blood pressure includes three levels: Level 1 with SBP 140–159 mmHg and/or DBP 90–99 mmHg; Level 2 with SBP 160–179 mmHg and/or DBP 100–109 mmHg; and Level 3 with SBP $\geq$ 180 mmHg and/or DBP $\geq$ 110 mmHg, based on the classification of office blood pressure and definitions of hypertension grade.[57]

Study Size Estimation

The sample size was determined using a statistical test of proportions via the G*Power program with the following input parameters: a significance level (p-value) of 0.05, power of 0.8 and proportion (p2) of 0.831 derived from previous research on self-efficacy and smoking status in self-care activities.[50] The required sample size was calculated to ensure the validity of the study variables, which was 296 participants. To account for potential data incompleteness, an additional 10% of the sample size (30 participants) was added. Therefore, the estimated sample size for this study was 326 participants.

Participants were recruited from three different healthcare settings based on the proportion of uncontrolled hypertensive patients. Specifically, the numbers of uncontrolled hypertensive patients were 88, 155, and 83 in primary, secondary, and tertiary care settings, respectively. The number of participants in each setting was based on the proportion of uncontrolled hypertension patients randomly selected from across four regions of Thailand, categorized by level of healthcare setting (primary, secondary, and tertiary).

Statistical Methods

The Statistical Package for the Social Sciences for Windows (SPSS) version 22.0 was used for data analysis. The statistical methods employed included descriptive statistics, logistic regression analysis, and Pearson's correlation.

Descriptive statistics, such as frequency, percentage, mean, and standard deviation, were used to summarize demographic data and describe participant characteristics. Binary logistic regression analysis was conducted to determine the effects of multi-level factors on the likelihood of hypertension self-care practices. The dependent variable, hypertension self-care practices, was coded as 0 for good self-care practices and 1 for poor self-care practices. The independent variables, representing multi-level factors, hypertension knowledge, health literacy, self-efficacy in managing hypertension, patient-nurse communication, social support, neighborhood resources, and health insurance schemes.

Pearson product-moment correlation analysis was performed to examine the relationships between blood pressure and hypertension self-care practices, including medication adherence, healthy eating, and physical activity, smoking status, weight management, and alcohol consumption.

Result

Characteristics of Participants

A total of 326 participants were recruited for the study. The majority of participants in this study were female (61%). Approximately 76.1% of participants were older than 60 years, with ages ranging from 33 to 90 years (Mean = 66.78 years, SD = 10.24). About half of the participants had completed primary school (50.9%), while 21.8% had completed high school. More than half of the participants were unemployed (57.7%), with 17.2% self-employed and 10.4% retired. Monthly incomes ranged from 0 to 60,000 baht (Mean = 9,109 baht, SD = 11,007 baht). More than half of the participants had sufficient income but no savings (53.4%), and over a quarter had insufficient income (26.7%). Most participants lived with their families (93.3%), and 58.6% were married. Fifty-one percent of the participants had been diagnosed with hypertension for more than 10 years. The duration of hypertension ranged from 1 to 54 years (Mean = 12.9, SD = 9.42). The average body mass index (BMI) was 26.43 kg/m² (SD = 5.22). Among the participants, 39.6% had two comorbidities, approximately one-third (33.1%) had three or more comorbidities, and only 6.8% had no comorbidities. The number of prescribed anti-hypertensive medications ranged from 1 to 6 types. (Mean = 2.49, SD = 1.21). The frequency of antihypertensive medication administration ranged varied from 1 to 4 times daily. (Mean = 1.71, SD = 0.87). Calcium channel blockers (CCBs) were the most frequently prescribed (71.4%), followed by beta-blockers (BBs) (48.9%), aldosterone receptor blockers (ARBs) (38.2%), diuretics (21.8%), direct vasodilators (19.1%), angiotensin-converting enzyme inhibitors (ACEIs) (18.5%), and alpha-1 blockers (16.9%). The majority of participants had systolic blood pressure (SBP) at the clinic within the range of 140–159 mmHg and diastolic blood pressure (DBP) of 90–99 mmHg (70.6%). The Universal Coverage Scheme (UCS), Civil Servant Medical Benefit Scheme (CSMBS), and Social Security Scheme (SSS) were used to access healthcare services by 69.9%, 20.9%, and 4.0% of participants, respectively. Other types of payments, including self-paid and government enterprises, accounted for 5.2%. In total, 88 participants were enrolled from a primary care setting (Primary Care Unit, Siriraj Hospital), 155 from a secondary care setting (Ratchaphiphat Hospital), and 83 from a tertiary care setting (Siriraj Hospital). (Table 1).

Hypertension Self-Care Practices

The dependent variable was hypertension self-care practices, which included medication adherence, eating a healthy diet, physical activity, non-smoking, weight management, and alcohol consumption. The score for each domain was categorized as adherence or non-adherence based on the cut-off point of the instrument. Patients who adhered to four or more of these six domains were considered to have "good self-care practices".[27] Descriptive statistics were used to report the number and percentage of good and poor hypertension self-care practices. The majority of the participants in this study were found to have poor hypertension self-care practices (80.1%).

In terms of individual domains, 72.4% of participants adhered to their medication regimen, while only 9.8% followed a healthy diet. Adherence to physical activity was 24.2%, and 77.0% of participants refrained from smoking. For weight management, adherence was just 3.1%, while 94.8% adhered to guidelines on alcohol consumption (Table 2).

Correlations Between Hypertension Self-Care Practices and Blood Pressure

A Pearson product-moment correlation was conducted to examine the relationships between hypertension self-care practices (medication adherence, eating a healthy diet, physical activity, smoking status, weight management, and alcohol consumption) and blood pressure. Medication adherence and physical activity were weakly and negatively related to diastolic blood pressure, with correlation coefficients of $r = -0.17$, $p < 0.01$, and $r = -0.11$, $p < 0.05$, respectively. Smoking status and alcohol consumption were weakly and positively related to diastolic blood pressure, with correlation coefficients of $r = 0.23$, $p < 0.01$, and $r = 0.15$, $p < 0.05$, respectively. No significant relationships were found between eating a healthy diet or managing weight and either systolic or diastolic blood pressure (Table 3).

Table 1 Number and Percentage of Individuals with Hypertension by Characteristics (N = 326)

Characteristic	N	%
Gender		
Male	127	39.0
Female	199	61.0
Age (years)		
18–40	5	1.5
41–60	73	22.4
> 60	248	76.1
Mean ± SD 66.78 ± 10.24, **Min-Max** 33–90		
Education		
None	20	6.1
Primary school	166	50.9
High school	71	21.8
High vocational certificate	26	8.0
Bachelor	41	12.6
Higher than Bachelor	2	0.6
Occupation		
Unemployed	188	57.7
Agriculturist	9	2.8
Labor	27	8.3
Own business/ self-employed	56	17.2
Factory worker	8	2.5
Government service/ State enterprise	4	1.2
Retired	34	10.4
Income (Bath)		
Mean ± SD 9109.2 ± 11,007.1, **Min-Max** 0–60000		
Income sufficiency		
Insufficient	87	26.7
Sufficient without savings	174	53.4
Sufficient with savings	65	19.9
Marital status		
Single	35	10.7
Married	191	58.6
Widowed	73	22.4

(*Continued*)

Table 1 (Continued).

Characteristic	N	%
Divorced/ separated	27	8.3
Persons who live with		
Alone	20	6.1
Friend	1	0.3
Family	304	93.3
Other (senior care center)	1	0.3
Duration of hypertension (years)		
< 5	66	20.2
5–10	93	28.5
> 10	167	51.2
Body Mass Index: BMI (kg/m^2)		
Underweight (< 18.5)	10	3.1
Normal (18.5–22.9)	75	23.0
Overweight (23.0–24.9)	62	19.0
Obese grade 1 (25.0–29.9)	106	32.5
Obese grade 2 (≥ 30)	73	22.4
Comorbidities		
No-Comorbidities	22	6.8
One co-morbidity	67	20.6
Two co-morbidities	129	39.6
≥ Three co-morbidities	108	33.1
Blood pressure level at clinic (mmHg)		
SBP 140–159 and/or DBP 90–99	230	70.6
SBP 160–179 and/or DBP 100–109	81	24.8
SBP ≥ 180 and/or DBP ≥ 110	15	4.6
Anti-hypertensive medication class used (patients may receive more than one class of medication)		
CCBs	232	71.4
BBs	159	48.9
ARBs	124	38.2
Diuretics	71	21.8
Direct vasodilators	62	19.1
ACEIs	60	18.5

(*Continued*)

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Table 1 (Continued).

Characteristic	N	%
Alpha-1 blockers	55	16.9
Nitrate	32	9.8
Central alpha-2 agonists	8	2.5
Number of anti-hypertensive medication pills used/ day		
1	75	23.1
2	106	32.6
3	81	24.9
4	41	12.6
5	17	5.2
6	5	1.5
Health service information		
Universal Coverage Scheme (UCS)	228	69.9
Civil Servant Medical Benefit Scheme (CSMBS)	68	20.9
Social Security Scheme (SSS)	13	4
Others (Government enterprise, Self-paid)	17	5.2
Level of healthcare setting		
Primary care	88	27.0
Secondary care	155	47.5
Tertiary care	83	25.5

Notes. ACEIs, angiotensin-converting enzyme inhibitors; BBs, beta-blockers; CCBs, calcium channel blockers; ARBs, aldosterone receptor blockers; SBP, systolic blood pressure; DBP, diastolic blood pressure.

Table 2 Number and Percentage of Hypertension Self-Care Practices (N = 326)

Variables	Categories	N	%
Hypertension self-care practices	Good	65	19.9
	Poor	261	80.1
Medication adherence	Adherence	236	72.4
	Non-adherence	90	27.6
Eating a healthy diet	Adherence	32	9.8
	Non-adherence	294	90.2
Physical activity	Adherence	79	24.2
	Non-adherence	247	75.8
Smoking status	Adherence	251	77.0

(*Continued*)

Table 2 (Continued).

Variables	Categories	N	%
	Non-adherence	75	23.0
Weight management	Adherence	10	3.1
	Non-adherence	316	96.9
Alcohol consumption	Adherence	309	94.8
	Non-adherence	17	5.2

Table 3 Person's Correlations Between Hypertension Self-Care Practices and Blood Pressure (N = 326)

Variables	1	2	3	4	5	6	7	8
1. Medication adherence	1							
2. Eating a healthy diet	−0.01	1						
3. Physical activity	0.02	0.23**	1					
4. Smoking status	0.00	−0.06	−0.05	1				
5. Weight management	0.12*	0.22**	0.32**	−0.08	1			
6. Alcohol consumption	−0.08	−0.00	−0.00	0.10	−0.00	1		
7. Systolic blood pressure	−0.07	−0.08	−0.05	0.08	−0.11	−0.07	1	
8. Diastolic blood pressure	−0.17**	0.01	−0.011*	0.23**	−0.06	0.15**	0.26**	1

Note: * Correlation is significant at the 0.05 level. **Correlation is significant at the 0.01 level.

Association Between Predictors and Hypertension Self-Care Practices

A binary logistic regression analysis was conducted to assess the influence of various multi-level factors on the likelihood of engaging in hypertension self-care practices. The dependent variable was hypertension self-care practices, and the independent variables included in the analysis were hypertension knowledge, health literacy, self-efficacy in managing hypertension, patient-nurse communication, social support, neighborhood resources, and health insurance schemes. The stepwise backward method was employed to refine the logistic regression model by systematically removing non-significant variables. The variables removed in the process included hypertension knowledge, self-efficacy to manage hypertension, health literacy, and health insurance schemes.

The analysis revealed that social support and neighborhood resources significantly affected hypertension self-care practices. The chi-square goodness-of-fit test yielded a value of 1.217 with a p-value greater than 0.05 ($p = 0.996$), indicating that the data fit the model well. Among the significant predictors, the adjusted odds ratio for moderate social support was 2.233. This suggests that individuals with moderate social support were approximately 2.2 times more likely to exhibit poor hypertension self-care practices compared to those with high social support (95% CI = 1.111–4.489). The adjusted odds ratio for neighborhood resources was 1.052, indicating that for each additional unit increase in the neighborhood resource score (reflecting worse resources), individuals were 1.052 times more likely to have poor hypertension self-care practices (95% CI = 1.015–1.091) (see Table 4).

Discussion

Based on the ecological model for health promotion, hypertension self-care practices were examined as the primary outcome, influenced by factors at different levels.[31] These levels include intrapersonal factors such as self-efficacy,

Table 4 Logistic Regression of Independent Variables on Hypertension Self-Care Practices (N = 326)

Independent Variables	B	S.E.	p-value	OR	95% CI for Exp(B)	
					Lower	Upper
Social support						
High	Ref.					
Moderate	0.80	0.36	0.02	2.23	1.11	4.49
Low	0.87	0.59	0.14	2.37	0.75	7.57
Neighborhood Resources	0.05	0.02	0.01	1.05	1.02	1.09

Notes: Hosmer and Lemeshow test: Chi-square = 1.22, *df* = 8, p = 0.996. −2 Log likelihood = 305.23. Model chi-square = 20.48, *df* =4, p = <0.001. Cox & Snell R2 = 0.06; Nagelkerke R2 = 0.096. Statistically significant at p < 0.05.

knowledge about hypertension, and health literacy; interpersonal factors such as patient-nurse communication and social support; community-level factors such as neighborhood resources; and policy-level factors like health insurance schemes. The results indicated that neighborhood resources and social support were the most influential factors in hypertension self-care practices. According to the ecological model, self-efficacy is an intrapersonal factor, and social support is an interpersonal factor. Thus, participants' hypertension self-care practices were affected by factors at multiple levels surrounding them.[30]

Intrapersonal Level

Hypertension Knowledge

The average hypertension knowledge score was 17.14 (SD = 2.38), with scores ranging from 5 to 21, indicating a good level of knowledge among 65.9% of participants. This level of knowledge is comparable to a study in Ethiopia (60%),[27] but lower than in Saudi Arabia (73%)[58] and higher than in India (57.5%)[59] and China (15.7%).[60] The relatively high knowledge score may be attributed to the fact that 79.7% of participants had been diagnosed with hypertension for over five years and likely received self-care instructions from healthcare professionals. Despite the high level of knowledge, the study found no significant effect of hypertension knowledge on self-care practices, consistent with findings from Kathmandu.[59] However, other studies have shown a relationship between knowledge and self-care practices.[33,58] The results suggest that knowledge alone may not be sufficient to improve self-care practices among hypertensive patients.

Health Literacy

The average health literacy score in this study was 0.10 (SD = 0.68), with scores ranging from 0 to 6. This finding aligns with previous studies that found no direct correlation between health literacy and self-care behaviors. The low health literacy score may be due to the requirement for calculation skills, which can be challenging for patients unfamiliar with these skills. Additionally, the elderly participants (76.1%) may have struggled with complex scenarios requiring critical thinking. Previous research suggests that health literacy's impact on hypertension self-care behavior might be mediated by self-efficacy.[61,62] Health literacy involves the ability to seek, comprehend, and use information to make informed health decisions and engage in self-care practices. The low health literacy score among elderly participants could imply that additional factors are necessary for effective self-care. Other studies have reported a significant relationship between health literacy and self-care management.[63–65] The differences in results may be influenced by the use of different tools, variations in study populations, and differences in study settings. While participants in other study were admitted to inpatient units, those in this study were recruited from outpatient units.

Self-Efficacy to Manage Hypertension

The average self-efficacy score for managing hypertension was 36.33 (SD = 6.97), with scores ranging from 5 to 50. Self-efficacy did not significantly influence hypertension self-care practices in this study. Conversely, other studies have found that higher self-efficacy is associated with better self-care behaviors.[66,67] In this study, 52.15% of participants reported a moderate level of self-efficacy. The item with the lowest score was "You can do all the things necessary to manage your high blood pressure on a regular basis", while the highest score was "You can judge when changes in your high blood pressure mean you should visit a doctor?". The results could be influenced by the characteristics of the participants, who may exhibit a greater reliance on healthcare providers due to the easy access to healthcare services. Consequently, participants may prefer to depend on healthcare providers rather than independently manage fluctuations in their blood pressure. Weight control, a behavior that scored low, was challenging for 73.9% of participants who had above-average BMIs. Despite feeling confident in some self-care activities, self-efficacy did not predict self-care behaviors. Some studies support these findings, showing no association between self-efficacy and self-care practices.[68,69]

Interpersonal Level

Patient-Nurse Communication

The average score for patient-nurse communication was 38.51 (SD = 11.91), with scores ranging from 15 to 75. The moderate score suggests that patient-nurse communication did not significantly impact hypertension self-care practices. This may be due to the crowded nature of the outpatient department (OPD) and the nurses' administrative duties, which could limit direct patient interaction. The highest frequency of 'Poor' reported in response to the question "The nurse told me he/she is a nurse?" indicates participants may not have known whom to ask for assistance beyond the doctor. Effective communication between healthcare providers and patients is crucial for building trust and understanding patients' needs. Previous studies have shown that good communication positively impacts self-efficacy, medication adherence, and problem discussion.[42,70] Improving patient-nurse communication is necessary for better healthcare outcomes.

Social Support

The average social support score was 4.06 (SD = 1.22), with scores ranging from 1 to 7, indicating a moderate level of support. Social support was identified as a significant predictor of hypertension self-care practices in this study. Studies have shown that family support increases self-care compliance among older adults with hypertension.[71] The majority of participants lived with their families (98.8%) and were elderly (76.1%), suggesting they may rely on family members for care. Consistent with other studies, good social support was associated with better self-care practices.[28,72]

Community Level

Neighborhood Resources

The average neighborhood resource score was 20.24 (SD = 8.79), with scores ranging from 9 to 45; lower scores indicate better resources. Neighborhood resources significantly influenced hypertension self-care practices. A notable prevalence of agreed to strongly agreed responses was observed. This finding is similar to a study of older veterans with hypertension, which found that neighborhood resources were associated with exercise-related health behaviors.[73] Other studies also highlighted the importance of external factors, such as the environment, in personal decisions.[74] Participants with convenient exercise locations were more likely to have good self-care practices.[28] A significant proportion of participants (80%) reported that their neighborhood had a wide variety of fresh fruits and vegetables available. This suggests that neighborhood resources, especially related to healthy dietary options, can promote self-care practices among hypertensive patients.

Policy Level

Health Insurance Scheme

Most participants were enrolled in various health insurance schemes: the Universal Coverage Scheme (UCS) (69.9%), the Civil Servant Medical Benefit Scheme (CSMBS) (20.9%), and the Social Security Scheme (SSS) (4%). These

schemes likely improved access to healthcare services, information, and medications. Health insurance has been positively correlated with improved access to hypertension treatment and control.[75] However, its impact on self-care practices may be limited. Participants might rely more on physician advice for medication and less on other self-care practices. Among UCS participants, poor self-care practices were found in 82.5%, CSMBS in 75.0%, and SSS in 84.6%.

To summarize, this study highlights that hypertension self-care practices are influenced by factors across multiple levels of the ecological model, with social support and neighborhood resources emerging as significant predictors. Effective social support systems and environmental resources play crucial roles in enhancing self-care practices among patients with uncontrolled hypertension.

Future research should explore the interplay between intrapersonal factors (such as knowledge and self-efficacy) and interpersonal, community, and policy-level factors to develop comprehensive strategies for improving self-care practices. Additionally, investigating how specific elements of neighborhood resources and social support contribute to self-care outcomes could provide insights for targeted interventions. Further studies could also examine the role of healthcare communication in fostering self-care and the impact of various health insurance schemes on comprehensive self-care practices.

Limitations and Implication

This study has several limitations that should be considered when interpreting the findings. First, the reliance on self-reported data introduces the potential for response bias, as participants may not always provide complete information regarding their self-care practices and behaviors. This could affect the reliability of the results. Second, the cross-sectional design of the study restricts the ability to evaluate causal relationships or observe changes over time. Consequently, it is challenging to establish whether certain factors are predictors of hypertension self-care practices or if the relationships are bidirectional. Third, the study's findings are based on data collected from a single city although it is from various settings, which may limit the generalizability of the results to other regions or populations. Despite these limitations, examining multi-level factors remains crucial for understanding self-care practices among individuals with uncontrolled hypertension, as these practices require support from various strategies to ensure success. Expanding the research to include multiple cities and employing longitudinal study designs would enhance the representativeness and provide more comprehensive insights into the dynamics of hypertension self-care practices.

Conclusion

The study revealed that a significant portion of participants exhibited inadequate hypertension self-care practices, highlighting considerable challenges in managing hypertension effectively within this population. Key findings indicate that individuals with moderate levels of social support and those residing in areas with fewer neighborhood resources were more likely to demonstrate poor self-care practices. Although various factors, including healthcare schemes, patient-nurse communication, hypertension knowledge, health literacy, and self-efficacy, were examined, none showed a significant impact on self-care practices.

Nurses play a crucial role in promoting family support to enhance patient engagement in self-care practices. They can also raise awareness of community resources by presenting evidence-based practices to policymakers and highlighting the importance of developing healthy neighborhood resources. This underscores that the concurrent development of multi-level nursing programs, rather than a single approach, is essential for improving self-care practices and achieving better blood pressure control in patients with uncontrolled hypertension.

Ethics Approval

The study complies with the Declaration of Helsinki and was approved by the Siriraj Institutional Review Board of the Faculty of Medicine Siriraj Hospital, Mahidol University (approval number: Si 804/2019), and the Bangkok Metropolitan Administration Human Research Ethics Committee (approval number: U001h/63_EXP). Data was collected after the approval of each hospital's Institutional Review Board (IRB).

Patient Consent

Informed consent was obtained from all participants, and the study protocol was reviewed and approved by the Siriraj Institutional Review Board of the Faculty of Medicine Siriraj Hospital, Mahidol University, and the Bangkok Metropolitan Administration Human Research Ethics Committee before the commencement of the study.

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