Factors Influencing Adherence to Treatment in Adult Patients with Hypertension[1]

Petlada Chansri, B.N.S.[2]
Autchariya Poungkaew, D.N.S.[3]
Aurawamon Sriyuktasuth, D.S.N.[4]
Srisakul Chirakarnjanakorn, M.D., Dip. Thai Board of Cardiology[5]

Extended Abstract

Introduction Adherence to treatment including medication and lifestyle modification is crucial for improving health outcomes in patients with hypertension. However, there is limited research investigating the factors influencing adherence to medication and lifestyle modification, particularly among adult patients diagnosed with hypertension.

Objective To investigate adherence to treatment and the predictive power of work status, comorbidity, complexity of medication regimens, perceived severity and risk of hypertension complications, and quality of care affecting adherence to treatment in adult patients with hypertension

Design Cross-sectional correlational predictive research using the multidimensional adherence model as the conceptual framework

Methodology The sample included 156 adult patients with essential hypertension aged 18 to 59 years old who had received antihypertensive medication and lifestyle modification treatment for at least six months at a super-tertiary hospital's hypertension clinic. Data were collected between April and July 2023. The research instruments consisted of a general profile questionnaire, a treatment adherence questionnaire for patients with hypertension, a perceived severity and risk of hypertension complications questionnaire, a patient assessment of chronic illness care, the Charlson Comorbidity Index, a medication regimen complexity index, and an illness record form. These instruments were examined for content validity by experts and tested for reliability prior to use in data collection. The reliability ranged from .77-1.00. The data were analyzed using descriptive statistics and multiple linear regression.

Results The sample had an average age of 46.50 years (SD = 9.65); 63.46% were female. The average score for adherence to treatment was 87.97 (SD = 9.02), with the highest score for average medication adherence of 34.37 (SD = 2.52) and the lowest score for average exercise adherence of 4.33 (SD = 1.89). Additionally, 14.74% were overweight, and 71.80% were obese. The majority were employed (83.33%), without any comorbidities (62.82%), and had a low level of medication regimen complexity (68.59%). Furthermore, they demonstrated a high level of perceived severity and risk of hypertension complications (96.15%) and reported a high level of quality of care (61.54%). In the Multiple linear regression, 30.9% of the variance in adherence to treatment was explained (Adjusted R^2 = .309 $F_{(5,150)}$ = 14.858, p < .001). Work status (β = -.262, p < .001), comorbidity (β = -.184, p = .020), perceived severity and risk of hypertension complications (β = .466, p < .001), and quality of care (β = .165, p = .017) together were significant predictors of adherence to treatment in adult patients with hypertension.

Recommendation To promote adherence to treatment in adult patients with hypertension, nurses should develop strategy to improve quality of care within hypertension clinics and enhance the perceived severity and risk of hypertension complications as well as enhance lifestyle modifications particularly regarding diet and exercise for overweight and obese adults with hypertension.

Keywords cardiovascular disease/ adult patients with hypertension/ adherence to treatment/ perceived severity and risk/ work status/ quality of care

Received 2 March 2024, Revised 30 April 2024, Accepted 30 April 2024

---

[1] *Master Thesis, Master of Nursing Science in Adult and Gerontological Nursing, Faculty of Nursing, Mahidol University, Bangkok, Thailand*

[2] *Student in Master of Nursing Science Program in Adult and Gerontological Nursing, Faculty of Nursing, Mahidol University, Bangkok, Thailand*

[3] *Corresponding Author: Associate Professor, Department of Medical Nursing, Faculty of Nursing, Mahidol University, Bangkok, Thailand; E-mail: ajchariya.pon@mahidol.ac.th*

[4] *Associate Professor, Department of Medical Nursing, Faculty of Nursing, Mahidol University, Bangkok, Thailand*

[5] *Assistant Professor, Department of Medicine, Faculty of Medicine, Siriraj Hospital, Mahidol University, Bangkok, Thailand*

https://doi.org/10.60099/jtnmc.v39i02.268032

ปัจจัยที่มีอิทธิพลต่อความร่วมมือในการรักษาในผู้ป่วยความดันโลหิตสูงวัยผู้ใหญ่[1]

เพชรลดา จันทร์ศรี, พย.บ.[2]
อัจฉริยา พ่วงแก้ว, พย.ด.[3]
อรวมน ศรียุกตศุทธ, D.S.N.[4]
ศรีสกุล จิรกาญจนากร, พ.บ.,วว. สาขาอายุรศาสตร์โรคหัวใจ[5]

บทคัดย่อขยาย

บทนำ ความร่วมมือในการรักษาที่ประกอบด้วยการใช้ยาและการปรับเปลี่ยนวิถีชีวิตมีความสำคัญต่อการปรับปรุงผลลัพธ์ทางสุขภาพในผู้ป่วยความดันโลหิตสูง อย่างไรก็ตามการศึกษาปัจจัยที่มีอิทธิพลต่อความร่วมมือในการรักษาทั้งการใช้ยาและการปรับพฤติกรรมในวัยผู้ใหญ่มีค่อนข้างจำกัด

วัตถุประสงค์การวิจัย เพื่อศึกษาความร่วมมือในการรักษาและอำนาจการทำนายของสถานภาพการทำงาน โรคร่วม ความซับซ้อนของแบบแผนการใช้ยา การรับรู้ความรุนแรงและความเสี่ยงต่อภาวะแทรกซ้อนของโรคความดันโลหิตสูง และคุณภาพการดูแลต่อความร่วมมือในการรักษาในผู้ป่วยความดันโลหิตสูงวัยผู้ใหญ่

การออกแบบการวิจัย การศึกษาวิเคราะห์เชิงภาคตัดขวาง เพื่อศึกษาความสัมพันธ์เชิงทำนาย โดยใช้กรอบแนวคิดแบบจำลองความหลากหลายมิติของความร่วมมือ

วิธีดำเนินการวิจัย กลุ่มตัวอย่าง จำนวน 156 คน เป็นผู้ป่วยความดันโลหิตสูงชนิดปฐมภูมิที่มีอายุ 18–59 ปี ได้รับการรักษาโดยการใช้ยาและปรับพฤติกรรม อย่างน้อย 6 เดือน ในคลินิกโรคความดันโลหิตสูง โรงพยาบาลตติยภูมิขั้นสูงแห่งหนึ่ง เก็บรวบรวมข้อมูลระหว่างเดือน เมษายน–กรกฎาคม พ.ศ. 2566 เครื่องมือวิจัยประกอบด้วยแบบสอบถามข้อมูลส่วนบุคคล แบบสอบถามความร่วมมือในการรักษาสำหรับผู้ป่วยโรคความดันโลหิตสูง แบบสอบถามการรับรู้ความรุนแรงและความเสี่ยงต่อภาวะแทรกซ้อนของโรคความดันโลหิตสูง แบบประเมินการได้รับการดูแลโรคเรื้อรังโดยผู้ป่วย แบบประเมินความรุนแรงของโรคร่วม ดัชนีวัดความซับซ้อนของแบบแผนการใช้ยา และแบบบันทึกข้อมูลความเจ็บป่วย ที่ได้รับการตรวจสอบความตรงเชิงเนื้อหาของเครื่องมือจากผู้ทรงคุณวุฒิ นำไปหาค่าความเชื่อมั่นก่อนนำมาใช้ในการเก็บข้อมูล ได้ค่าความเชื่อมั่นอยู่ระหว่าง .77–1.00 วิเคราะห์ข้อมูลโดยใช้สถิติเชิงบรรยายและการถดถอยเชิงเส้นแบบพหุ

ผลการวิจัย กลุ่มตัวอย่างมีอายุเฉลี่ย 46.50 ปี (SD = 9.65) เป็นเพศหญิง ร้อยละ 63.46 มีคะแนนเฉลี่ยความร่วมมือในการรักษา 87.97 (SD = 9.02) โดยคะแนนเฉลี่ยความร่วมมือในการรับประทานยามากที่สุด 34.37 (SD=2.52) และคะแนนเฉลี่ยการออกกำลังกายน้อยที่สุด 4.33 (SD = 1.89) มีภาวะน้ำหนักเกินเกณฑ์มาตรฐานร้อยละ 14.74 และอ้วนร้อยละ 71.80 ส่วนใหญ่มีงานทำ (ร้อยละ 83.33) ไม่มีโรคร่วม (ร้อยละ 62.82) มีความซับซ้อนของแบบแผนการใช้ยาระดับต่ำ (ร้อยละ 68.59) รับรู้ความรุนแรงและความเสี่ยงต่อภาวะแทรกซ้อนของโรคความดันโลหิตสูงระดับสูง (ร้อยละ 96.15) และคุณภาพการดูแลระดับสูง (ร้อยละ 61.54) การทดสอบด้วยสถิติการถดถอยเชิงเส้นพหุคูณพบว่าตัวแปรทั้งหมดที่ศึกษาทำนายความร่วมมือในการรักษาได้ร้อยละ 30.9 (Adjusted R^2 = .309, $F_{(5,150)}$ = 14.858, p < .001) โดยสถานภาพการทำงาน (β = –.262, p < . 001) โรคร่วม (β = –.184, p = .020) การรับรู้ความรุนแรงและความเสี่ยงต่อภาวะแทรกซ้อนของโรคความดันโลหิตสูง (β = .466, p < .001) และคุณภาพการดูแล (β = .165, p = .017) ทำนายความร่วมมือในการรักษาในผู้ป่วยความดันโลหิตสูงวัยผู้ใหญ่ได้อย่างมีนัยสำคัญทางสถิติ

ข้อเสนอแนะ การสนับสนุนให้ผู้ป่วยโรคความดันโลหิตสูงวัยผู้ใหญ่เกิดความร่วมมือในการรักษา พยาบาลควรพัฒนากลยุทธ์ในการเพิ่มคุณภาพการดูแลในคลินิกความดันโลหิตสูงและส่งเสริมให้ผู้ป่วยรับรู้ความรุนแรงและความเสี่ยงต่อภาวะแทรกซ้อนของโรคความดันโลหิตสูง รวมทั้งส่งเสริมความร่วมมือด้านการปรับเปลี่ยนวิถีชีวิตโดยเฉพาะเรื่องอาหารและการออกกำลังกายในกลุ่มผู้ใหญ่ความดันโลหิตสูงที่มีน้ำหนักเกินและอ้วน

Journal of Thailand Nursing and Midwifery Council 2024; 39(2) 178–190

คำสำคัญ โรคหัวใจและหลอดเลือด ผู้ป่วยความดันโลหิตสูงวัยผู้ใหญ่ ความร่วมมือในการรักษา การรับรู้ความรุนแรงและความเสี่ยง สถานภาพการทำงาน คุณภาพการดูแล

วันที่ได้รับ 2 มี.ค. 67 วันที่แก้ไขบทความเสร็จ 30 เม.ย. 67 วันที่รับตีพิมพ์ 30 เม.ย. 67

---

[1] วิทยานิพนธ์หลักสูตรพยาบาลศาสตรมหาบัณฑิต สาขาวิชาการพยาบาลผู้ใหญ่และผู้สูงอายุ คณะพยาบาลศาสตร์ มหาวิทยาลัยมหิดล
[2] นักศึกษาหลักสูตรพยาบาลศาสตรมหาบัณฑิต สาขาวิชาการพยาบาลผู้ใหญ่และผู้สูงอายุ คณะพยาบาลศาสตร์ มหาวิทยาลัยมหิดล
[3] ผู้ประพันธ์บรรณกิจ รองศาสตราจารย์ภาควิชาการพยาบาลอายุรศาสตร์ คณะพยาบาลศาสตร์ มหาวิทยาลัยมหิดล E-mail: ajchariya.pon@mahidol.ac.th
[4] รองศาสตราจารย์ ภาควิชาการพยาบาลอายุรศาสตร์ คณะพยาบาลศาสตร์ มหาวิทยาลัยมหิดล
[5] ผู้ช่วยศาสตราจารย์ ภาควิชาอายุรศาสตร์ คณะแพทยศาสตร์ ศิริราชพยาบาล มหาวิทยาลัยมหิดล

Introduction

Hypertension (HT) is a significant health problem across the globe and in Thailand, affecting a large portion of the population,[1] particularly with essential or primary hypertension. Essential hypertension accounts for 90-95% of all cases of hypertension and is closely linked to the development of various cardiovascular diseases (CVDs).[1] According to the World Health Organization (WHO), the prevalence of HT among people aged 30-79 years were doubled in 30 years, from 1990 to 2019.[1] In Thailand, the prevalence of HT in adults aged 15-29 years increased from 2.9% to 3.3% within 23 years, from 1998-2020.[2-3] One of important causes is non-adherence to treatment.[3-4] A longitudinal study employing 25-year follow-up period post treatment in adults with HT aged 18 - 30 years revealed a risk of target organ damage, causing a burden on individuals, families, and treatment costs.[1] Promoting adherence to treatment is a primary goal in the management of hypertension, supported by the American Heart Association and the Thai Hypertension Society.[3,5]

Adherence to treatment for HT requires patients to adhere to a prescribed regimen, including dietary modifications, alcohol consumption, smoking cessation, exercise, weight management, and stress reduction, as suggested by health care providers.[4,6] Recent literature reviews indicate that only 20-30% of adults with HT had medication adherence,[7-8] while older adults tend to exhibit better adherence to lifestyle modifications.[1] Among Thai females aged 35-65 with HT, both medication and lifestyle modification adherence were found to be at a moderate level.[9]

The World Health Organization's (WHO) Multidimensional Adherence Model (MAM)[6] defines adherence as a multidimensional concept determined by five interrelated factors. This study adopted the MAM as a conceptual framework to investigate adherence to treatment and its associated factors, including patient related factor, social and economic related factor, condition related factor, therapy related factor, and healthcare team and system related factor.

Work status, a social and economic related factor, refers to the employment or occupational conditions of adult patients with HT, enabling them to earn wages or payment. Research conducted in Bhutan revealed that more than half of adult patients with HT were actively employed.[10] Another study found a correlation between work status and medication adherence in patients with HT, indicating that employed people exhibited higher medication adherence compared to the unemployed.[11] Employed patients often receive income, which provides social security, psychosocial support, access to health services, and a healthier diet, all contributing to medication adherence.[11] These findings, although conducted abroad, highlight the association between work status and medication adherence in those with HT, including adults, older people, and particularly those engaged in employment.

Comorbidity, a condition related factor, refers to the severity of medical conditions that adult patients with HT have in addition to HT. Recent research has indicated that 20-40% of adult patients with HT experience comorbidities,[7,10] leading them to require multiple medications to manage both HT and other health issues. Consequently, those with comorbidities often encounter challenges in self-management and show lower medication

adherence compared to those without comorbidities.[12] Consistently, another study found that patients with HT without comorbidity demonstrated higher medication adherence than those with comorbidity.[7] These findings highlight the impact of comorbidity on medication adherence, although further research is needed to explore its relationship with lifestyle modifications, necessitating an integrated study of both forms of adherence.

Medication regimen complexity, therapy related factor, refers to various aspects of a patient's medication regimen in adult patients with HT, including dosage forms, dosing frequency and additional directions. Research indicated that 35% of patients with HT had a high level of medication regimen complexity.[13] Studies conducted both in Thailand and internationally revealed a relationship between medication regimen complexity and medication adherence in both adults and older persons with HT and a low level of medication regimen complexity led to a better blood pressure control compared to those with a high level.[13-14] While these findings highlighted the impact of medication regimen complexity on medication adherence, they do not address the dimension of lifestyle modification adherence which is a crucial part of HT management.

Perceived severity and risk of hypertension complications, a patient related factor, describes adult patients with HT regarding the degree of seriousness and uncertainty towards the occurrence of complications associated with HT. Adults living with HT generally have longer lifespans, increasing the tendency of disease progression and complications compared to younger age groups. However, understanding the relationship between perceived severity and risk of HT and adherence to treatment in adult patients with HT remains limited and requires further investigation. A study conducted in adults and older patients with HT in Iran revealed that those who perceived HT as highly severe had greater medication adherence compared to those with lower perceptions of severity.[15,16]

Quality of care, a health care team and system related factor, is the extent to which health services provided by health care providers lead to desired health outcomes as perceived by adult patients with HT. Good quality of care is linked to healthier behaviors in patients with HT.[12] A study conducted in Malaysia found that 50% of patients with HT perceived good quality of care.[17] Patients who perceived good quality of care demonstrated higher medication adherence compared to those perceiving poor quality of care.[18] However, most studies only examined the relationship between quality of care and medication adherence, neglecting to address lifestyle modification adherence, especially in patients with HT.

Most of the previous studies on treatment adherence in patients with HT addressed medication adherence while lifestyle modification plays pivotal role in HT management. Therefore, investigating adherence to treatment that includes both medication and lifestyle modification in this study can provide guidelines for optimizing the health services to support adherence to treatment for adult patients with HT.

Research objectives

This study aimed to 1) examine adherence to treatment in adult patients with HT and 2) investigate factors predicting adherence to treatment, including work status, comorbidity, medication regimen complexity, perceived severity and risk of hypertension complications, and quality of care.

Research hypothesis

Work status, comorbidity, medication regimen complexity, perceived severity and risk of hypertension complications, and quality of care can together predict adherence to treatment in adult patients with HT.

Conceptual framework

In this study, the Multidimensional Adherence Model (MAM) developed by the World Health Organization (WHO)[6] served as the conceptual framework to describe adherence to treatment and its predicting factors in adult patients with HT. The model describes five predictive factors: 1) work status, considered a social and economic related factor, 2) comorbidity, representing a condition related factor, 3) medication regimen complexity representing a therapy related factor, 4) perceived severity and risk of hypertension complications, representing a patient related factor, and 5) quality of life representing a healthcare team and system related factor[6] (Figure 1).

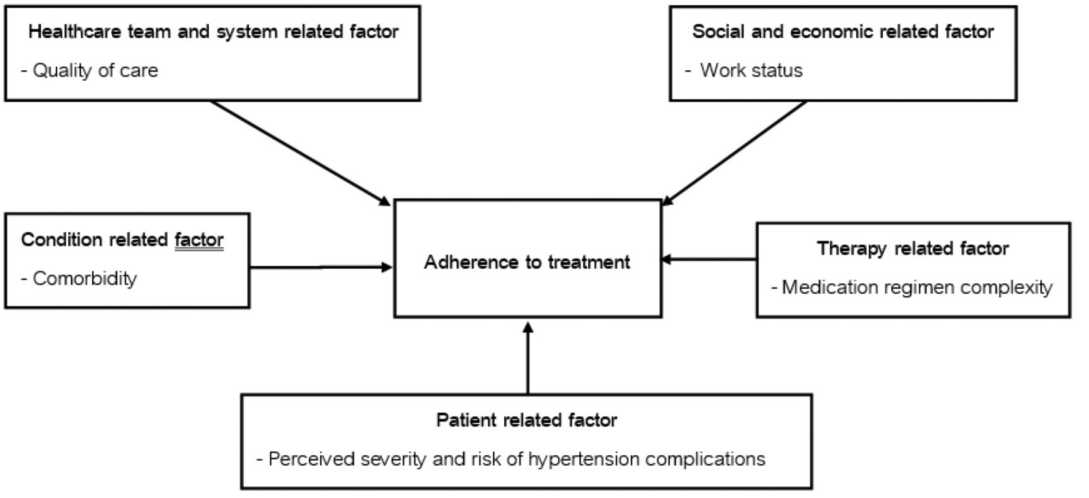

Figure 1 Conceptual Framework

Methods

Study design This research employed a cross-sectional correlational predictive design.

Sample and setting The sample included 156 adult patients with HT, consisting of both males and females, aged 18-59 years, who were attending the hypertension clinic at outpatient department of a super tertiary hospital in Bangkok. Convenience sampling was used according to the following inclusion criteria: 1) Diagnosis of essential HT, 2) Maintenance of antihypertensive medications and lifestyle modifications for a minimum of 6 months, 3) Orientation to time, place, and person as screened by asking about the date and time, places, and people, and 4) Ability in reading, writing, and communicating in Thai. Exclusion criteria included a history of mental illness or severe/terminal disease as indicated in medical records.

To determine the sample size, power analysis was performed using G*power program version 3.1.9.7.[19] The effect size was determined at 0.11 based on the correlation coefficient between perceived disease severity and adherence to treatment in patients with HT.[20] Using an alpha of .05 and a

power of .90, the calculation yielded a sample size of 156.

Instruments

In this study, seven parts of research instruments were employed.

Part 1: The demographic questionnaire was developed by the researchers based on related literature. There were 13 items, consisting of work status and other personal information.

Part 2: The Treatment Adherence Questionnaire for Patients with Hypertension (TAQPH), developed by Ma et al.[21] and translated into Thai using the back-translation process, included 28 items divided into six dimensions: 1) medication, 2) diet, 3) exercise, 4) stimulation, 5) weight control, and 6) relieving stress. Treatment adherence levels were evaluated using a 4-point Likert scale ranging from 1 to 4, with a total score ranging from 28 to 112.[21] A higher score indicated better adherence to treatment. In this study, the Item-Objective Congruence (IOC) of the instrument was .95. The reliability was assessed, resulting in a Cronbach's alpha coefficient of .81.

Part 3: The perceived severity and risk of hypertension complications questionnaire was developed by Samdaengsarn et al.[22] It consisted of 8 items with a 3-point Likert scale ranging from 0 to 2. Total scores ranged from 0 to 16, subsequently adjusted to a scale of 0 to 2. Scores were divided into three levels: low (0-0.66), moderate (0.67-1.33), and high (1.34-2.00).[22] In this study, the IOC was 1.0 and the instrument's reliability was confirmed with a Cronbach's alpha coefficient of .77.

Part 4: The Patient Assessment of Chronic Illness Care (PACIC), developed by Glasgow et al[23] was utilized to assess the quality of care. This instrument was translated into Thai through the back-translation process. It consisted of 20 items with a 5-point Likert scale, ranging from 1 to 5. Total scores ranged from 20-100, adjusted to a mean score ranging from 1 to 5. Scores were classified into three levels: low (1.00-2.33), moderate (2.34 - 3.66), and high (3.67-5.00).[23] In this study, the IOC was 1.0 and the instrument's reliability was confirmed with a Cronbach's alpha coefficient of .90.

Part 5: The Charlson Comorbidity Index (CCI) was developed by Charlson et al,[24] including 23 co-morbidities, each assigned a score of 1, 2, 3, or 6 based on its severity. Total scores ranged from 0 to 42, divided into four levels: absence of severity (0), low severity (1-2), moderate severity (3-4), and high severity (>4).[24]

Part 6: The Medication Regimen Complexity Index (MRCI), developed by George et al,[25] included 65 items with three dimensions: 1) dosage forms, 2) dosing frequency, and 3) additional directions. Each item was assigned a different score, with complexity considered. Scores were divided into three levels: low (3.00-16.99), moderate (17.00 - 30.99), and high (31.00 - 45.00).[25] In this study, the inter-rater reliability of the instrument was 1.00.

Part 7: The illness information record, developed by researchers based on related literature, consisted of four items: body weight and height for body mass index (BMI) determination, blood pressure level, medication duration, and prescribed medications. Data were collected from medical records for the past six-month period.

The instruments for Parts 1-4 were questionnaire-based, with a total of 69 items, while

Parts 5 through 7 comprised assessment forms and a health record form obtained from medical records by the principal investigator.

Ethical consideration

This study was approved by the Institutional Review Board of the Faculty of Nursing and Faculty of Medicine, Siriraj Hospital, Mahidol University (MU-MOU CoA No. IRB-NS2023/752.1002). All participants received a detailed explanation of the study protocol, their rights as participants, and potential risks and benefits. Written informed consent was obtained from all participants prior to their enrollment in the study.

Data collection

The data were gathered from April to July 2023 through questionnaires and medical records using structured interviews. The principal investigator began the data collection process after obtaining approval from the Institutional Review Board Committee and gained permission from the hospital director. The participants were selected based on the inclusion criteria during their visits to the hypertension clinic at outpatient department of a super-tertiary hospital in Bangkok. All participants were informed about the study and provided their written consent to participate in this study. The data collection lasted approximately 30-45 minutes for each participant.

Data analysis

Descriptive statistics were used for analyzing characteristics of the participants. Work status was dummy coded, with unemployed coded as 0 and employed coded as 1. Correlations between dependent and independent variables were analyzed using Pearson's Product-Moment correlation coefficient. Assumptions were met including normality, linearity, no multicollinearity (Tolerance = .732-.979 and Variance Inflation Factor (VIF) = 1.022-1.365), homoscedasticity, and no autocorrelation (Durbin-Watson = 2.053). Multiple linear regression analysis using ENTER-method was performed with statistical significance set at .05.

Results

The study included 156 participants with a mean age of 46.50 years (SD = 9.65). Most of them were female (63.46%), and 46.15% held a bachelor's degree. In terms of body mass index (BMI), 14.74% were overweight (BMI 23.00-24.99 kg/m^2) while 71.80% were obese (BMI > 24.99 kg/m^2). More than half were diagnosed with HT (59.62%) and received antihypertensive medications (52.56%) for over 60 months. The mean systolic blood pressure (SBP) was 135.62 mmHg (SD = 13.32) and the mean diastolic blood pressure (DBP) was 81.42 mmHg (SD = 9.21). More than one-third took 2-drugs combination for HT therapy (38.46%), using calcium-channel blockers (75.64%) (Table 1).

Table 1 Description of the participants (n = 156)

Variables	M ± SD n (%)	Variables	M ± SD n (%)
Age (years)	46.50 ± 9.65	**Education level**	
18-29	10 (6.41)	Bachelor's degree	72 (46.15)
30-44	51 (32.69)	Secondary school	46 (29.49)
45-59	95 (60.90)	Postgraduate	29 (18.59)
Gender		Primary school	8 (5.13)
Female	99 (63.46)	Illiterate	1 (0.64)
Male	57 (36.54)		

Table 1 Description of the participants (n = 156) (Cont.)

Variables	M ± SD n (%)	Variables	M ± SD n (%)
Duration of diagnosis		**BMI***	28.89 ± 5.42
6-36 months	38 (24.36)	< 23.00 kg/m^2	21 (13.46)
37-60 months	25 (16.03)	23.00-24.99 kg/m^2	23 (14.74)
> 60 months	93 (59.62)	25.00-29.99 kg/m^2	48 (30.77)
Duration of taking antihypertensive medication		> 29.99 kg/m^2	64 (41.03)
6-36 months	47 (30.13)	**SBP***	135.62 ± 13.32
37-60 months	27 (17.31)	< 120 mmHg	19 (12.17)
> 60 months	82 (52.56)	120-129 mmHg	24 (15.39)
Type of antihypertensive medication **		130-139 mmHg	53 (33.97)
CCBs*	118 (75.64)	140-159 mmHg	53 (33.97)
ACEIs/ARBs*	114 (73.08)	160-179 mmHg	7 (4.49)
BBs*	73 (46.80)	**DBP***	81.42 ± 9.21
Combination type of antihypertensive medication		< 80 mmHg	66 (42.31)
1	38 (24.36)	80-84 mmHg	38 (24.36)
2	60 (38.46)	85-89 mmHg	18 (11.54)
> 2	58 (37.18)	90-99 mmHg	31 (19.87)
		100-109 mmHg	3 (1.92)

* BMI = Body Mass Index, SBP = Systolic Blood Pressure, DBP = Diastolic Blood Pressure, CCBs = Calcium-channel blockers, ACEIs = Angiotensin converting enzyme inhibitors, ARBs = Angiotensin II receptor blockers, BBs = Beta-adrenergic blockers

** Answer more than 1 item

Overall, the participants had a mean adherence to treatment of 87.97 (SD = 9.02). Medication adherence had a mean score of 34.37 (SD = 2.52). Lifestyle modification adherence had a mean score of 53.60 (SD = 8.19) while diet adherence had a mean score of 24.72 (SD = 4.73). When considering stimulation adherence, such as drinking coffee, drinking alcohol, and smoking, the mean score was 9.93 (SD = 2.05). In terms of weight control adherence, the mean score was 5.12 (SD = 1.18). Relieving stress adherence had a mean score of 9.49 (SD = 2.18). Exercise adherence was the lowest, with a mean score of 4.33 (SD = 1.89) (Table 2).

Table 2 Description of adherence to treatment (n = 156)

Adherence to treatment	Min-Max	Actual score	M (SD)	Relative mean*
Overall	28-112	61-110	87.97 (9.02)	3.14
Medication	9-36	19-36	34.37 (2.52)	3.82
Lifestyle modification	19-76	33-74	53.60 (8.19)	2.84
Stimulation	3-12	3-12	9.93 (2.05)	3.31
Relieving stress	3-12	3-12	9.49 (2.18)	3.16
Diet	9-36	14-36	24.72 (4.73)	2.75
Weigh control	2-8	2-8	5.12 (1.81)	2.56
Exercise	2-8	2-8	4.33 (1.89)	2.17

* Mean score calculated from a score ranging from 1-4

Most of the participants were employed (83.33%) with absence of severity for comorbidity (62.82%). They generally followed a low medication regimen complexity (68.59%). Remarkably, 96.15% perceived severity and risk of hypertension complications at a high level, and 61.54% rated the quality of care at a high level (Table 3).

Table 3 Description of predictive factors (n = 156)

Variables	n	%
Work status		
Employed	130	83.33
Unemployed	26	16.67
Severity of comorbidity		
Absence (0)	98	62.82
Low (1-2)	52	33.33
Moderate (3-4)	4	2.56
High (> 4)	2	1.28
Medication regimen complexity		
Low (3.00-16.99)	107	68.59
Moderate (17.00-30.99)	43	27.56
High (31.00-45.00)	6	3.85
Perceived severity and risk of hypertension complications		
Moderate (0.67-1.33)	6	3.85
High (1.34-2.00)	150	96.15
Quality of care		
Low (1.00-2.33)	4	2.56
Moderate (2.34-3.66)	56	35.90
High (3.67-5.00)	96	61.54

The correlation matrix of the study variables revealed that work status, perceived severity and risk of hypertension complications, and quality of care were significantly correlated with adherence to treatment, while comorbidity and medication regimen complexity were not statistically correlated with adherence to treatment (Table 4).

Table 4 The correlation matrix of the study variables (n = 156)

Variables	1	2	3	4	5
1. Comorbidity	1.00				
2. Medication regimen complexity	.478	1.00			
3. Perceived severity and risk of hypertension complications	.089	.052	1.00		
4. Quality of care	.094	.001	.076	1.00	
5. Adherence to treatment	-.046	.019	.491**	.153*	1.00

*p < .05, **p < .01

The multiple regression analysis revealed that work status, comorbidity, perceived severity and risk of hypertension complications, and quality of care could jointly predict adherence to treatment, accounting for 30.9% of variance in adult patients with HT. Perceived severity and risk of hypertension complications was the strongest predictor, followed by work status, comorbidity, and quality of care, while medication regimen complexity could not predict adherence to treatment (Table 5).

Table 5 Factors predicting adherence to treatment using multiple regression analysis (n = 156)

Variables	B	S.E (b)	β	t	p-value
1. Work status	-6.313	1.661	-.262	-3.801	< .001
2. Comorbidity	-1.697	.719	-.184	-2.360	.020
3. Medication regimen complexity	.078	.077	.077	1.014	.312
4. Perceived severity and risk of hypertension complications	2.369	.343	.466	6.899	< .001
5. Quality of care	.101	.042	.165	2.424	.017
Constant	51.524	5.878		8.766	< .001

$R = .576$, $R^2 = .331$, Adjusted $R^2 = .309$, R^2change = .331, df = 5, $F_{(5,150)} = 14.858$, $p < .001$

Discussion

The study participants had mean adherence to treatment at 87.97 (SD = 9.02), indicating a generally good level of adherence to treatment. Medication adherence scored highest, possibly due to information from healthcare providers and a high perception of severity and risk of hypertension complications. Consequently, they mostly adhered to taking medications that were direct to manage for controlling blood pressure. It was consistent with a previous study in Thai patients.[22] This finding indicates that adult patients with HT living in urban areas and employed may find it difficult to adhere to lifestyle modifications due to an unsupportive environment for diet and physical activity. As a result, most of them were overweight or obese (Table 1-2).

The Multiple regression analysis revealed that work status, comorbidity, perceived severity and risk of hypertension complications, and quality of care could jointly predict adherence to treatment, explaining 30.9% of variance in adult patients with HT in this study. This could be explained from the Multidimensional Adherence Model (MAM), describing that patient related factor, social and economic related factor, healthcare team and system related factor could explain the adherence to treatment in adult patients with HT.

The patient related factor, perceived severity and risk of HT complications emerged as the strongest predictor, likely because patients received comprehensive information from healthcare providers and clearly understood their management plans. This was consistent with a study in adults with HT aged over 30 years, which found that those who perceived a risk of hypertension complications were more likely to adhere to their medication.[14]

Among the predictors, work status ranked second in its influence on treatment adherence. It is worth noting that employed participants had lower adherence levels compared to those who were unemployed, despite the majority of participants in this study being employed (83.33%). This finding contrasts with a study conducted in patients with HT living in a rural area abroad, where employed patients had higher medication adherence than those unemployed.[11]

Most of the participants perceived a high level of quality of care, which was found to predict adherence to treatment in this study. This perception may stem from receiving treatment at a hypertension clinic in a super tertiary hospital, where they received comprehensive information and therapy based on HT guidelines, including medication and lifestyle modification. Despite receiving 2-drug combination

for HT treatment, leading to an average reduction in blood pressure as shown in Table 1, it was observed that BP levels slightly exceeded the target. Moreover, a significant proportion (86.54%) had higher BMI than normal, with only 17.78% referring to dietitians for nutritional management. Additionally, only 31.82% of participants received relevant information primarily related to hypertension and its complications from nurses, indicating a need for stronger emphasis on lifestyle modification adherence. These findings align with a previous study on patient satisfaction with outpatient services at a tertiary hospital, which similarly reported a high level of satisfaction with the quality of care.[26]

Regarding comorbidity, 62.82% of study participants had absence of severity. However, comorbidity could together predict adherence to treatment in this study. Participants received treatment at a hypertension clinic in a super tertiary hospital, adhering to standard regimens aligned with HT guidelines. Despite a diagnosis duration of over 60 months, they maintained treatment adherence, effectively managing the disease to prevent complications. This finding aligns with previous research suggesting that the absence or low severity of comorbidities enhances treatment adherence. [8]

The study findings revealed that 68.59% of the participants had a low level of medication regimen complexity, which did not predict adherence to treatment. This was inconsistent with previous research indicating that medication regimen complexity could predict medication adherence in adults and older adults with HT,[13-14] as older adults may struggle with complex regimens due to forgetfulness. In this study, however, the focus was on adult patients and adherence to both medication and lifestyle modifications. Due to the simplicity of the medication regimen for participants in this study, it is possible that this variable could not statistically predict adherence to treatment.

Limitation of the study

This study was carried out at a hypertension clinic in a super-tertiary hospital. Therefore, consideration should be given when applying these findings to adult patients with hypertension receiving care in other healthcare contexts.

Recommendations

Recommendations for nursing practice Nurses should play a leading role in developing strategies to improve the quality of care in hypertension clinics. They need to focus on increasing patients' awareness of the severity and risks associated with hypertension, particularly among employed patients and those with significant comorbidities. Furthermore, nurses should implement approaches to encourage lifestyle modifications, with an emphasis on diet and exercise, for patients struggling with overweight or obesity.

Recommendations for nursing research Future research should investigate the social determinants of health that affect treatment adherence in adult patients with hypertension, focusing on those who are employed, overweight, obese, or have uncontrolled hypertension.

References

1. Zhou B, Carrillo-Larco RM, Danaei G, Riley LM, Paciorek CJ, Stevens GA, et al. Worldwide trends in hypertension prevalence and progress in treatment and control from 1990 to 2019: a pooled analysis of 1201 population-representative studies with 104 million participants. Lancet. 2021;398:957-80. https://doi.org/10.1016/s0140-6736(21)01330-1 PMID: 34450083

2. Aekplakorn W, Puckcharern H, Satheannoppakao W. An evaluation of the national health examination survey in Thailand 6th 2019-2020. Bangkok: Aksorn Graphic and Design Publishing; 2021. Available from: https://www.hiso.or.th/hiso/picture/reportHealth/report/sreport6/ sreport6_full.pdf (in Thai)
3. Thai Hypertension Society. 2019 Thai Guidelines on The Treatment of Hypertension. Chiang Mai: Trick Think; 2019. Available from: https://www.thaihypertension.org/hypertensiondetail. php?n_id=442 (in Thai)
4. Burnier M, Egan BM. Adherence in hypertension: a review of prevalence, risk factors, impact, and management. Circ Res. 2019;124(7):1124-40. https://doi.org/10.1161/circresaha.118.313220 PMID: 30920917
5. Whelton PK, Carey RM, Aronow WS, Casey DE, Jr., Collins KJ, Dennison Himmelfarb C, et al. 2017 ACC/AHA/AAPA/ABC/ACPM/AGS/APhA/ASH/ASPC/NMA/PCNA Guideline for the Prevention, Detection, Evaluation, and Management of High Blood Pressure in Adults: a Report of the American College of Cardiology/American Heart Association Task Force on Clinical Practice Guidelines. Hypertension. 2018;71(6):e13-e115. https://doi.org/10.1161/hyp. 0000000000000065 PMID: 29133356
6. World Health Organization. Adherence to long-term therapies: evidence for action. [Internet]. 2003[cited 2022Aug25]. Available from: https://iris.who.int/bitstream/handle/10665/42682/9241545992.pdf;jsessionid=DCA2825725FD40BBDB8BA5E0FB8D3F98?sequence=1
7. Lee H, Yano Y, Cho SMJ, Heo JE, Kim DW, Park S, et al. Adherence to antihypertensive medication and incident cardiovascular events in young adults with hypertension. Hypertension. 2021;77(4):1341-9. https://doi.org/10.1161/hypertensionaha.120.16784 PMID: 33641364
8. Spikes T, Higgins M, Lewis T, Dunbar S. B. The associations among illness perceptions, resilient coping, and medication adherence in young adult hypertensive black women. J Clin Hypertens. 2019;21(11):1695-1704. https://doi.org/10.1111/jch.13712 PMID: 31556484
9. Meekusol S, Maneesriwongul W, Orathai P, Pongthavornkamol K, Sharps PW. Factors predicting women's adherence to hypertensive treatment. PRIJNR. 2020 Aug 15;25(1):131-42. Available from: https://he02.tci-thaijo.org/index.php/PRIJNR/article/view/241920/168398
10. Dorji N, Samartkit N, Masingboon K. Factors influencing lifestyle modification among persons with hypertension in Punakha, Bhutan. BKKMEDJ. 2021;17(1):1-8. Available from: https://he02.tci-thaijo.org/index.php/bkkmedj/article/view/245755/169602
11. Andualem A, Liknaw T, Edmealem A, Gedefaw M. Adherence to antihypertensive medications among adult hypertensive patients attending chronic follow-up units of Dessie Referral Hospital, Northeastern Ethiopia: a cross-sectional study. Medicine (Baltimore). 2021;100(31):1-6. https://doi.org/10.1097/md.0000000000026818 PMID: 34397841
12. Hussein A, Awad MS, Mahmoud HEM. Patient adherence to antihypertensive medications in upper Egypt: a cross-sectional study. Egypt Heart J. 2020;72(1):29. https://doi.org/10.1186/s43044-020-00066-0 PMID: 32451726
13. Yazie TS, Mengistu WE, Asmare Z, Belete AM, Teshome AA, Yimer YS. Medication regimen complexity and its association with adherence and blood pressure control among hypertensive patients at selected hospitals of South Gondar Zone: a hospital based cross sectional study. PLoS One. 2022;17(8): e0272717. https://doi.org/10.1371/journal.pone.0272717 PMID: 35980967

14. Tanukaew D, Watanakijkrilert D, Sriyuktasuth A, Chattranukulchai P. Factors predicting medication adherence in patients with essential hypertension. Thai Red Cross Nursing Journal. 2022;15(1):127-43. Available from: https://he02.tci-thaijo.org/index.php/trcnj/article/ view/247347/176346 (in Thai)
15. Shiraly R, Khani Jeihooni A, Bakhshizadeh Shirazi R. Perception of risk of hypertension related complications and adherence to antihypertensive drugs: a primary healthcare based cross-sectional study. BMC Prim Care. 2022;23(1):303. https://doi.org/10.1186/s12875-022-01918-1 PMID: 36443657
16. Namwong A. Relationships between selected factors and adherence to therapeutic regimens among older adults with hypertension. Journal of Nursing and Education. 2015;8(4):78-93. Available from: https://he01.tci-thaijo.org/index.php/JNAE/article/view/48009 (in Thai)
17. Teh XR, Lim MT, Tong SF, Husin M, Khamis N, Sivasampu S. Quality of hypertension management in public primary care clinics in Malaysia: an update. PLoS One. 2020;15(8):e0237083. https://doi.org/10.1371/journal.pone.0237083 PMID: 32780769
18. Fortuna RJ, Nagel AK, Rocco TA, Legette-Sobers S, Quigley DD. Patient experience with care and its association with adherence to hypertension medications. Am J Hypertens. 2018;31(3):340-5. https://doi.org/10.1093/ajh/hpx200 PMID: 29253071
19. Faul F, Erdfelder E, Buchner A, Lang AG. Statistical power analyses using G*Power 3.1: tests for correlation and regression analyses. Behav Res Methods. 2009;41(4):1149-60. https://doi.org/10.3758/brm.41.4.1149 PMID: 19897823
20. Ismael D, Qadir C. Factors affecting treatment compliance of hypertensive patients in Erbil city. Kufa J Nurs Sci. 2015;5(2):1-8. https://doi.org/10.36321/kjns.vi20152.2601
21. Ma C, Chen S, You L, Luo Z, Xing C. Development and psychometric evaluation of the Treatment Adherence Questionnaire for Patients with Hypertension. J Adv Nurs. 2021;68(6):1402-13. https://doi.org/10.1111/j.1365-2648.2011.05835.x PMID: 21954893
22. Samdaengsarn D, Chinnawong T, Thaniwatthananon P. Factors related to treatment adherence in older persons with hypertension. Songklanagarind Journal of Nursing. 2019;39(3):51-66. Available from: https://he02.tci-thaijo.org/index.php/nur-psu/article/view/ 218933/152718 (in Thai)
23. Glasgow RE, Wagner EH, Schaefer J, Mahoney LD, Reid RJ, Greene SM. Development and validation of the Patient Assessment of Chronic Illness Care (PACIC). Med Care. 2005; 43(5):436-44. https://doi.org/10.1097/01.mlr.0000160375.47920.8c PMID: 15838407
24. Charlson ME, Charlson RE, Peterson JC, Marinopoulos SS, Briggs WM, Hollenberg JP. The Charlson comorbidity index is adapted to predict costs of chronic disease in primary care patients. J Clin Epidemiol. 2008;61(12):1234-40. https://doi.org/10.1016/j.jclinepi.2008.01.006 PMID: 18619805
25. George J, Phun Y, Bailey MJ, Kong DC, Stewart K. Development and validation of the medication regimen complexity index. Ann Pharmacother. 2004;38(9):1369-76. https://doi.org/10.1345/aph.1d479 PMID: 15266038
26. Hu L, Ding H, Hu G, Wang Z, Liu S, Liu Y. How perceived quality of care affects outpatient satisfaction in China: a cross-sectional study of 136 tertiary hospitals. Inquiry. 2019;56:1-8. https://doi.org/10.1177%2F0046958019895397 PMID: 31884866