Factors Associated with Medication Adherence Behavior among Hypertensive Patients

นิพนธ์ต้นฉบับ

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บทคัดย่อ

วัตถุประสงค์: เพื่อศึกษาพฤติกรรมการใช้ยาต่อเนื่อง และทดสอบปัจจัยที่สัมพันธ์กับพฤติกรรมการใช้ยาต่อเนื่องของผู้ป่วยโรคความดันโลหิตสูง **วิธีการศึกษา:** การศึกษาเชิงวิเคราะห์แบบภาคตัดขวาง มีกลุ่มตัวอย่าง คือ ผู้ป่วยโรคความดันโลหิตสูงที่เข้ารับการรักษา ณ โรงพยาบาลทรายทองวัฒนาจำนวน 460 คน สุ่มตัวอย่างแบบเป็นระบบและเก็บรวบรวมข้อมูลโดยใช้แบบสอบถามที่ได้รับการตรวจสอบเชิงเนื้อหาจากผู้ทรงคุณวุฒิ จำนวน 3 ท่าน มีค่าความตรงเชิงเนื้อหาเท่ากับ 0.94 ค่าความเที่ยงของแบบสอบถามความรู้ที่ยอมรับได้ (KR-20 เท่ากับ 0.77) ส่วนความเชื่อมั่นของแบบสอบถามด้านการรับรู้ ปัจจัยเอื้อ ปัจจัยเสริม และพฤติกรรมการใช้ยาต่อเนื่องนั้นยอมรับได้ โดยมีค่าสัมประสิทธิ์แอลฟาของครอนบาคเท่ากับ 0.70, 0.71, 0.71 และ 0.71 ตามลำดับ วิเคราะห์ข้อมูลด้วยสถิติเชิงพรรณนา และวิเคราะห์ความสัมพันธ์ด้วยสถิติถดถอยโลจิสติกส์ **ผลการศึกษา:** กลุ่มตัวอย่างร้อยละ 40.4 มีพฤติกรรมการใช้ยาอย่างต่อเนื่อง เพศหญิงมีโอกาสใช้ยาต่อเนื่องเป็น 1.81 เท่าของเพศชาย ($OR_{adj.}$ = 1.81, 95% CI: 1.21 ถึง 2.73) คนที่อายุไม่เกิน 60 ปีมีโอกาสใช้ยาต่อเนื่องเป็น 1.91 เท่าของคนที่อายุมากกว่า 60 ปี ($OR_{adj.}$ = 1.91, 95% CI: 1.23 ถึง 2.96) และผู้ที่มีคะแนนการรับรู้อุปสรรคของการใช้ยาต่ำมีโอกาสใช้ยาต่อเนื่องเป็น 2.61 เท่าของคนที่มีระดับสูง ($OR_{adj.}$ = 2.61, 95% CI: 1.62 ถึง 4.19) **สรุป:** พบการใช้ยาต่อเนื่องในคนไข้ความดันโลหิตสูงเพียงร้อยละ 40.4 และสัมพันธ์กับเพศ อายุ และการรับรู้อุปสรรค ควรจัดกิจกรรมส่งเสริมการใช้ยาต่อเนื่องในคนไข้ชาย และอายุมากกว่า 60 ปี และควรจัดกิจกรรมเพื่อลดอุปสรรคในการใช้ยาต่อเนื่อง

คำสำคัญ: พฤติกรรมการใช้ยาต่อเนื่อง, ผู้ป่วยโรคความดันโลหิตสูง, การรับรู้, ปัจจัยเอื้อ, ปัจจัยเสริม

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Abstract

Objective: To assess the medication adherence behavior and investigate factors related to medication adherence behavior of hypertensive patients. **Methods:** In this cross-sectional study, a sample of 460 patients diagnosed with primary hypertension were recruited through systematic random sampling at Saithongwattana Community Hospital. Data were collected by using questionnaires. Content validity was confirmed by three experts with an index of congruence of 0.94. Reliability of questions of knowledge about hypertension was acceptable with a KR-20 coefficient of 0.77, questions about factors based health belief model, enabling factors, reinforcing factors, and medication adherence was acceptable with Cronbach's alpha coefficients of 0.66, 0.71, 0.71, and 0.71 respectively. Descriptive statistics and logistic regression analysis were used to determine factors associated with medication adherence behavior. **Results:** About 40.4% of the participants had medication adherence. Women were 1.81 times more likely to adhere to their medications than men ($OR_{adj.}$ = 1.81, 95% CI: 1.21 to 2.73). Patients aged 60 years or younger were 1.91 times more likely to have medication adherence compared to their counterparts ($OR_{adj.}$ = 1.91, 95% CI: 1.23 to 2.96). Participants with low scores of perceived barriers were more likely to have medication adherence compared to their counterparts ($OR_{adj.}$ = 2.61, 95% CI: 1.62 to 4.19). **Conclusion:** Medication adherence was found in 40.4% of hypertensive patients, and was associated with age, gender and perceived barriers. Activities to reduce perceived barriers should be created.

Keywords: medication adherence, hypertensive patients, perception, enabling factors, reinforcing factors

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Introduction

Hypertension has been a public health problem worldwide. In 2008, World Health Organization reported that there were 40% of individuals aged 25 years diagnosed with hypertension. The actual number of hypertension patients increased from 600 millions in 1980 to 1,000 millions in 2008. Of the 7.6 millions of worldwide incidents of premature death, 54% were associated with cardiovascular disease, while 47% were associated with hypertension. It has been widely known that hypertension poses a high risk for cardiovascular, cerebrovascular and renal diseases.[1] Hence, those able to control their hypertension are less likely to suffer the complications and healthcare expenses.[2]

In Thailand, the 5th health examination survey (2014) found a prevalence of hypertension in individuals aged 15 years or older to increase from 22.0% in 2009 to 24.7% in 2014. However, the proportion of those treated but their hypertension not well controlled decreased from 23.6% in 2009 to 20.1% in 2014. This reflected a small improvement in a 5-year period in Thailand. The study of Lindblad and colleagues found that there has been about one-third of hypertension patients with adequate blood pressure control,

or a rule of third.[2] Thus the 20.1% of well controlled hypertensive cases in 2014 in Thailand did not meet the rule of third. One could expect that patients with poorly controlled chronic hypertension could shorten their lifespan by 10 – 20 years, and increase their risk of cerebrovascular diseases by 3 – 17 folds and heart failure by 6 folds of normotensive persons.[3]

Recently, the Eighth Joint National Committee or JNC 8 (2014) representing the US National Heart Lung and Blood Institute (NHLBI)[4] and the Thailand Clinical Guideline for Hypertension (2015) have provided the clinical practice guideline for hypertension. Based on these guidelines, two treatment modalities for hypertension have been established including life-style modifications and pharmacological treatment targeting the nearest normal blood pressure.[5] Physicians and related healthcare providers should put more effort on the advice to improve life-style and medication adherence. The medication non-adherence has been a worldwide problem especially in countries with low to moderate income.[6] It has been known that as high as 50% of hypertensive patients have poor medication adherence.[7]

Mediation adherence refers to the willingness to take medications as prescribed by physicians. The patient with good adherence are willing to take the correct dose, frequency, and duration of the prescribed medications. Medication adherence is essential for a better blood pressure control, health status and treatment plan.[8] With its crucial role in the success of hypertension treatment, studies to understand medication adherence have been done with various methods. Self-report is considered a useful method because of its simplicity, low cost and non-invasiveness. Self-report also offers means to understand attitude and belief of the patients about their prescribed medications. Many self-report questionnaires have been used, for example, the Medication Adherence Questionnaire (MAQ), the Self-efficacy for Appropriate Medication Use (SEAMS), and the Hill-Bone Compliance Scale.[8,9]

Ramill and colleagues examined medication adherence in hypertensive patients receiving care at a primary care setting and found that 53.4% of them had an acceptable level of adherence.[10] It has been known that more knowledge about medication use is positively correlated with more adherence. However, more kinds of medications and higher daily frequency of medication administration are associated with less medication adherence. The study by Alsolami and colleagues found that only 27.9% of the patients had acceptable medication adherence while factors associating with affecting the adherence included education level, patient-physician relationship, and co-morbidities.[11] This is consistent with the study by Thongpila and colleagues where they found that physician's advice to the patients was significantly associated with better self-care and medication adherence among elderly patients with hypertension.[12]

Based on the report of the public health information center of the Kampaengpet Provincial Health Administration Office, the proportions of hypertensive patients with no blood press control (BP of less than 140/90 mmHg) were 61.19%, 72.43%, and 69.55% in 2013, 2014 and 2015, respectively, which were all lower than the target of less than 60%.[13] The pharmacy department of Saithongwatthana Community Hospital (Saithongwatthana district, Kampaengpet province) had initiated a service to obtain left-over medications back from the patients and found that the most obtained medications were enalapril, followed by amlodipine, metformin, aspirin and propranolol. With three hypertension medications in the list of five most left-over medications, adherence to hypertension medications were poor which could potentially lead to long-term poor blood pressure control, and complications. Pill-counting on left-over medications is one of the methods to assess the patient's medication adherence.[14]

In terms of factors affecting medication adherence, Gabrielle and colleagues reported that 65.1% of the hypertensive patients had an acceptable medication adherence. They found that younger age, short period of anti-hypertension drugs use, and having occupation were enhancing medication adherence; while the patient's poverty and lack of perceived health status were discouraging the behavior.[15] Most studies on medication adherence mainly determined the internal factors; however, it has been known that external factors also play a major role influencing the behavior. The factors include but not limited to knowledge, healthcare expense, access to healthcare service, convenience for medication refill, and support from family and friends. We aimed to study the medication adherence behavior in hypertensive patients using the PRECEDE model. Based on the PRECEDE model, health behavior is influenced by three health determining factors. First, the predisposing factors are internal ones such as knowledge on, attitude toward, and perception on the behavior. Second, enabling factors are those that involve the access to source of

information regarding medications. Last, reinforcing factors include social support and advice on medication use. These factors could be used to design a program to promote desirable behavior of medication adherence on anti-hypertensive medications by understanding individual's adherence and their internal and external factors. The findings could be useful in planning a better healthcare service for hypertensive patients to achieve a better blood pressure control and better prevention of complications.

Specifically, the study aimed to 1) determine the level of medication adherence among hypertensive patients and 2) examine factors related to medication adherence behavior in these patients. Predisposing factors included gender, age, jobs, education, marital status, knowledge on hypertension and its treatment, adverse drug reaction (ADR), health beliefs (perceived severity, perceived benefit, and perceived barriers of hypertension), number of drugs taken per day, comorbidity and family history of hypertension. Enabling factors were employment status, payment scheme, access to healthcare service, and the convenience of medication refill. Last, reinforcing factors included family support, and relationships between patients and healthcare providers. It was hypothesized that each of individual factors was associated with medication adherence.

Methods

In this cross-sectional study, study population were 1,700 patients diagnosed with hypertension based on the systolic blood pressure (SBP) of 140 mmHg or higher and/or diastolic blood pressure (DBP) of 90 mmHg or higher who were followed up at the Saithongwattana Community Hospital, Kampaengper province. To be eligible for the study, the participants had to be diagnosed with hypertension with anti-hypertensive medications for at least one year, able to communicate in Thai, intact perception, and willing to participate. On the other hand, those who had any abnormalities detrimental for communications such as physical disabilities, stroke, deafness, and psychological disorders, were excluded.

The sample size was estimated as suggested by Daniel.[16] With a proportion of individuals with medication adherence (p)[10] of 53.4 %or 0.53 and a sampling error of 0.05, a sample size of 383 participants was suggested. To compensate for a loss of 20%, a final sample size of 460 participants was needed. Systematic sampling was used using an interval (k) as a function of the total population (N) divided by the sample size needed (n), i.e., k = N/n. The investigator found the follow-up appointment of the selected participants to prepare for the survey. For those missing the follow-up appointment, they were contacted by telephone for the survey on their next visit.

Study instruments

The participants were asked to complete the self-administered questionnaire. For those unable to self-administer, the investigator read and fill the questionnaire for them. The questionnaire consisted of five parts of the total of 93 questions. The first part of 30 questions collected demographic information of the participants. The second part which represented some predisposing factors was based on health belief model consisted of knowledge about hypertension (20 questions) and perceived benefits and barriers of taking anti- hypertensive medications (17 questions).

For the questions on knowledge about hypertension, the answer was in the correct-incorrect with a score of 1 point for the correct and 0 point for the incorrect answer.

Part three asked about the enabling factors for medication adherence with five questions including the ability to pay for the medications, the travel distance to the prescription access, the time spent for office visit and prescription refill, and the access to consultation by healthcare providers. Part four assessed the factors reinforcing medication adherence including family support, social support, patient- provider relationship, and the telephone follow- up by healthcare providers (7 questions). The answers for the questions in parts three to four were in a three-point rating scale ranging from 3 (agree), to 2 (neither agree or disagree), and 1 (disagree). The higher scores indicated higher levels of the factors.

Part five assessed the medication adherence behaviors. This set of 14 questions was translated and modified the Hill-Bone Compliance of Kim and colleagues[17] by forward translation and examined by three experts. The response format for 14 questions of the medication adherence behavior was a four- point rating scale ranging from 4 (regularly practice), to 3 (usually practice), 2 (occasionally practice) and 1 (rarely practice) resulting in a possible score range of 14 to 56. Since all questions represented poor medication adherence, e.g., "Forget to take your hypertension medicine?,"

the higher scores indicated a poorer medication adherence. Scores of medication adherence were categorized into adherence and non-adherence groups.[18]

Scores of all factors were categorized into low, moderate and high level by dividing the actual range of scores (i.e., minimum to maximum) by the three levels.[19] As a result, perception predisposing factors based on heal belief model were classified as low, moderate and high levels with scores of 27 – 34, 35 – 42, and 43 – 51 points, respectively. Enabling factors were categorized as low, moderate and high levels with scores of 9 – 10, 11 – 12, and 13 – 15 points, respectively. Lastly, reinforcing factors were classified as low, moderate and high levels with scores of 7 – 11, 12 – 16, and 17 – 21 points, respectively.

The questionnaires were tested for quality by three experts. Content validity was high with an Index of Item-Objective Congruence (IOC) of 0.94. Reliability of questionnaire on knowledge about hypertension was acceptable with a Kuder-Richardson-20 coefficient of 0.77. Reliability of predisposing factors based on health belief model, enabling factors and reinforcing factors was also acceptable with Cronbach's alpha coefficients of 0.70, 0.71, and 0.71, respectively,

This study was approved by the Study Ethic Committee of Naresuan University (COA No .411/2016). The permission to conduct the study from the director of Saithongwattana Community Hsopital was obtained.

Data analysis

All data were presented with descriptive statistics including mean with standard deviation and frequency with percentage. Bivariate logistic regression analysis was conducted to determine association of medication adherence with each of the influencing factors. A *P*-value of less than 0.25 by Wald test was considered significance to be a candidate for the final multiple logistic regression with the Enter elimination method where independent variables with a *P*-value of 0.05 or greater were subject to elimination. The likelihood of medication adherence was presented with odds ratio with 95% confidence interval (CI).

Results

The majority of the participants were female (61.30%) with the age of 57 – 67 years (35.20%) (mean = 59.93 ± 11.53). Their body mass index was 25 kg/m2 or more (53.50%). Most participants were married (90.20%), had primary education (82.60%), had job (59.30%) with 34.80% in agriculture, had a monthly income of 1,000 – 5,000 baht (38.70%) with a range of 600 - 30,000 baht, had a universal coverage scheme for healthcare payment (83.90%). The majority had had the illness for 1 – 5 years (50.60%) with a mean of 7.00 ± 4.30 years) and 57.20% had only hypertension while 42.8% had at least one co-morbidity, for example, hyperlipidemia, diabetes, asthma, heart disease, gout, and thyroid disease.

Regarding hypertension, most participants had a current SBP of less than 140 mmHg (70.70%) and DBP of less than 90 mmHg (87.40%). The majority had no family history of hypertension (54.10%). They had had hypertension for an average of 7 years. Almost all of them started the treatment once diagnosed with hypertension (99.60%). While 96.50% used only anti-hypertensive medications, 3.50% used the medications and herbal products. It was found that these participants took four tablets of anti-hypertensive medications per day with a range of 1 – 14 tablets.

The participants had a high level of knowledge about hypertension (98.91%) with a mean of 18.98 ± 1.55 points, high level of perceived severity (96.52%) with a mean of 16.53 ± 1.29 points, high level of perceived benefits (98.26%) with a mean of 11.88 ± 0.58 points), and low level of perceived barriers (74.13%) with a mean of 10.38 ± 2.44 points (Table 1). For enabling factors of medication adherence, a high level was found in most participants (95.00%) with a mean of 14.42 ± 1.09 points. For reinforcing factors, the majority had a high level (87.17%) with a mean of 18.97 ± 3.06 points.

Table 1 Levels of knowledge about hypertension, enabling factors and reinforcing factors (N = 460).

Variable	Level of each factor, n (%)			Mean	S.D.	Possible range	Actual range
	High	Moderate	Low				
Knowledge	455 (98.91)	5 (1.09)	0	18.98	1.55	0 - 20	10 - 20
Perception	135 (29.35)	322 (70.00)	3 (0.65)	38.80	1.09	17 - 51	27 - 51
Perceived severity	444 (96.52)	16 (3.48)	0	16.53	1.29	6 - 18	11 - 18
Perceived benefits	452 (98.26)	8 (1.74)	0	11.88	0.58	4 - 12	8 - 12
Perceived barriers	8 (1.74)	111 (24.13)	341 (74.13)	10.38	2.44	7 - 21	7 - 21
Enabling factors	437 (95.00)	23 (5.00)	0	14.42	1.09	5 - 15	9 - 15
Reinforcing factors	401 (87.17)	42 (9.13)	17 (3.70)	18.97	3.06	7 - 21	7 - 21

Since the mean of medication adherence score was 52.00 points, only 186 of 460 participants had the adherence (40.4%), and the rest (274 or 59.6%) were non-adherent.

Each of individual factors was associated with medication adherence as follows (Table 2). In terms of gender, women were 1.64 times more likely than men to be associated with medication adherence (OR_{crude} = 1.64, 95% CI: 1.12 to 2.40). Those with 60 years of age or younger were 1.95 times more likely to have medication adherence than their counterparts (OR_{crude} = 1.95, 95% CI: 1.33 to 2.85). Those with primary education had a low chance of adherence compared to those with higher primary education (OR_{crude} = 0.55, 95% CI: 0.35 to 0.89). Patients with five years of illness or less had a lower chance of adherence than their counterparts (OR_{crude} = 0.10, 95% CI: 0.01 to 0.20).

Table 2 Factors associated with medication adherence behavior by bivariate regression analysis (N = 460).

Factors	N	Medication adherence, n (%)	Crude OR (95% CI)	*P*-value
Gender				
Male	178	85 (47.75)	1	
Female	282	101 (35.82)	1.64 (1.12-2.40)	0.011
Age				
More than 60 years	247	118 (47.77)	1	
Less than or equal to 60 years	213	68 (31.92)	1.95 (1.33 – 2.85)	0.001
Education				
Higher than primary school	380	144 (37.89)	1	
Primary school	80	42 (52.50)	0.55 (0.35 – 0.89)	0.016
Duration of illness				
More than 5 years	227	80 (35.24)	1	
Less than or equal to 5 years	233	106 (45.49)	0.10 (0.01 – 0.20)	0.025
Number of drugs taken per day				
More than 4 tablets	134	51 (38.06)	1	
Less than or equal to 4 tablets	326	135 (41.41)	0.87 (0.58 – 1.31)	0.507
Knowledge				
High level (≥ 14 points)	455	183 (40.22)	1	
Low level (< 14 points)	5	3 (60.00)	0.45 (0 – 2.27)	0.371
Perceived severity				
High level (≥ 14 points)	444	176 (39.64)	1	
Low level (< 14 points)	16	10 (62.50)	0.39 (0.15 – 1.06)	0.067
Perceived benefits				
High level (≥ 11 points)	446	177 (39.69)	1	
Low level (< 11 points)	14	9 (64.29)	0.37 (0.13 – 1.06)	0.065
Perceived barriers				
High level (> 15 points)	357	126 (35.29)	1	
Low level (≤ 15 points)	103	60 (58.25)	0.39 (0.25 – 0.61)	0.001
Enabling factors				
High level (≥ 12 points)	442	174 (39.37)	1	
Low level (< 12 points)	18	12 (66.67)	0.32 (0.12 – 0.85)	0.021
Reinforcing factors				
High level (≥ 16 points)	404	163 (40.35)	1	
Low level (< 16 points)	56	23 (41.07)	0.97 (0.55 – 1.70)	0.918

In terms of predisposing factors based on the health belief model, low level of perceived barriers to medication administration (< 16 points) was less likely than high level (16 points or greater) to be associated with medication adherence (OR_{crude} = 0.39, 95% CI: 0.25 to 0.61) (Table 2). Patients with low level of enabling factors (score of less than 12 points) were less likely to have adherence than their counterparts (OR_{crude} = 0.32, 95% CI: 0.12 to 0.85).

Once significant factors from bivariate logistic regression were taken into account simultaneously in a multiple logistic regression, only gender, age, and perceived barriers were significantly associated with medication adherence. Female patients were 1.81 times more likely to adhere to medications than men ($OR_{adj.}$ = 1.81, 95% CI: 1.21 to 2.73). Those with 60 years of age or younger were 1.91 times more likely to have medication adherence than their counterparts ($OR_{adj.}$ = 1.91, 95% CI: 1.23 to 2.96). Low level of perceived barriers to medication administration (< 16 points) was 2.61 times more likely than high level to be associated with medication adherence ($OR_{adj.}$ = 2.61, 95% CI: 1.62 to 4.19) which was opposite to what was found in bivariate analysis.

Table 3 Factors associated with medication adherence behavior by multiple regression analysis (N = 460).

Variables	N	Medication adherence, n (%)	Crude OR (95% CI)*	OR_{adj} (95% CI)	*P*-value
Gender					
Male	178	85 (47.75)	1	1	
Female	282	101 (35.82)	1.64 (1.12-2.40)	1.81 (1.21 -2.73)	0.008
Age					
More than 60 years	247	118 (47.77)	1	1	
Less than or equal to 60 years	213	68 (31.92)	1.95 (1.33 – 2.85)	1.91 (1.23 - 2.96)	0.003
Perceived barriers					
Low level (>15 points)	357	126 (35.29)	1	1	
High level (≤15 points)	103	60 (58.25)	0.39 (0.25 – 0.61)	2.61 (1.62 - 4.19)	0.001

* Based on bivariate regression analysis shown in Table 2.

Discussions and Conclusion

Our study found that 40.4% of the participants had medication adherence. This was consistent with the study of Wangtrakul and colleagues where 45% of hypertension patients had medication adherence.[20] It was also consistent with the study of Ramil and colleagues where 53.4% of hypertension patients receiving care a primary care setting had medication adherence. Our 40.4% adherence was consistent with the WHO report where 50% was found in developed countries and lower than 50% in developing countries.[21] Once individual questions of the questionnaire were considered, forgetting to take medication was found in

11.5% of the patients. This finding suggested an opportunity to enhance the adherence behavior by means of more effective activities in medication use counseling and promote planning and managing the medication administration. S

Women were significantly more likely to adhere to medication administration than men ($OR_{adj.}$ = 1.81, 95% CI: 1.21 to 2.73). This was consistent with the study of Ramli and co-workers where women with hypertension receiving care at a primary care setting in Malaysia were 1.5 folds of the men in adhering to medications.[10] This could be attributable to the fact that women usually are responsible for taking care of family members; hence the skill for self-management including regular medication taking. However, a study by Khayyat and colleagues revealed that women hypertension patients receiving care at a primary care setting in Saudi Arabia were 0.40 times significantly less likely to adhere to medication administration com[pared with men.[22] The studies of Rolnick and colleagues[23] and Tadesse and co- workers[24] also indicated that men were more likely to adhere to medication administration. With this inconclusive finding, effect of gender as a modifying factor on medication adherence should be further examined.

Age was found to be associated with medication adherence. We found that patients aged 60 years or younger were significantly 1.91 times more likely to have medication adherence than their counterparts. This finding was consistent with the study of Rolnick and colleagues where medication adherence decreased with age.[23] This was also consistent with the study of Khan and co-workers which reported that the highest level of medication adherence (82%) was found in patients with 30 – 40 years of age.[25] Our result also agreed with that of the study of Teshome and colleagues where patients who were 60 years of age or older were less likely to adhere to medication taking, i.e., 0.33 times of that of their counterparts.[26] This could be attributable to the fact that the elderly could suffer from a declined cognitive function as they age.[27] As a result, they are more likely to forget to take the scheduled medication and a poorer medication adherence is more prominent.

Low level of perceived barriers to taking anti-hypertensive medications was significantly associated with a 2.61 folds of medication adherence than their counterparts. This was consistent with the study of Wangworatrakul and colleagues where perceived barriers to medication could significantly predict medication adherence behavior (β = -0.202, *P*-value <.05). It was also consistent with the study of Kamran and co-workers where Iranian hypertension patients with high level of perceived barriers had a low level of medication adherence than those with low or moderate perceived barriers.[28] Our result was also in agreement with the work of Yue and colleagues where low perceived barriers among Chinese hypertension patients were significantly more likely to have medication adherence.[29] Based on our finding and the others', innovative activities to alleviate perceived barriers to medication use could be useful in enhancing the medication adherence behavior in hypertension patients.

In terms of enabling and reinforcing factors, they were not significantly associated with medication adherence in hypertension patients (*P*-value = 0.08 and 0.88, respectively) which were not what we hypothesized. However, this finding was consistent with the study of Poolperm where knowledge about hypertension and social support were not associated with self-care behaviors of hypertension patients.[30] However, Yoopan and colleagues found that social support was significantly positively correlated with health belief (r = 0.218, *P*-value < 0.01); while health belief was further significantly positively correlated with self-care behavior (r = 0.406, *P*-value < 0.01). In addition, the study by Pruengprat found that enabling factors including health information provided by healthcare providers, neighbors and media was found to be significantly associated with self-care behavior in hypertension patients (*P*-value < 0.01).[32] We recommended more studies on enabling and reinforcing factors of the medication adherence.

With a limited time for study, many modifiable factors such as enabling and reinforcing factors, were not fully explored. We recommend more study time to explore these factors more thoroughly.

In terms of application, hypertension patients should be encouraged to adhere to follow-up visit for continuous care and medication adherence. Healthcare providers should have an opportunity to participate in developing activities and guideline for promoting medication adherence especially hypertension patients with certain characteristics such as male patients and patients with 60 years of age or older. The reminder through community health volunteers and home visit could help promote medication adherence. In addition, materials to help promote medication adherence such as auxillary labels and unit-dose package should be developed.

To understand more on medication adherence behavior, a better research method such as sequential explanatory mixed method could be used in the future study to quantitatively determine medication adherence and qualitatively expore .the cause of non-adherence. In the future study, innovative activities for promote medication adherence should also be developed and tested for effectiveness.

In conclusion, more than half of hypertension patients at Saithongwattana Community Hospital had medication non-adherence. Medication adherence was associated with gender, age, and perceived barriers. Healthcare providers should participate in developing interventions to promote the adherence.

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