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ORIGINAL ARTICLE

Community-Based Health Literacy Program on Uncontrolled Hypertension in Urban Area, Thailand

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ABSTRACT

Many strategies have been used to address uncontrolled HT. There was few intervention-based on integration of health literacy, chronic care model and self-management theory to approach this problem. This study aimed to determine the community-based health literacy program which effected on uncontrolled hypertension (HT) in an urban area. This was a quasi-experiment performing during June 2017 to March 2018. Two urban areas were selected as sites for an intervention group and a comparison group, and patients with uncontrolled HT were separately randomized within each group, 63 patients who received a community-based health literacy program of care (mainly comprising 2-days workshop of self-management, home blood pressure monitoring, home visit by village health volunteers and family nurses) for six months, and 60 patients who received usual care. Data were collected by questionnaire, and blood pressure (BP) measurement was done at home for seven consecutive days at 0, 3, 6 months. Biochemistry levels were tested at 0, 6 months. Statistics were analyzed by descriptive statistics. Multiple linear regression was used for mean comparison with adjusted confounders. Statistically significant changes ($P < 0.001$) were found between the intervention and comparison groups. The intervention group showed decrease of -9.6 mmHg (95% CI; -14.0, -5.2) in systolic home blood pressure (SHBP), -6.2 mmHg (95% CI; -8.2, -4.0) in diastolic home blood pressure (DHBP), -0.8 kg/ m^2 (95% CI; -1.2, -0.4) in body mass index (BMI), and -23.8 mg/dL (95% CI; -34.2, -13.5) in low density lipoprotein (LDL) compared to the comparison group. The community-based health literacy program effectively decreased blood pressure, BMI and LDL in uncontrolled HT patients in an urban community. Expanding the program integrating of health literacy, chronic care model and self-management theory into other urban areas may effectively decrease blood pressure aiming to control HT and to prevent its complications.

Keywords: home blood pressure, primary care, health literate care model, self-management behavior, uncontrolled hypertension

INTRODUCTION

The global estimated number of death by HT was 9.4 million per year.[1] By a 2012 estimate, the prevalence of HT among adults in Southeast Asia was 36.6%[2], while less than 50% of those identified were aware that they had HT. Among those who were aware, only about half were being treated. A 2014 survey in Thailand showed that 69.8% of HT patients did not aware of having it. Of those HT patients who were aware, solely 36. 6% were controlled HT patients.[3] In Thailand, hospitalization from NCD has increased significantly,[4] and the estimated number of NCD deaths was nearly 400,000 in 2010[5] and in 2018, this number accounted for 71% of total deaths in Thailand.[6] However, the death rates of cerebrovascular disease (stroke) and ischemic heart disease (IHD) doubled from 2002 to 2014,[7] stroke death rate rose from 35.9 per 100,000 in 2013 to 47.8 per 100,000 in 2017, and IHD death rate increased from 26.9 per 100,000 in 2013 to 31.8 per 100,000 in 2017.[8] From a systematic analysis in 2013, HT was pointed as the second range of common death cause in Thailand.[9] Uncontrolled HT is clearly a challenge, especially systolic HT, which is the major cause uncontrolled HT.[10]

Many interventions have been provided to control HT directly to individual and community or via health personnel including organizational development.[11] Approach by mutidis-ciplinary team decreased blood pressure resulting in increase of HT control rate.[12,13] Taking care by pharmacists and nurses with patient align care team lowered blood pressure.[14-16] Home blood pressure monitoring was also effective for HT control.[17]Although there were many intervention including the chronic care model (CCM) which has been broadly utilized, it has been shown to be insufficient for patient engagement, health personnel must to address whole patients with the hypothesis that patients might not comprehend the information.[18] Thus, in 2010, the health literate care model (HLCM) was added to the Agency for Healthcare Research and Quality (AHRQ) Health Literacy Universal Precautions Toolkit.[18] HLCM consisted 20 tools as following; 1) Form a team 2) Assess your practice 3) Raise awareness 4) Tips for communicating clearly 5) The teach-back method 6) Follow-up with patients 7) Telephone considerations 8) Brown bag medication review 9) How to address language differences 10) Culture and other considerations 11) Design easy-to-read material 12) Use health education material effectively 13) Welcome patients: helpful attitudes, signs 14) Encourage questions 15) Make action plans 16) Improve medication adherence and accuracy 17) Get patient feedback 18) Link patients to nonmedical support 19) Medication resources 20) Use health and literacy resources in the community.[18] HLCM represents a com-prehensive, synergistic, proactive, and practical framework to adapt for all level of health literacy that patients have. HLCM help to decrease overlap, inefficiency, patients incomprehension and un-engaging in care of health .[18] Additionally, self- regulation behaviors have been shown to lead to self-efficacy and taking part in self- management (SM) behaviors. Self-regulation relies on social learning theory and social cognitive theory strategies.[19]

Few studies have looked at programs that integrate comprehensive organization improvement and self-management to address uncontrolled HT in urban areas. The community-based health literacy program used in the present study

was created based on the integration of HL, CCM, and SM theory. The aim of the study was to explore the effects of community-based health literacy program of care on uncontrolled HT in an urban area.

METHODS

Study design and area

The quasi-experiment study was performed during June 2017 to March 2018 in an urban area of Nakorn Ratchasima province in Thailand. The inclusion criteria for selecting an intervention primary care unit (PCU) were 1) a prevalence of hypertension ≥ 10%, 2) a population ≥ 10,000 and 3) sufficient home blood pressure monitoring (HBPM) instruments (TD3128) provided to patients. The comparison PCU was selected using similar criteria, including prevalence of HT, population, health service system, and staff. PCUs in the center of urban areas, where malls, governmental offices, and famous schools are located, were excluded.

Study population, sample size, and sampling

The target population was uncontrolled hypertension patients living in urban areas. The formula for a two-sample parallel design for continuous data was calculated for the sample size [20] When σ = the standard deviation of systolic blood pressure = 11.2, Z_α = 1.65 at α = 0.05, Z_β = 0.84 at β = 0.2 (power 80), Δ = effect size of the mean difference of systolic blood pressure change between intervention and control group= 5.5.[14] The sample size in each group was at least 67 after accounting for a 30% attrition rate resulting in the total number was 134 participants. To select participants, the last three blood pressure level measurements were retrieved from 43 files of the database among 2,231 hypertension patients in two PCUs as adapted consort flow diagram which presented in figure 1. The average BP level of a patient was calculated, then 1,029 were identified as having uncontrolled hypertension—that is, an average clinic BP ≥140/90 mm Hg. One hundred ninety patients met the inclusion criteria (aged 30–70 years, patient registered to PCU, essential HT, lived in the catchment area ≥ 1 year) and exclusion criteria (BP ≥200/100 mm Hg, postural HT, psychiatric hospitalization within the past two years, terminal stage of diseases) as eligible participants. The 99 and 91 participants identified as eligible for the intervention group and comparison group respectively were separately coded and randomized. This resulted in the enrollment of 63 participants in the intervention group and 60 participants in the comparison group. All of the enrolled participants both groups were followed up and were analyzed for their result data.

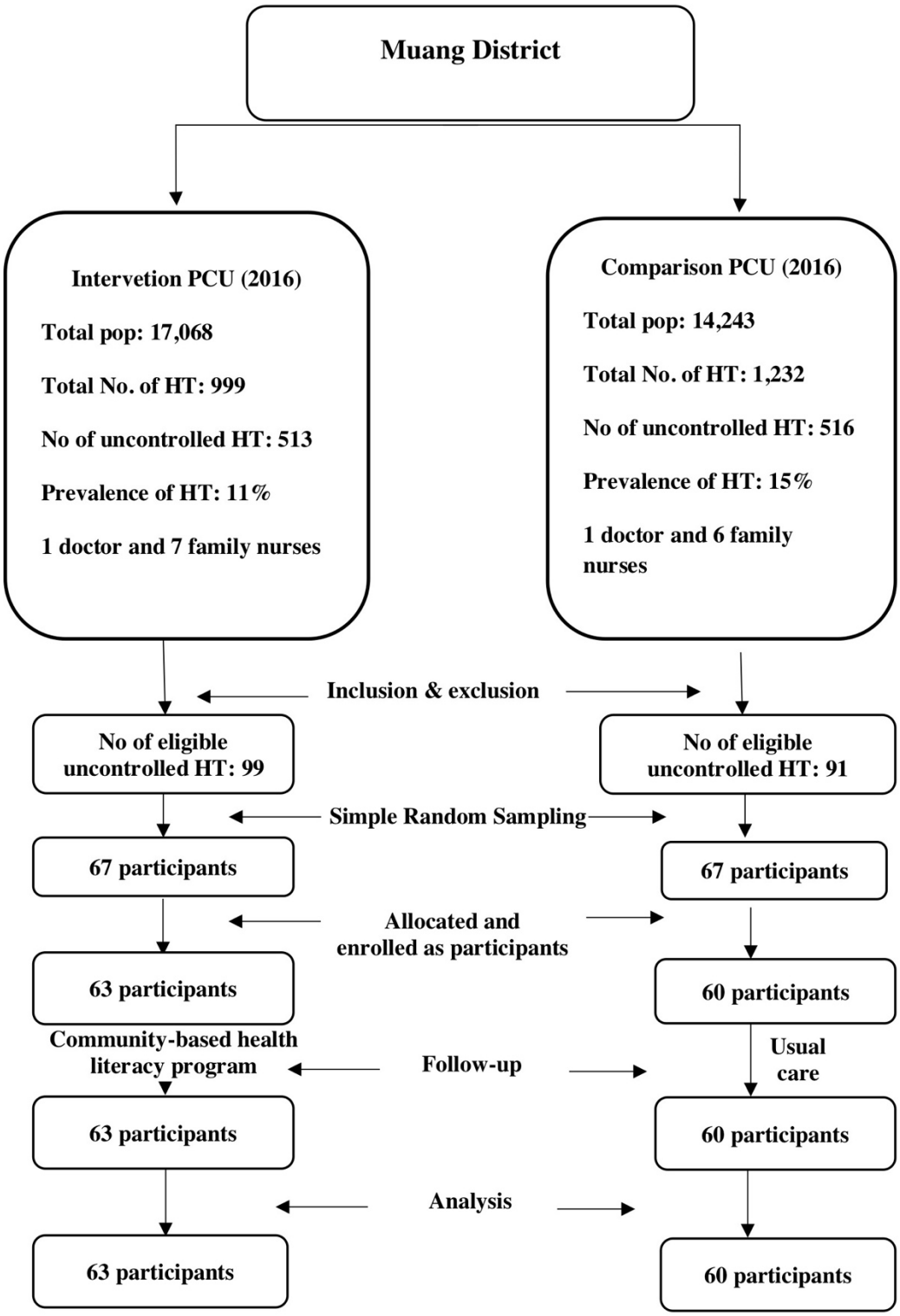

Figure 1: Adapted consort flow diagram

Intervention

Table 1 presented the community-based health literacy program. This program was constructed with tools to support the 6-month implementation.

Table 1. The community-based health literacy program

Preparation			
Program development	Stakeholders defined health system improvement needs based on HLCM. Then the program was constructed and revised by all stakeholders.		
Tool establishment	A collaborative team establishment, the URIGHT Telehealth software installation to store and manage patients 'data, HT guidelines providing, a cartoon book creation, a musical video, and a workshop production to raise HT self-management for two days.		
Implementation			
1st month	The two-day workshop was implemented before participants carried out HBPM twice in the morning and twice in the evening as schedule by themselves.	VHVs did a home visit/ call to support	FD and FN were trained to use HT guideline to guide their decision-making of patients' treatment.
2nd month			
3rd month			FN did a home visiting to explore patients 'goal, their thought, their decision, their plan of and involvement of their behaviors, evaluation themselves and management change by themselves. Also, FN promoted a personal performance to manage HT care.
4th month			A group meeting for discussion any identification of self-management successfulness, problems, and possible solutions was established to conduct appropriate individual care.
5th month			
6th month			FN made a second home visit to follow up reminder, promote health behavior, and empower participant and family.

Usual care

Firstly, VHVs or the participants of comparison PCU did not get training to execute the intervention. However, VHVs

were trained BP measurements then they measured BP of the comparison participants for seven days at baseline, three months, and six months. Secondly, improving organization grounded on HLCM and involving of stakeholders were not provided to the comparison PCU, and participants did not enroll workshop. But, the comparison participants got home visits or calls by the VHVs as routine.

Research instruments

The measurement tools consisted of three parts: 1) a questionnaire, 2) BP monitoring, and 3) biochemistry laboratory tests. The face-to-face interviewing by questionnaire was utilized for data collection. Firstly, questionnaire was written in English. Secondly it was translated into Thai. However, there was no need to translate part 3 because it was originally Thai version. FN and other staffs in urban areas edited questionnaire to make them more comprehensible. The questionnaire was then transfer to three experts for improvement of valid. The score of the overall item objective congruence index was 0.8. There were 67 questions divided into four parts: 1) demographic characteristics had 16 questions, 2) lifestyle and management knowledge had 9 questions[21] (KR-20: 0.61), 3) health literacy had 20 questions[22] (Cronbach's alpha of 1) literacy and potential was 0.96 and 2) self-care of chronic patients was 0.86), and 4) self-management behaviors[23] had 22 questions (Cronbach's alpha: 0.88).

Seven-day morning field BP (MFBP) measurements were taken by VHVs at baseline, three months, and six months using TD-3128 with a telehealth assisted system (ESH 2010 approval of the FORA Care Blood Pressure Monitoring System is substantially equivalent to predicate URIGHT TD-3128 blood pressure monitoring system). For each of the three periods, the average of the second and third values of each day was calculated to be representative of the patient's SHBP/DHBP at that time.

In term of biochemistry levels, blood was tested for LDL cholesterol, HDL cholesterol, and triglycerides including estimated glomerular filtration rate (GFR). Urine was tested for albumin. Blood and urine were tested twice, at baseline and six months. The tests were sent to a medical laboratory, which received **MOPH-DMSc-CL01 for** quality assurance approval by the Ministry of Public Health.

Data analysis

Data were analyzed by computer software. Demographics, lifestyle and management knowledge, health literacy, self-management behaviors, and clinical outcomes were analyzed by descriptive statistics. Analysis categorical data was performed by Fisher's exact test, chi-square. For continuous data, Wilcoxon-Mann-Whitney test and independent-t test were used to determine differences in uncontrolled hypertensions and comparison groups.

We used multivariable linear regression to compare the mean and 95% CIs of the adjusted confounding variables. All reported *P*-values were two-sided, and statistical significance was set at the 0.05 level.

Ethical considerations

The Institutional Review Boards (IRBs) of the Ethical Committee of Maharat Nakhon Ratchasima Hospital approved this study on 18 May 2017 with number 047/ 2017. Before signing on informed-consent, all participant read the form. Each participant had code names in order to protect their privacy. The data was kept confidential. The comparison PCU will get the community- based health literacy program after end of this study.

RESULTS

Overall of the comparing baseline categorical data of the intervention and comparison groups, comparisons of categorical parameters between both groups were not dissimilar for BMI, WC, marital status, education, number of family members, financial status, occupation, health insurance, smoking and drinking history, comorbidity, first treatment, drug preparation, drug reminder, lifestyle and management knowledge, and self-management behaviors. Interestingly, only one-fourth of both groups had a high level of lifestyle and management knowledge, two-thirds had adequate self-management behaviors. The two groups differed only in terms of male to female ratio (1:1 in the intervention group and 1: 3 in the comparison group).

Table 2. Baseline characteristics of uncontrolled HT patients in an urban area

Characteristics	Intervention (n=63)	Comparison (n=60)	*P-value*
Age (years)			0.091[a]
Median (IQR.)	61.0 (8.0)	63.5 (9.0)	
Household income (Baht/year)			0.123[a]
Median (IQR.)	140,000.0 (228,000.0)	204,000.0(288,000.0)	
Individual income (Baht/year)			0.291[a]
Median (IQR.)	31,200.0 (64,800.0)	43,800.0 (88,800.0)	
GFR (ml/min/1.73m^2)			0.459[a]
Median (IQR.)	83.0 (24.0)	80.5 (26.8)	
Female HDL (mg/dL)			0.431[a]
Median (IQR.)	56.5 (18.0)	60.0 (17.0)	
Male HDL (mg/Dl)			0.885[a]
Median (IQR.)	50.0 (11.0)	52.4 (18.5)	
TG (mg/dL)			0.599[a]
Median (IQR.)	147.0 (152.0)	159.5 (62.5)	
Albuminuria (mg/gcreatinine)			0.568[a]
Median (IQR.)	17.6 (98.1)	15.5 (33.7)	
Lifestyle and management knowledge (score)			0.115[a]
Median (IQR.)	7.0 (3.0)	6.0 (2.0)	
Health Literacy for Chronic Diseases Literacy and Potential Literacy			
Writing messages for others to understand			0.232[a]
Median (IQR)	2.0 (1.0)	2.0 (2.0)	

Table 2. Baseline characteristics of uncontrolled HT patients in an urban area (cont.)

Characteristics	Intervention (n=63)	Comparison (n=60)	*P-value*
Reading comprehension			0.156[a]
Median (IQR.)	3.0 (1.0)	2.0 (1.0)	
Talking to others understandably			0.089[a]
Median (IQR.)	3.0 (1.0)	3.0 (1.8)	
Heard voices clearly			0.606[a]
Median (IQR.)	3.0 (0.0)	3.0 (1.8)	
Clear vision			0.391[a]
Median (IQR.)	3.0 (1.0)	3.0 (1.0)	
Daily activities			0.354[a]
Median (IQR.)	3.0 (1.0)	3.0 (1.8)	
Going out independently			0.786[a]
Median (IQR.)	3.0 (1.0)	3.0 (1.0)	
Health Literacy for Chronic Diseases Self-care of Chronic Patients			
Experience sharing			0.047[a]
Median (IQR.)	8.4 (2.4)	7.8 (2.6)	
Self-observation			0.125[a]
Median (IQR.)	8.1 (2.3)	7.8 (1.6)	
Female WC (cm.)			0.119[b]
Mean (S.D.)	92.0 (12.5)	88.0 (9.7)	
Male WC (cm.)			0.856[b]
Mean (S.D.)	96.9 (10.3)	96.4 (11.1)	
BMI (kg/ m^2)			0.809[b]
Mean (S.D.)	27.7 (4.8)	27.5 (4.0)	
SHBP (mmHg)			0.019[b]
Mean (S.D.)	134.7 (13.3)	128.9 (13.4)	
DHBP (mmHg)			0.002[b]
Mean (S.D.)	80.6 (8.2)	75.9 (7.5)	
LDL (mg/dL)			0.009[b]
Mean (S.D.)	121.1 (29.7)	105.7 (33.5)	
Self-management behavior score			0.753[b]
Mean (S.D.)	2.4 (0.2)	2.4 (0.2)	

Notes: *[a] The Wilcoxon–Mann–Whitney was applied to test., [b] The independent t-test was applied to test.*

Abbreviations: *SD, standard deviation; I.Q.R., inter quartile range; GFR, estimated glomerular filtration rate; ml, milliliter; min, minute; m^2 , square meter; TG, triglycerides; HDL, high density lipoprotein; ml, milliliter; mg/dL, milligram per deciliter; mg/gcreatinine, milligram per a gram of creatinine; WC, waist circumference; BMI, body mass index; SHBP, systolic home blood pressure; DHBP, diastolic home blood pressure; kg, kilogram; m, meter; cm, centimeter; mmHg, millimeters of mercury; LDL, low density lipoprotein; mg/dL, milligram per deciliter.*

Table 2 shows the differences in variables between the two groups, including median age (slightly higher in the intervention group) and median household income (slightly lower in

the intervention group). Across the other variables displayed in Table 2 there were no significant differences between the two groups. The average BMI in both groups was nearly 27.5 kg/m^2, which is considered overweight. The average SBPH, DBPH, and LDL levels in the intervention group were significantly higher than the comparison group, whereas the average score of self-management behaviors was at similar level. The unadjusted mean for all outcomes by group are presented in Table 3.

Table 3. Comparisons the effects of the Community-Based Health Literacy Program by group.

Main outcomes	Time	Intervention (n=63) mean (SD)	Comparison (n=60) mean (SD)	Unadjusted Mean difference (95%CI)	Adjusted Mean difference (95%CI)	p-value
SHBP (mmHg)	Baseline	135.7 (11.9)	128.8 (11.8)			
	3 mo	130.2 (10.3)	132.2 (12.0)	-7.2 (-11.1, -3.4)	-6.8 (-10.8, -2.9)	0.001
	6 mo	127.0 (10.4)	129.9 (11.9)	-9.9 (-14.2, -5.6)	-9.6 (-14.0, -5.2)	<0.001
DHBP (mmHg)	Baseline	81.1 (7.9)	76.1 (7.1)			
	3 mo	77.5 (7.7)	78.0 (6.6)	-4.7 (-6.5, -2.9)	-4.6 (-6.5, -2.8)	<0.001
	6 mo	75.8 (7.9)	77.1 (7.3)	-6.4 (-8.4, -4.4)	-6.2 (-8.2, -4.0)	<0.001
BMI (kg/ m^2)	Baseline	28.2 (4.4)	27.5 (4.1)			
	3 mo	27.9 (4.3)	28.2 (4.7)	-0.8 (-1.2, -0.4)	-0.8 (-1.2, -0.4)	<0.001
	6 mo	27.7 (4.4)	28.0 (4.8)	-0.8 (-1.2, -0.4)	-0.8 (-1.2, -0.4)	<0.001
WC (cm.)	Baseline	95.0 (11.7)	91.1 (11.2)			
	3 mo	96.0 (12.0)	92.7 (12.0)	-0.7 (-3.1, 1.6)	-1.3 (-3.7, 1.2)	0.307
	6 mo	95.9 (11.7)	94.2 (14.0)	-2.0 (-4.6, 0.6)	-2.3 (-5.0, 0.4)	0.091
Self-management behavior	Baseline	2.4 (0.3)	2.4 (0.3)			
	3 mo	2.6 (0.3)	2.5 (0.2)	0.2 (0.1,0.3)	0.2 (0.1, 0.3)	0.001
	6 mo	2.7 (0.2)	2.4 (0.2)	0.3 (0.3, 0.4)	0.4 (0.3, 0.4)	<0.001
Lifestyle and management knowledge	Baseline	6.4 (0.2)	5.8 (0.3)			
	3 mo	7.6 (0.2)	6.3 (0.3)	0.6 (-0.1, 1.4)	0.7 (-0.1, 1.4)	0.073
	6 mo	7.5 (0.2)	6.6 (0.2)	0.4 (-0.4, 1.1)	0.4 (-0.4, 1.1)	0.310

Table 3. Comparisons the effects of the Community-Based Health Literacy Program by group. (cont.)

Main outcomes	Time	Intervention (n=63) mean (SD)	Comparison (n=60) mean (SD)	Unadjusted Mean difference (95%CI)	Adjusted Mean difference (95%CI)	p-value
Experience sharing	Baseline	8.0 (1.8)	7.3 (1.7)			
	3 mo	8.6 (1.4)	7.9 (1.5)	-0.1 (-0.7, 0.6)	0.2 (-0.3, 0.7)	0.448
	6 mo	9.1 (1.1)	7.7 (1.6)	0.7 (0.2, 1.3)	1.0 (0.6, 1.4)	<0.001
Self-observation	Baseline	8.2 (1.4)	7.7 (1.4)			
	3 mo	8.8 (2.2)	7.8 (1.6)	0.6 (-0.1, 1.4)	0.7 (-0.1, 1.5)	0.088
	6 mo	9.3 (0.9)	7.8 (1.3)	1.0 (0.5, 1.4)	1.0 (0.5, 1.5)	<0.001
GFR (ml/min/1.73m^{2})	Baseline	80.5 (18.3)	75.8 (24.1)			
	6 mo	80.0 (20.2)	75.1 (24.9)	0.5 (-4.2, 4.3)	1.0 (-3.4, 5.3)	0.665
HDL (mg/dL)	Baseline	56.1 (15.0)	57.7 (10.7)			
	6 mo	61.7 (18.7)	62.5 (12.2)	0.8 (-3.5, 5.2)	1.6 (-2.9, 6.2)	0.487
TG (mg/dL)	Baseline	206.5 (197.3)	181.1 (97.9)			
	6 mo	214.0 (235.2)	167.6 (70.6)	21.2 (-33.1, 75.5)	6.5 (-49.7, 62.7)	0.819
LDL (mg/dL)	Baseline	120.3 (30.1)	107.1 (34.9)			
	6 mo	91.7 (28.9)	101.1 (36.8)	-24.3 (-34.6, -14.0)	-23.8 (-34.2, -13.5)	<0.001
Albuminuria (mg/gcreatinine)	Baseline	86.8 (159.8)	70.7 (127.1)			
	6 mo	168.0 (412.0)	82.0 (139.3)	75.4 (-6.8, 157.5)	78.8 (-3.9, 161.5)	0.062

The results of multiple linear regression by adjustment for sex, number of risks for CVD/CVD, and experience sharing, are shown in Tables 3. Table 3 reveals the mean SHBP in the intervention group declined continuously from 135.7 at baseline to 130.2 and 127.0 mmHg at the three-month and six-month follow ups respectively. The adjusted mean difference of SHBP between the intervention and comparison groups at three months and six months from baseline decreased significantly (6.8 mmHg (95% CI; 2.9, 10.8) and 9.6 mmHg (95% CI; 5.2, 14.0)

respectively. Likewise, the mean DHBP in the intervention group continuously decreased from baseline 81.1 mmHg to 77.5 at three months and 75.8 mmHg at six months. The mean DHBP differences between the two groups also decreased significantly (4.6 mmHg (95% CI; 2.8, 6.5) at three months and 6.2 mmHg (95% CI; 4.0, 8.2) at six months), as did the mean differences in BMI (0.8 kg/ m^2 (95% CI; 0.4, 1.2) at three months and 0.8 kg/ m^2 (95% CI; 0.4, 1.2) at six months). The program had no significant effect on the mean difference of waist circumference (WC) between the two groups.

The mean score of self-management behavior steadily increased during the six-month intervention for the intervention group, but there was no change in the comparison group. Both groups tended to gain a higher score for lifestyle and management knowledge during the six-month period of this program. However, the mean knowledge score increase between both groups at three months and six months without significant difference. In term of health literacy, experience sharing levels and self-observation levels rose in both groups. Finally, this program effectively reduced LDL levels in the intervention group, there were no effects on GFR, HDL, TG, or albuminuria levels.

DISCUSSION

Comparing with the comparison, the intervention participants presented significantly greater improvements in health literacy for chronic diseases, experience sharing, and self-observation of self-care for follow up at the six-month. In contrast, there were no significant changes in lifestyle and management knowledge in the intervention group compared to the comparison group. From baseline to six months, the intervention group's self-management behavior steadily increased compared to the comparison group. There were continually reduced HBP and BMI in the intervention group but no significant change of WC in either group. LDL levels decreased significantly by 23.8 mg/dL. Overall, these changes suggest the effectiveness of the community-based health literacy program of care on uncontrolled HT in an urban area after adjusting for the imbalance in baseline variables. The results could be explained by the fact that the program emphasizes improvement of health literacy and self-management over improvement of lifestyle and management knowledge.

Many reasons which caused increase of health literacy level in intervention group presented in this study. All stakeholders including HT patients and VHVs involved in program design; consequently, the program should be suitable for them to implement. Hypertensive patients were taught not only knowledge and practice to take care themselves they also known and shared their experiences with the other uncontrolled HT patients and their assigned VHV and family nurse (FN). HT patients also received HT cartoon book, QR code of HT cartoon book and musical video, TD-3128 blood pressure measurement, an assigned VHV and FN as facilitators therefore they can access data which they need via assigned persons, book, and video. Besides, FN and VHV were trained to apply 3-Thai-modified questions to ask patients during home visit about what the main problem in HT control is, what method he/she use to solve problem, and why this method is important for controlling HT. Moreover, HT patients discussed self-management successfulness, problems, and

possible solutions with their group. All of above mentions ensured that HT patients can access necessary information to care themselves, they can understand and analyze these information, and they have ability to discuss and advice other people for self-care.

Self-management is one of five domains in the chronic care model and relates to 16 of 20 items of HCLM.[18] In this program, a two-days' workshop, VHVs' home visit and support, and FNs' home visit enhanced self-monitoring and self-management resulted in a decrease of 9.6 mmHg in SHBP and 6.2 mmHg in DHBP, although self-monitoring had moderate net reductions: -2.5 mmHg of SBP and -1.8 mmHg of DBP.[11] Therefore, the remaining SHBP/DHBP decrease may have resulted from other strategies.

A systematic review and meta-analysis revealed that self-monitoring of BP alone did not relate to lower HBP.[24] Consequently, this program supported HBPM with a two-day workshop, VHV support, and home visits by FN. Therefore, HBPM is one useful intervention for lowering BP effectively, especially in programs involving HBPM as one of many strategies.

The decrease in SHBP/DHBP and reduction of BMI and LDL levels proves the effectiveness of this program which is consistent with other similar interventions.[11] The program used in this study shares similar approaches as other studies[11]; which were HBPM by HT patients, education and practice directed to HT patients (by FD, FN, VHVs, a cartoon book, and musical video), and services improvement by using HT guideline to guide decision and purposive home visit. Unlike other interventions, this program did not include an appointment reminder because the HLCM evaluation result from stakeholders. Additionally, forming a team and improving self-management behaviors especially were two items of HLCM which had a significant effect. Two items were also managed in the workshop. Previous studies have also shown that a multidisciplinary-team approach led to SBP/DBP decrease in uncontrolled HT patients.[12] Similar to the two-day workshop, a multidisciplinary approach and improvement of medication knowledge has also been shown to improve lifestyle change and medication adherence.[25] Although a systematic review showed that team-based care interventions decreased BP thanks to the effect of education on BP medication,[12,26] health education was doubtful to be related with the great of decrease in BP.[11] Thus, it cannot be concluded that education alone effected HBP reduction. This program used integrated activities, and while the results showed no differences in lifestyle and management knowledge between the groups, it was observed that lifestyle and management knowledge scores in both groups increased. This might be due to the comparison group education received by HT patients including living in similar context to intervention group. Additionally, Thailand has promoted knowledge of non-communicable diseases through online media and routine program such as lifestyle modification program and routine home visit.

Previous studies using community health workers and coach led care with a multidisciplinary team approach significantly reduced SBP/DBP. Furthermore, home visit program for HT management proved effective in all outcomes improvement and in promotion of an individual's capability for self-manage

hypertensive care.[27] VHVs of this program were trained in an HT content refresh course and HBP measurement course and communication skills during home visits in order to support participants in the intervention group. Moreover, a Line group was set up for family care teams (composing with VHVs, FNs, and FD) to communicate with and support community VHVs. This community-based program also provided care through home visits by FN. The results were consistent other studies, such as a multicomponent proactive nursing program for elderly HT patients of PCUs in Thailand [(14)], a study among underserved primary care hypertension patients,[28] and a study in which community health workers were trained to be coaches in HBPM, lifestyle modification, and drug adherence.[29]

Although SBP, DBP, and LDL of intervention group were higher than comparison group, the community-based health literacy program effectively decreased those values in the intervention group calculating by multivariable linear regression with adjusting for the imbalance in baseline variables. PCUs could not be randomized to either the intervention or comparison group nor could the environments of the two groups be fully controlled. However, the intervention and comparison groups were selected to be comparable in terms of population, HT prevalence, staff, and services. A quasi-experiment design is especially useful for behavior studies in real situations. Therefore, the results of this study may be appropriate to implement into practice at the urban primary care. Hawthorne effect may be another bias. The intervention participants may have had more compliance of medical and non-medical treatment than the comparison participants. They felt that they were being observed during procedure of home visit and supporting by FN and VHVs. However, researcher performed an explanation of the study details including activities for both the eligible intervention participants and the eligible comparison participants before inform consent. They may felt this study waste their valuable time and also felt boring to enroll in this study. Thus the participants who did an inform consent and participated the study until the completion of this study might be from the effects of study intervention, which might not be from hawthorn effect.

RECOMMENDATIONS

In sum, a community-based health literacy program may be effective for hypertension control among uncontrolled HT patients in an urban community by increasing health literacy for chronic disease, and self-management behaviors by a two-day workshop, HBPM with VHV support, and home visits by VHV and FN. A community-based health literacy program should be one strategy of national policy to defeat uncontrolled HT. Extending the program into other areas, especially urban areas, could be useful for controlling HT in order to prevent complications.

To define which factors mostly affect reduction of BP and to decide the appropriate strategy to address uncontrolled HT in urban communities, research is necessary in the future. Research should explore further the effectiveness of the community-based health literacy program to control HT in rural areas. Without budget limitations, a randomized control trial designed should be applied to test the effectiveness of the community-based health literacy program.

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