Effectiveness of Health Literacy Enhancement Integrated with Telehealth in People Newly Diagnosed with Hypertension in Suburban Thailand: A Quasi-Experimental Study

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Abstract: People newly diagnosed with hypertension often have insufficient health literacy and suboptimal self-care behaviors, particularly in diet, physical activity, and medication adherence. Thus, health literacy enhancement is essential. This quasi-experimental study examined the effectiveness of a telehealth-integrated health literacy enhancement among people newly diagnosed with hypertension. Fifty participants diagnosed with hypertension within the past year were consecutively recruited from subdistrict health-promoting hospitals in two districts. They were assigned at the cluster level to the experimental or control group (25 per group). The experimental group received usual care plus a six-week telehealth-integrated health literacy enhancement program. The control group received only usual care. Data were collected at baseline and post-intervention using the Personal Health Questionnaire, the Health Literacy Questionnaire, and the Self-Care of Hypertension Inventory. Data were analyzed using descriptive statistics, paired t-tests, and independent t-tests.

After the intervention, the experimental group demonstrated signif icant improvements in health literacy and self-care behaviors, as well as a substantial reduction in systolic blood pressure compared with baseline and the control group. In contrast, no significant differences in diastolic blood pressure were observed. The findings demonstrate the effectiveness of the Health Literacy Enhancement Integrated with Telehealth program in improving health literacy, self-care behaviors, and blood pressure control among people newly diagnosed with hypertension. Nurses can incorporate this program into routine care to improve outcomes, reduce long-term complications, and support continuity of care. However, future studies should include long-term follow-up, a randomized controlled trial, and multisite research before it can be widely used.

Keywords: Health literacy, Hypertension, Hypertension control, Newly diagnosed, Self-care behaviors, Telehealth, Thailand

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Introduction

Hypertension is a serious global public health threat,[1] often called the "silent killer."[2] This condition has been associated with an increased risk of cardiovascular and chronic kidney disease[2] and is a major cause of mortality and long-term impacts on the healthcare system.[2] Despite significant prevention strategies,

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the number of adults with systolic blood pressure (SBP) ≥ 140 mmHg and/or diastolic blood pressure (DBP) ≥ 90 mmHg continues to increase, globally reaching approximately 1.4 billion in 2024 and is expected to exceed 1.5 billion by 2030.[1,2]

In Thailand, the prevalence of people with hypertension has risen from 25.4% to 29.5%,[3] reflecting gaps in disease awareness, treatment, and blood pressure control.[4] Unhealthy lifestyle behaviors influence these challenges, the fact that high blood pressure is a relatively asymptomatic disease,[1] and the constraints in terms of the counseling process due to the high number of patients in the healthcare setting.[4] Consequently, people with newly diagnosed hypertension (PW-NHT) often receive limited support and have insufficient understanding of the disease, leading to suboptimal self-care behaviors and poor adherence to antihypertensive medication.[5]

Enhancing health literacy has a greater impact on self-care behavior than traditional health education, as it focuses on strengthening individuals' capacities to engage with health-related information effectively,[6] rather than simply providing information.[7] Thailand has identified health literacy as a national priority and implemented community-based education and lifestyle-modification initiatives.[8] However, the efficacy and tailoring of various programs are less than adequate, given that current levels of health literacy in the population are reported to be moderate.[9] However, a staggering 20% of the population has low health literacy.[9] Specifically, people with hypertension in suburban areas with varying cultural and socioeconomic backgrounds also report difficulty engaging in healthy lifestyle activities that prevent or control BP, despite having access to health information and good health literacy. However, many continue to have high-sodium and/or refined carbohydrate diet intake patterns and engage in little to no physical activity.[10]

Recently, an increasing number of studies have utilized health literacy-based interventions that have been shown to improve self-care behaviors,[11-18] and significantly reduce blood pressure levels.[13,18,19] However, most of these interventions have primarily targeted individuals with uncontrolled hypertension and those with comorbidities or chronic diseases.[11-19] Research focusing on adult PW-NHT remains limited, despite their need for continuous support during the early stages of disease management. Although telehealth interventions have demonstrated effectiveness in improving health literacy,[20,21] the integration of telehealth within a health literacy framework, particularly among PW-NHT in the Thai context, remains scarce. Therefore, this study was conducted to design and evaluate a telehealth-integrated program to enhance health literacy and strengthen self-care behaviors among adult PW-NHT in suburban Thai communities.

Literature Review and Conceptual Framework

Nutbeam's health literacy model[6] was used to guide the conceptual framework in this study. Health literacy is positioned as a mediator through which health education interventions influence health behaviors and health outcomes,[22] by concentrating on people's ability to acquire, comprehend, and apply health information to improve and preserve good health.[6] Health literacy is divided into three levels: functional, interactive, and critical.[6]

In the Thai context, health literacy has been conceptualized as a set of practical skills applied in daily life, comprising six key components: access, cognitive, self-management, communication, decision-making, and media literacy.[23] This contextualized framework aligns closely with Nutbeam's model. It is particularly relevant for adult PW-NHT, who often have insufficient skills for sustainable self-care during the early stages of disease management. Evidence suggests that higher health literacy is linked to greater self-care activities

and blood pressure control,[24-26] while enhancing health literacy interventions can effectively promote healthier lifestyles and support improved blood pressure control.[11-19] Nonetheless, prior research on chronic illness management has shown that care programs grounded in health literacy can improve patients' comprehension, self-management abilities, and health-related behaviors, which are crucial to enhancing clinical outcomes.[27]

Clear, purposeful, and individualized communication is crucial in improving health literacy, and instruction must involve focused teaching methods.[28] Accordingly, this study employed the Teach-Back and Ask Me 3 techniques, which have been shown to enhance health literacy effectively.[16,28] However, these approaches may be limited by barriers to real-time learning and to the continuity of support. The LINE application, a widely used platform in Thailand, was incorporated as a telehealth component to facilitate communication, continuous health education, and on-demand access to health information. Therefore, this study integrated health literacy enhancement with telehealth to improve health literacy, strengthen self-care behaviors to support effective blood pressure control among adult PW-NHT.

Study Aim and Hypothesis

This study examined the effectiveness of the Health Literacy Enhancement Integrated with Telehealth program (HLE-IT) among PW-NHT in suburban Thai communities. The primary outcomes included health literacy scores, self-care behaviors scores, SBP, and DBP. We hypothesized that, after participating in the HLE-IT, individuals in the experimental group would exhibit higher mean health literacy and self-care behavior scores, as well as lower mean SBP and DBP, compared with both their baseline values and those of the control group.

Methods

Design: A clustered quasi-experimental two-group pretest-posttest design, in which districts were assigned at the cluster level to the experimental or control condition. This report followed the Transparent Reporting of Evaluations with Non-randomized Designs (TREND) statement for reporting non-randomized studies.

Sample Size: This was calculated using G*Power 3.1 with $\alpha = 0.05$ and power = 0.95, based on a similar study,[12] resulting in 42 participants. Adjusting for 20% attrition,[29] 50 participants were recruited (25 per group), all of whom completed the study and were included in the analysis.

Sampling and Settings: A multi-stage sampling approach was used to select clusters. Two of the seven districts in a suburban province of Thailand were selected by simple random sampling and, at the district (cluster) level, assigned to the experimental or control group (one district per group). In the experimental district (District A), two of seven subdistricts were randomly selected, comprising three subdistrict health-promoting hospitals (SHPHs). In the control district (District B), three of seven subdistricts were similarly selected, comprising two SHPHs. Access to the study participants was facilitated through coordination with the head nurses at each setting in the participating SHPHs.

After cluster selection, lists of eligible adults were obtained from each SHPH. Participants were consecutively recruited by the primary investigator (PI) during scheduled Non-Communicable Disease (NCD) clinic days and approached while waiting for their appointments **(Figure 1).**

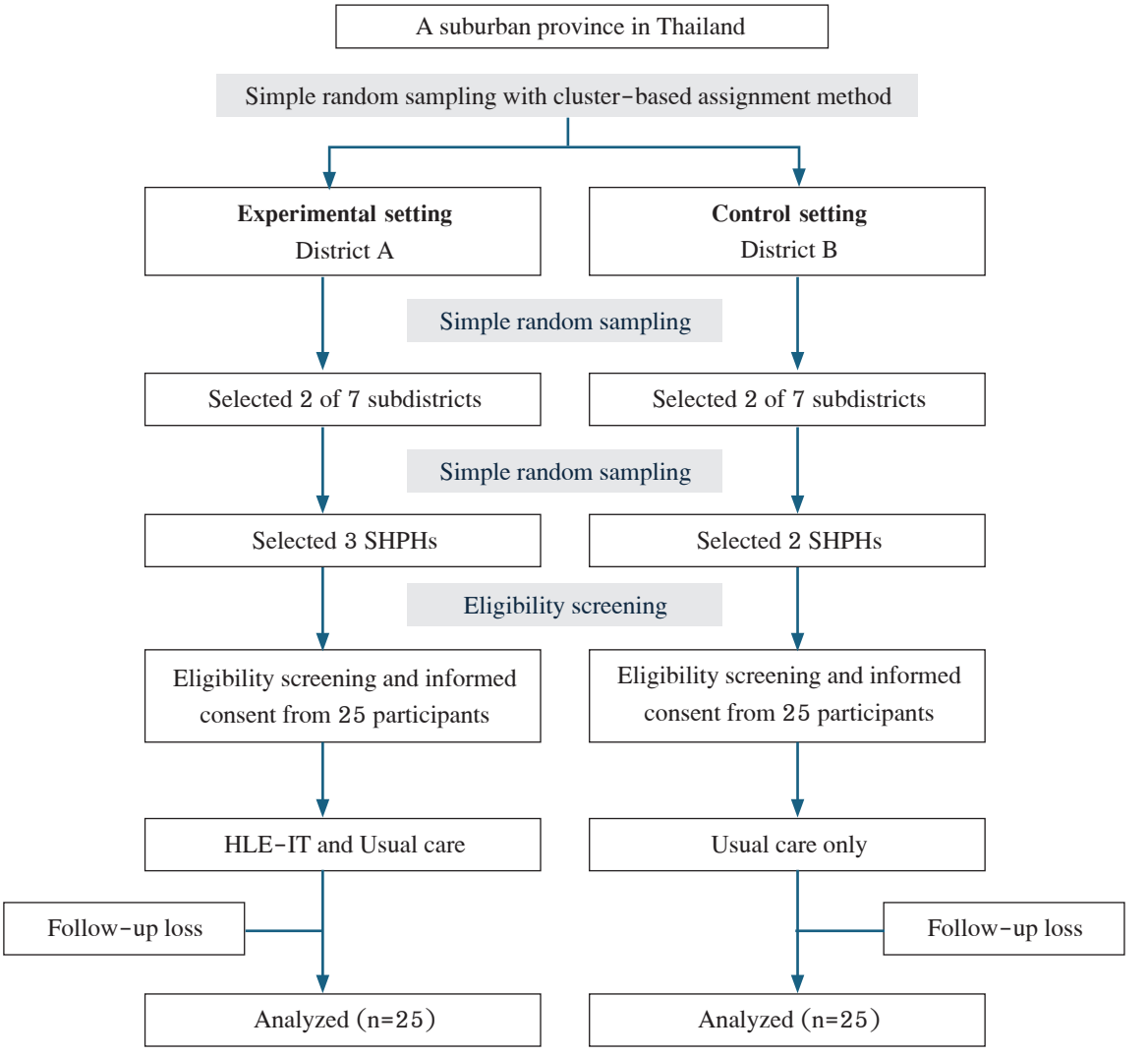


Figure 1: Participants' flow chart over the duration of the study

Note. SHPHs = Subdistrict health-promoting hospitals; HLE-IT = Health Literacy Enhancement Integrated with Telehealth program

Inclusion criteria were: age ≥ 20 years; diagnosis of primary hypertension within the past year; residence in the province ≥ 1 year; no dementia (Mini-Cog screening for those ≥ 60 years); systolic blood pressure > 130 to ≤ 160 mmHg and/or diastolic blood pressure > 85 to ≤ 100 mmHg based on two consecutive measurements; ability to read and communicate in Thai; independence in activities of daily living; willingness to participate; and smartphone ownership.

Exclusion criteria were: inability to attend ≥ two of the three small-group sessions; development of complications during the program (e.g., ischemic heart disease, myocardial infarction, acute stroke); prior participation in hypertension-related education beyond routine care; or change of healthcare facility or residence during the study period.

The experimental and control sites were located in separate districts approximately 40 km apart, minimizing the likelihood of interaction or contamination between groups.

Ethical Considerations: This study was approved by the Human Research Ethics Committee, Faculty of Medicine Ramathibodi Hospital, Mahidol University (MURA2024/691), for the period September 26, 2024, to September 25, 2026. Written informed consent was obtained from all participants. Participation was voluntary and confidential, with participants' right to withdraw at any time.

Research Instruments: Data were collected using the following research instruments.

A Personal Health Questionnaire (12 items) was developed by the research team based on a review of literature to record the participants' demographic data and health status, including gender, age, marital status, education, monthly income, health care rights, comorbidities, hypertension in family, number of antihypertensive medications, weight, height, and systolic and diastolic blood pressure.

The European Health Literacy Survey (HLS-EU)[30] is a 31-item self-report instrument developed by Sørensen et al. The HLS-EU has been widely used in studies on hypertension and chronic disease management.[12,16,18,19] The questionnaire was modified for public use to reflect health literacy related to hypertension management among PW-NHT and was structured according to the six health literacy skills defined in the Thai context[23]: 1) access skills (6 items i.e., "Find information about hypertension from public media, the Internet, online platforms, or health education materials"), 2) cognitive skills (5 items i.e., "Understand what your doctor explains to you about self-care for hypertension"), 3) self-management skills (4 items i.e., "I can evaluate my self-care activities to control my blood pressure when it is not well controlled") Judge my self-care activities to keep my blood pressure when uncontrol blood pressure"), 4) communication skills (6 items i.e., "Ask doctors or nurses for information about hypertension and self-care"), 5) decision-making skills (6 items i.e., "After receiving information about hypertension, I can decide to adopt the Dietary Approaches to Stop Hypertension [DASH] diet to control my blood pressure"), and 6) media literacy skills (4 items i.e., "After discussing blood pressure self-care, I evaluate and compare the information before deciding whether to follow it"). Each item is rated on a 4-point Likert scale, ranging from 1 (challenging) to 4 (very easy), yielding total scores from 31 to 124. Higher scores reflect greater health literacy in managing hypertension. The questionnaire demonstrated a scale-level content validity index (S-CVI) of 0.99, as assessed by a panel of three experts comprising two nursing faculty members specializing in health literacy and one expert in hypertension. Reliability testing was conducted using a two-week test-retest procedure with a try-out sample of PW-NHT (n = 12), which was considered adequate for a try-out study aimed at evaluating feasibility and preliminary reliability in a setting comparable to the main study population, yielding a Pearson's correlation coefficient of 0.87. In the main study, the test-retest reliability remained robust at 0.96.

The Self-Care of Hypertension Inventory Version 3.0 was used to assess self-care activities related to hypertension, with prior permission obtained. The

original instrument was developed by Dickson[31] and then translated into Thai by Suwannano.[32] The scale comprises 24 items distributed across three domains: self-care maintenance (9 items, i.e., "Keep appointments with your healthcare provider"), self-care monitoring (8 items, i.e., "Monitor your condition"), and self-care management (7 items, i.e., "Reduce the salt in your diet"). Each item is rated on a 5-point Likert scale ranging from 1 (never or rarely) to 5 (always or daily), with total scores ranging from 24 to 120. Higher scores reflect better self-management of hypertension. The original study by the instrument developers reported internal consistency reliability coefficients of 0.81 for self-care maintenance, 0.94 for self-care monitoring, and 0.84 for self-care management.[33] For the Thai version, content validity was confirmed by a panel of three experts (CVI = 0.96). In the current study, reliability was assessed in two phases: the pilot study among a sample of PW-NHT (n = 12) yielded alpha coefficients of 0.71, 0.84, and 0.70, while the main study (n = 50) showed improved coefficients of 0.80, 0.91, and 0.82 across the three respective domains. Furthermore, test-retest reliability over a 2-week interval in the pilot sample indicated strong stability, with Pearson's correlation coefficients of 0.81, 0.86, and 0.80 for the three respective domains.

An automatic blood pressure monitor was used to assess participants' blood pressure levels, measured in mmHg. To ensure accuracy and consistency, the device was calibrated and maintained by certified personnel from the medical equipment supplier, and the same device was used throughout the study period. Participants rested for 5 minutes before blood pressure was measured twice on the same arm, and the average of the two measurements was recorded. Both systolic and diastolic blood pressure values were documented in the personal health questionnaire.

Intervention: The Health Literacy Enhancement Integrated with Telehealth program (HLE-IT)

The HLE-IT program was developed based on Nutbeam's[6] health literacy concepts and has been adapted to the Thai context.[23] We designed the intervention to enhance functional, interactive, and critical health literacy across six core skills. The online components supplemented learning with video clips and interactive Q&A, allowing flexible, ongoing support beyond the group sessions. The program was conducted over six weeks and included three small-group sessions held during weeks 1, 3, and 6, each lasting approximately two hours. Each subgroup consisted of eight to nine participants. In every session, a short quiz was administered to enhance motivation, with small prizes awarded to winners. The on-site activities took place at Subdistrict Health-Promoting Hospitals (SHPHs). Additionally, participants engaged in weekly online learning activities through a LINE Official Account (LINE OA) and a LINE group chat to reinforce and extend their learning beyond face-to-face interactions. Through these online platforms, participants received supplementary health information and were encouraged to submit daily self-care photos related to assigned topics. Prizes were awarded to participants with the highest accumulated points. Three expert nursing instructors validated the program: two specialized in caring for patients with hypertension, and one focused on health literacy. They evaluated its content, activities, duration, and processes. We revised the program based on the experts' recommendations. Details of the HLE-IT and the implementation are provided in **Appendix Table A1.**

Routine care: All participants received appointments with their physicians every two months and received usual hypertension management, which involved maintaining their usual activities of daily living, such as diet, physical activity, and medication use. No further structured instruction or intervention beyond standard care was offered.

Data Collection: After IRB approval, the PI and two trained research assistants (RAs) carried out the study. All three were trained to administer the study questionnaires to ensure uniform data collection and consistent manner. The PI and the RAs approached the participants while they were waiting for their scheduled appointments at the NCD clinic of the selected SHPH, introduced themselves, and clarified the purposes, procedures, potential direct benefits, and possible risks associated with participation. Before conducting the study, the PI obtained informed consent with the ethical research form. After that, the PI and two RAs trained interviewers to complete the Health Literacy Questionnaire and the Self-Care of Hypertension Inventory, which took approximately 10 minutes in the waiting area outside the outpatient department room. The researchers then coordinated with the SHPH to obtain clinical data on that day, including blood pressure, weight, height, and waist circumference. Data collection occurred in the same 6-week period in both groups, between October and December 2024.

Participants allocated to the experimental group were invited to join a LINE application group and a LINE OA, received a self-care handbook, and participated in the HLE-IT program. A minor deviation in the timing of intervention sessions occurred due to participants' outcomes. The control group received only routine care. Blinding was not feasible because the intervention was delivered at the cluster level and involved face-to-face group activities and telehealth components, making masking of providers and outcome assessors impractical.

At six weeks, outcomes were assessed in both groups, including blood pressure measurement and post-test evaluation, which required approximately 10–15 minutes. Following outcome assessment, participants in the control group were invited to join the LINE application group and LINE OA and received the same self-care handbook as the experimental group.

Data Analysis: The smallest unit of analysis was the individual participant. We analyzed characteristics using descriptive statistics (mean, standard deviation, frequency, and percentage) and compared them using the Chi-square test; at least 80% of cells met the minimum expected frequency of 5, and no cell had an expected frequency of zero. An independent-samples t-test SPSS Version 29 was used, with a significance level set at 0.05. The independent-sample t-test was used to compare health literacy and self-care behavior scores and blood pressure values between groups, and the paired sample t-test was used to compare within-group comparisons (pre- and post-intervention). Data normality was assessed using the Shapiro-Wilk test; p-values > 0.05 were consideres indicative of normal distribution. All the analyses were conducted in consultation with a biostatistics expert. All 50 participants (25 per group) were analyzed using a per-protocol approach, with no missing data.

Results

This study involved 25 participants in both the experimental and control groups. Most of the participants in both groups were female, with mean ages of 55.84 years in the experimental group and 54.44 years in the control group. Further, most of the participants were married, had completed at least secondary education, earned 10,000 THB (approximately < 323 USD) or more per month, were covered by social security, and had a family history of hypertension. The most common comorbidity was cardiovascular disease, and the participants were receiving monotherapy for hypertension. The mean body mass index (BMI) was 26.49 kg/m^2 in the experimental group and 25.46 kg/m^2 in the control group. The baseline characteristics of the two groups did not significantly differ. Baseline equivalence between groups was assessed and confirmed for demographic characteristics, health literacy, self-care behaviors, and blood pressure, consistent with the cluster-based assignment. The demographic and health status of the sample are described in **Table 1.**

Table 1. Description of demographic and health status of the sample

Characteristics	Experimental group (n = 25)		Control group (n = 25)		χ^2	p-value
	n	%	n	%		
Gender						
Male	9	36	7	28	0.368	0.544[a]
Female	16	64	18	72		
Age (years)						
Min-Max	41-67		42-65			
Mean (S.D.)	55.84 (6.95)		54.44 (5.87)		-0.770	0.445[b]
Marital status						
Single/ living alone	11	44	6	24	2.228	0.136[a]
married/ cohabiting	14	56	19	76		
Education						
Lower secondary education or below	6	24	11	44	2.228	0.136[a]
Upper secondary education or above	19	76	14	56		
Monthly income (THB) (USD)						
Less than 10,000 THB (approximately < 323 USD)	8	32	6	24	0.397	0.529[a]
10,000 THB or more (approximately ≥ 323 USD)	17	68	19	76		
Healthcare rights						
CSMSB/Government Enterprise/UC	9	36	6	24	0.857	0.355[a]
Social Security	16	64	19	76		
Comorbidities (Multiple responses are possible)						
Diabetes Mellitus	7	28	9	36	0.368	0.544[a]
Cardiovascular Disease	15	60	16	64	0.085	0.771[a]
Hypertension in family	17	68	15	60	0.347	0.556[a]
Number of antihypertensive medications						
Monotherapy	21	84	17	68	1.754	0.185[a]
Dual therapy	4	16	8	32		
Body mass index (kg/)						
Min-Max	19.61-37.11		17.24-36.31		-7.69	0.446[b]
Mean (SD)	26.49 (4.69)		25.46 (4.79)			

Note. a = Chi-square test; b = Independent-samples t-test

Within the experimental group, paired-samples t-tests showed significant improvements in all outcomes from pre- to post-intervention, except diastolic blood pressure (DBP). Total health literacy and all six subdomains (access, cognitive, self-management, communication, decision-making, and media literacy) increased significantly (all $p < 0.001$). Total self-care behavior and all three subdomains (maintenance, monitoring, and management) also increased significantly (all $p < 0.001$). Systolic blood pressure (SBP) decreased significantly ($p < 0.001$), whereas the reduction in DBP was not significant. No significant pre- to post-intervention changes were observed in the control group (**Table 2**).

Table 2. Comparison of outcomes between the pre-test and post-test in the experimental group (n = 25)

Variable	Pre-test		Post-test		t/df	p-value
	Mean	SD	Mean	SD		
Total health literacy score	64.24	18.34	106.00	12.51	9.778/24	< 0.001
Access skills	14.04	3.99	21.32	2.64	8.147/24	< 0.001
Cognitive skills	10.56	3.61	17.96	2.42	8.661/24	< 0.001
Self-management skills	8.68	2.76	14.24	2.24	7.887/24	< 0.001
Communication skills	10.84	4.34	19.60	3.12	8.614/24	< 0.001
Decision-making skills	12.12	3.92	20.16	2.66	8.612/24	< 0.001
Media literacy skills	8.00	2.63	12.72	2.48	7.049/24	< 0.001
Total self-care behavior score	78.60	11.42	103.16	11.16	9.562/24	< 0.001
Self-care maintenance	34.64	3.58	41.00	3.54	7.497/24	< 0.001
Self-care monitoring	23.28	6.09	32.68	5.02	6.844/24	< 0.001
Self-care management	20.68	4.53	29.48	4.06	8.574 /24	< 0.001
Systolic blood pressure	139.46	8.24	130.60	5.79	-7.334 /24	< 0.001
Diastolic blood pressure	80.44	9.14	77.26	8.20	-1.902 /24	0.069

Between-group analyses at post-intervention showed greater improvement in the experimental group than in the control group for all outcomes except DBP. Total health literacy and all six subdomains, as well as total self-care behavior, and all three subdomains were significantly higher in the experimental group (all $p < 0.001$). SBP decreased in the experimental group but increased in the control group, resulting in a significantly lower SBP in the experimental group. The post-test DBP difference between groups was not significant (**Table 3**).

Table 3. Comparison of outcomes between the experimental and control groups

Variable	Experimental group (n = 25)		Control group (n = 25)		t/df	p-value
	Mean	SD	Mean	SD		
Total health literacy scores						
Pre-test	64.24	18.34	69.88	17.29	1.119/48	0.269
Post-test	106.00	12.50	69.60	15.95	-8.977/48	< 0.001
Access skills						
Pre-test	14.04	3.99	15.00	4.18	0.830/48	0.411
Post-test	21.32	2.64	14.76	4.01	-6.827/48	< 0.001
Cognitive skills						
Pre-test	10.56	3.61	11.64	3.38	1.093/48	0.280
Post-test	17.96	2.42	11.36	3.29	-8.078/48	< 0.001
Self-management skills						
Pre-test	8.68	2.76	9.12	2.82	0.557/48	0.580
Post-test	14.24	2.24	9.16	2.46	-7.631/48	< 0.001
Communication skills						
Pre-test	10.84	4.34	11.44	4.44	0.484/48	0.631
Post-test	19.60	3.12	11.68	3.83	-8.018/48	< 0.001

Table 3. Comparison of outcomes between the experimental and control groups (Cont.)

Variable	Experimental group (n = 25)		Control group (n = 25)		t/df	p-value
	Mean	SD	Mean	SD		
Decision-making skills						
Pre-test	12.12	3.92	13.24	3.80	1.026/48	0.310
Post-test	20.16	2.66	14.00	2.96	-7.747/48	< 0.001
Media literacy skills						
Pre-test	8.00	2.63	9.44	2.93	1.828/48	0.074
Post-test	12.72	2.48	8.64	2.45	-5.861 /48	< 0.001
Total self-care behavior scores						
Pre-test	78.60	11.41	78.52	15.12	-0.021/48	0.983
Post-test	103.16	11.16	77.16	11.69	-8.044/48	< 0.001
Self-care maintenance						
Pre-test	34.64	3.58	35.28	4.60	0.549/48	0.585
Post-test	41.00	3.54	35.36	4.41	-4.992/48	< 0.001
Self-care monitoring						
Pre-test	23.28	6.09	21.88	7.07	-0.750/48	0.457
Post-test	32.68	5.02	20.52	5.67	-8.031/48	< 0.001
Self-care management						
Pre-test	20.68	4.53	21.36	5.42	0.481/48	0.632
Post-test	29.48	4.06	21.28	4.38	-6.860/48	< 0.001
Systolic Blood Pressure						
Pre-test	139.46	8.24	139.76	5.87	0.148/48	0.883
Post-test	130.60	5.80	142.16	7.24	6.234/48	< 0.001
Diastolic Blood Pressure						
Pre-test	80.44	9.14	77.06	9.08	-1.312 /48	0.196
Post-test	77.26	9.00	78.18	9.83	0.359/48	0.721

The results largely supported the study hypothesis that participants receiving the HLE-IT would demonstrate higher health literacy and self-care behavior scores, as well as lower SBP, compared with both the baseline and control groups; however, reductions in DBP did not reach statistical significance.

Discussion

This study demonstrated the effectiveness of the HLE-IT program in enhancing health literacy across all domains, including access, cognitive, self-management, communication, decision-making, and media literacy skills. The intervention also improved self-care behaviors and reduced systolic blood pressure among PW-NHT.

This program was effective because it was designed to align with the needs of the target population and presented content in a clear, easily understandable manner. The HLE-IT focuses on enhancing all three levels of health literacy—functional, interactive, and critical—through a structured approach that incorporates Thailand's health promotion guidelines. The latter promotes balanced nutrition with reduced sugar, fat, and salt intake; regular physical activity; effective stress management; adequate rest; and avoiding smoking and alcohol consumption. Health information was delivered using simple language, clear explanations, and interactive questioning through the Teach-Back

and Ask Me 3 key questions technique, which were: 1) What are my primary problems? 2) What should I do? and 3) What makes doing this crucial for me?[35] These strategies were used to assess participants' understanding and to encourage active engagement during group discussion activities. By emphasizing interactive and critical health literacy, these communication techniques helped enhance participants' motivation, knowledge, self-management skills, and confidence. This study's findings align with previous research showing that Teach-Back and Ask Me 3 enhance health information retention and engagement across various groups, including patients in home health and chronic care settings and nursing students, ultimately improving health literacy.[16,36,37]

Additionally, out-of-class telehealth learning further supported the development of health literacy. The use of a LINE Official Account and group chat facilitated ongoing access to health information and sustained interaction between participants and the research team. The findings align with previous studies conducted among diverse groups—including older monks with hypertension, adults with hypertension, and patients with solid tumors—which have shown that telehealth-based interventions can enhance health literacy, reinforce self-care behaviors, and support continuity of care.[20,21,38] The integration of digital platforms also ensured that the program was contextually appropriate for the suburban Thai population, consistent with evidence supporting the effectiveness of tailored health literacy interventions.

The improvement in self-care behaviors across all dimensions supports conceptual frameworks that position health literacy as a mediator through which health education interventions influence health behaviors and health outcomes. This was achieved by strengthening individuals' ability to obtain, interpret, and apply health information. Health literacy-focused interventions can promote healthier lifestyles among people newly diagnosed with chronic diseases,[27] as well as individuals with hypertension.[11-19]

Moreover, a significant reduction in systolic blood pressure was observed in the experimental group, reflecting the clinical benefits of improved health literacy, which facilitates better self-care behaviors and, in turn, leads to better physiological outcomes, particularly more effective blood pressure control. This pathway, from improved health literacy to strengthened self-care practices and improved clinical outcomes, is supported by previous studies demonstrating that higher health literacy supports sustained self-care behaviors and contributes to better blood pressure control among people with hypertension.[13,18,19] Although the DBP declined in the experimental group, the change was not statistically significant, possibly due to the group's baseline DBP averaging 80 mmHg (classified as "high-normal" under the JNC 8 guidelines[39]) which may also have been influenced by the participants' average age (approximately 55 years), during which vascular stiffness typically increases and DBP tends to decline.[40]

Nurses play a crucial role in the effectiveness of the HLE-IT program. The findings of this study support the validity of Nutbeam's health literacy framework by addressing all three levels of literacy. First, the program enhanced functional health literacy by ensuring participants could access and understand basic health information. Second, the use of Teach-Back and Ask Me 3 fostered interactive health literacy, empowering participants to communicate effectively and clarify information with the research team. Finally, by incorporating simulated scenarios, the program promoted critical health literacy, enabling participants to analyze and evaluate health options to make informed decisions in diverse daily situations. When combined with digital platforms, these approaches enabled participants to assess their comprehension, pose critical questions, and actively engage in health management tailored to their specific needs, thereby aligning with Nutbeam's conceptual framework.

Limitations and Recommendations

Because it was impossible to blind intervention providers and outcome assessors, performance and detection bias may have been introduced by the same personnel who delivered the intervention and collected outcome data. Furthermore, findings on the sustainability of the intervention's benefits were limited because changes in blood pressure and self-care practices were evaluated only shortly after the program ended. Future research may need to consider a randomized controlled trial design with suitable blinding techniques when feasible, extend the follow-up period to assess long-term outcomes, and conduct a multisite study, thereby improving internal validity and generalizability.

Conclusions and Implications for Nursing Practice

This study found that among people newly diagnosed with hypertension, the HLE-IT effectively improved health literacy and self-care behaviors and reduced blood pressure levels, which accorded with the hypothesis. The results emphasize the importance of early health literacy-based interventions to promote health in the initial stage following diagnosis.

Nurses and SHPH nurses can adopt the HLE-IT intervention by integrating small-group educational sessions with online platforms, such as LINE discussion groups. This blended approach enhances ongoing communication, promotes positive health behaviors, and improves access to health information. Emphasis should be placed on delivering health education using the Teach-Back and Ask Me 3 techniques to strengthen patient understanding, engagement, and self-care awareness.

The results support the incorporation of health literacy-based communication strategies targeted at individuals with newly diagnosed conditions into nursing curricula and continuing professional development programs, suggesting relevance for nursing education and implications for nursing practice. To improve early and long-term hypertension care, healthcare administrators could consider integrating organized health literacy initiatives targeted at newly diagnosed patients into primary care services and chronic disease management strategies in Thailand and nationally.

Author Contributions

Conceptualization, Methodology, Conclusion, Critically revised and edited manuscript: P.A., S.P., N.N.
Data analysis, Final proofing of the manuscript: P.A., S.P.
Supervision: S.P., N.N.
Data collection, Writing original draft, Project administration, Funding acquisition: P.A
Submission of the manuscript, Corresponding to the editor, Coordination of revisions: S.P.

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Declaration on using artificial intelligence

We used ChatGPT to improve English clarity and grammar.

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Appendix

Table A1. Themes and topics of HLE-IT

Week	Theme	Key activities and topics
1	Functional, interactive health literacy (2 hr)	- Introduction to hypertension and Thailand's health promotion guideline - Accessing health services - Shared goal setting
	LINE application (10 min)	- Video on self-care + Q&A
2	LINE application (10 min)	- Video on diet & exercise for hypertension + Q&A
3	Functional, interactive, critical health literacy (2 hr)	- Promote medication adherence - Discuss health misinformation - Role-play decision-making
	LINE application (10 min)	- Video on exercise + Q&A
4	LINE application (10 min)	- Video on stroke + Q&A
5	LINE application (10 min)	- Video on myths (e.g., medication & kidney disease) + Q&A
6	Functional, interactive, critical health literacy (2 hr)	- Role model activity (record score of self-care via LINE) - Fortune Stick quiz on 6 health literacy skills - "Ask Me 3" practice
	LINE application (10 min)	- Video on myths about health behaviors + Q&A

ประสิทธิผลของการเสริมสร้างความรอบรู้ด้านสุขภาพร่วมกับการดูแลสุขภาพทางไกลในผู้เป็นความดันโลหิตสูงรายใหม่ เขตชานเมืองประเทศไทย : การศึกษาแบบกึ่งทดลอง

พิมพ์ลภัส อัจนากิตติ สุภามาศ ผาติประจักษ์ นรีมาลย์ นีละไพจิตร*

บทคัดย่อ : ผู้เป็นความดันโลหิตสูงรายใหม่ มักมีความรอบรู้ด้านสุขภาพไม่เพียงพอ และมีพฤติกรรมการดูแลตนเองที่ไม่เหมาะสม โดยเฉพาะในด้านการบริโภคอาหาร การมีกิจกรรมทางกาย และการรับประทานยาอย่างต่อเนื่อง ดังนั้น การส่งเสริมความรอบรู้ด้านสุขภาพจึงมีความจำเป็นอย่างยิ่ง การวิจัยกึ่งทดลองนี้มีวัตถุประสงค์เพื่อประเมินประสิทธิผลของการเสริมสร้างความรอบรู้ด้านสุขภาพบูรณาการกับการดูแลสุขภาพทางไกลในผู้เป็นความดันโลหิตสูงรายใหม่ กลุ่มตัวอย่าง คือ ผู้ป่วยที่ได้รับการวินิจฉัยว่าเป็นโรคความดันโลหิตสูงภายในระยะเวลาหนึ่งปีที่ผ่านมา จำนวน 50 ราย ซึ่งได้รับการคัดเลือกแบบต่อเนื่องจากโรงพยาบาลส่งเสริมสุขภาพตำบลในสองอำเภอ โดยกำหนดให้แต่ละอำเภอเป็นกลุ่มทดลองหรือกลุ่มควบคุมตามระดับกลุ่ม (กลุ่มละ 25 ราย) กลุ่มทดลองได้รับโปรแกรมเสริมสร้างความรอบรู้ด้านสุขภาพบูรณาการร่วมกับการดูแลสุขภาพทางไกลเป็นระยะเวลา 6 สัปดาห์ ควบคู่ไปกับการดูแลตามปกติ ขณะที่กลุ่มควบคุมได้รับเฉพาะการดูแลตามปกติ เก็บข้อมูลก่อนการทดลองและหลังสิ้นสุดการทดลองโดยใช้แบบสอบถามข้อมูลส่วนบุคคล แบบวัดความรอบรู้ด้านสุขภาพ และแบบประเมินพฤติกรรมการดูแลตนเองของผู้ป่วยความดันโลหิตสูง วิเคราะห์ข้อมูลด้วยสถิติเชิงพรรณนา สถิติทดสอบทีแบบจับคู่และสถิติทดสอบทีแบบอิสระ

ภายหลังการทดลอง กลุ่มทดลองมีการพัฒนาของความรอบรู้ด้านสุขภาพและพฤติกรรมการดูแลตนเอง และมีการลดลงของความดันโลหิตซิสโตลิกอย่างมีนัยสำคัญทางสถิติเมื่อเปรียบเทียบกับก่อนการทดลองและเมื่อเปรียบเทียบกับกลุ่มควบคุมซึ่งไม่พบความแตกต่างอย่างมีนัยสำคัญทางสถิติของความดันโลหิตไดแอสโตลิก ผลการศึกษาแสดงให้เห็นถึงประสิทธิผลของโปรแกรมเสริมสร้างความรอบรู้ด้านสุขภาพบูรณาการกับการดูแลสุขภาพทางไกลในการเพิ่มความรอบรู้ด้านสุขภาพ พัฒนาพฤติกรรมการดูแลตนเอง และการควบคุมระดับความดันโลหิตในผู้ป่วยความดันโลหิตสูงรายใหม่ พยาบาลสามารถนำโปรแกรมนี้ไปบูรณาการเข้ากับการพยาบาลตามปกติเพื่อพัฒนาผลลัพธ์ทางสุขภาพ ลดภาวะแทรกซ้อนในระยะยาว และส่งเสริมความต่อเนื่องของการดูแล อย่างไรก็ตาม การศึกษาในอนาคตควรมีการติดตามผลในระยะยาว การวิจัยแบบสุ่มและมีกลุ่มควบคุม และการศึกษาในหลายพื้นที่ก่อนที่จะนำไปใช้ในวงกว้างต่อไป

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คำสำคัญ : ความรอบรู้ด้านสุขภาพ ความดันโลหิตสูง การควบคุมความดันโลหิต ผู้ป่วยรายใหม่ พฤติกรรมการดูแลตนเอง การดูแลสุขภาพทางไกล ประเทศไทย

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