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REVIEW

The Existing Interventions to Promote Self-Care and Self-Monitoring Preventing Hypertension Among Thai Risk People: A Scoping Review

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Abstract: Hypertension affects one-third of the worldwide adult population and is a major contributor to premature mortality in Thailand. However, hypertension is mainly preventable, highlighting the need for effective prevention strategies to mitigate this critical health concern. This scoping review aimed to identify existing knowledge gaps and provide a comprehensive understanding of hypertension prevention interventions. Keywords were identified, and an unrestricted search for empirical studies was conducted until December 20, 2024. The search strategy encompassed 11 databases. Ultimately, studies focusing on preventive interventions targeting the Thai population at risk of hypertension were included in this review. Finally, we included 41 studies: 35 in community settings, two in hospital clinics, and four in Buddhist temples. The total number of participants was 16,401, ranging from 32 to 4,786, aged between 18 and 74. Research designs comprised 32 quasi-experimental studies, seven randomized controlled trials, one action research, and one research and development. Researchers primarily delivered interventions. The interventions focused on hypertension monitoring, knowledge promotion, health behavior modification, social support, and counseling, emphasizing preventive behaviors, nutrition promotion, and disease awareness. Researchers commonly took outcome measurements before and 12 weeks after intervention. Manuals, logbooks, and lectures with presentation slides were the primary platforms. Finally, knowledge, behaviors, and biomarkers were the most frequently assessed outcomes. This scoping review provided recommendations that future research should expand intervention strategies, emphasize biomarkers, adopt modern delivery methods like AI chatbots and mobile apps, and include follow-ups beyond 12 weeks to ensure lasting impact.

Keywords: hypertension, intervention, review, self-care, self-management, self-monitoring

Introduction

Primary hypertension is a cause of serious and life-threatening conditions requiring emergency and complicated treatments.[1–3] This condition impacts approximately one-third of worldwide adults and remains a major contributor to premature mortality despite significant advancements in pharmacological treatments.[4] This disease is widely regarded as one of the most influential and modifiable risk factors for the development of cardiovascular disease, stroke, and renal disease globally.[3–7]

Chronic hypertension gradually leads to organ damage, similar to how acute hypertension—specifically, a hypertensive emergency—is associated with acute target-organ damage. This damage may include conditions such as pulmonary edema, coronary artery disease, cardiac ischemia, aortic dissection, heart failure, neurological deficits, acute renal failure, eclampsia, and stroke.[1,2] Both chronic hypertension and hypertensive emergencies affect multiple organs and systems

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throughout the body, increasing the risk of early and sudden death. Chronic hypertension contributes to cardiac remodeling within the left ventricle, ultimately resulting in hypertensive heart disease and, eventually, heart failure.[5] Additionally, it impairs renal circulation, leading to glomerular damage. Furthermore, a sudden rise in blood pressure significantly increases the risk of stroke.[4,6,7]

There are many factors causing hypertension, such as genetic predisposition, inappropriate health behaviors, stress, obesity, and vascular degeneration following the aging process. Obesity, a major modifiable risk factor for hypertension, contributes substantially to the development of primary hypertension. As obesity prevalence continues to rise, the incidence of hypertension and associated cardiorenal diseases is also expected to increase unless more effective strategies for obesity prevention and treatment are implemented.[6] Other modifiable factors also should be considered in the prevention of hypertension, such as diet, exercise, use of tobacco and alcohol, and stress.[2,3] Uncontrolled blood pressure results in substantial organ damage, with brain damage occurring in 93% of cases, left ventricular hypertrophy in 82%, reduced cardiac pumping function in 56%, kidney damage in 55%, and blood clots in small blood vessels in 15% of affected individuals.[8] Deng et al (2022) also found that hypertension can cause cognitive impairment, and uncontrolled blood pressure was associated with the progression of mild cognitive impairment to dementia.[9] Despite established guidelines for high blood pressure management and behavioral interventions, blood pressure control remains suboptimal worldwide, particularly in low- and middle-income countries, including Thailand.[3] High disease burden and early death were found among people with hypertension.[2]

Early detection and appropriate management are essential for preventing heart disease and other cardiovascular and renal conditions.[5] A review of global and Thai studies highlights growing evidence supporting lifestyle interventions for hypertension prevention and adjunctive treatment. These interventions include regular physical activity, weight management, adherence to healthy dietary patterns, and non-traditional approaches such as stress management and promoting adequate sleep with circadian rhythm regulation.[4] Although lifestyle modifications—such as dietary adjustments, reducing sedentary behavior, and increasing physical activity—are commonly recommended for individuals with obesity, their long-term effectiveness in reducing adiposity, maintaining weight loss, and lowering blood pressure remains limited.[6] Additionally, substantial evidence supports a causal link between salt intake and blood pressure. Randomized controlled trials have demonstrated that reducing salt consumption effectively lowers blood pressure in hypertensive and non-hypertensive individuals, complementing antihypertensive treatments. Methodologically rigorous studies with precise salt intake assessments further indicate that lower sodium consumption is associated with a decreased risk of hypertension, cardiovascular disease, all-cause mortality, and other conditions, including kidney disease, stomach cancer, and osteoporosis.[3] High salt intake is a major dietary risk factor, so implementing cost-effective salt reduction programs should be prioritized as a public health strategy.[7] We found a scoping review of hypertension management among people in Southeast Asia;[10] however, the knowledge gap is that we do not yet know what is going on in the pathway/type, component, and content of interventions nowadays among the Thai population. Although we are Asian countries, it is diversity of culture, lifestyle, and beliefs related to health behaviors and hypertension risk factors.

A preliminary search of MEDLINE, PubMed, the Cochrane Database of Systematic Reviews, and JBI Evidence Synthesis from 2013 to 2024 found no existing or ongoing systematic or scoping reviews on this topic. The scoping review of selected studies within the Thai context provided insights into hypertension prevention interventions and identified knowledge gaps in existing strategies. By mapping the details of these studies, this review offers a foundation to guide future research in this area. Moreover, this method can also help provide effective existing interventions to promote self-care and self-monitoring, preventing hypertension among Thai-risk people. This project provided and allowed data comparisons from a multisite study. New strategies will be used to guide, adopt, or integrate for program development to promote self-care and self-monitoring, preventing hypertension among Thai-risk people.

Review Objective

This scoping review used the mapping technique to find a knowledge gap and clarify the phenomenon of hypertensive preventive intervention. Moreover, details of an intervention to promote self-care and self-monitoring and prevent hypertension among at-risk people were provided.

Review Question

What are the gaps and effective existing interventions to promote self-care and self-monitoring, preventing hypertension among people at risk?

Methods

Design

This scoping review was conducted following the JBI methodology for scoping reviews, aiming to provide a narrative synthesis of intervention details alongside a quantitative summary of selected health outcomes. The review adhered to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) checklist guidelines[11] and utilized the PRISMA-ScR flow diagram recommended by the Joanna Briggs Institute.[12] Additionally, the protocol for this scoping review was prospectively registered and published on the Open Science Framework (OSF) at https://osf.io/yhpg4.

Databases

A comprehensive search for empirical articles was conducted across 11 databases, with no date restrictions, up to December 20, 2024. The search utilized relevant keywords in the databases: PubMed, Embase, CINAHL, Scopus, PsycINFO, Cochrane Library, Ageline, ProQuest, ThaiLis, ThaiJO, and E-THESIS.

Keywords

Keywords were identified for searching by using PCC, including participants, concept, and context. The participants were Thai adults at least 18 years old and at risk of hypertension. The concepts were primary prevention and lifestyle modification. The contexts were risky people and living in the community. Search terms included hypertension, prevention, self-care, self-monitoring, lifestyle factors, exercise, health behaviors, food consumption, intervention, education, program, apps, studies, randomized controlled trial, and quasi-experimental. The researchers employed "OR" to link terms within a concept, while "AND" was used to connect terms across different concepts. Additionally, "NOT" was applied to exclude articles containing keywords specified in the exclusion criteria, such as "Children." Specific details were provided to identify the keywords according to the PCC framework.

Eligibility Criteria

P-Participants

Inclusion.

- Thai Adult (Age 18 years and above)
- Consumption of unhealthy diets (excessive salt consumption, a diet high in saturated fat and trans fats, low intake of fruits and vegetables)
- Being physical inactivity
- Consumption of tobacco and alcohol
- Being overweight or obese
- Having a family history of hypertension
- Having co-existing diseases such as diabetes or kidney disease

Exclusion.

- Pregnancy
- Blood pressure is a lower-level outcome (article is not primarily about hypertension)
- Children

C-Concept

Inclusion.

- Primary prevention

- Diet
- Lifestyle
- Exercise

Exclusion.

- Medications
- Secondary prevention

C-Context

Inclusion.

- Risk people
- Living in community

Exclusion.

- Hospitalized patients
- Being residents in long-term care facilities, such as assisted living, skilled nursing homes, short-term rehabilitation centers, nursing homes, or even hospice

Types of Sources

This scoping review included experimental and quasi-experimental study designs, such as randomized controlled trials, non-randomized controlled trials, before-and-after studies, and interrupted time-series studies. However, analytical observational studies were excluded, including prospective and retrospective cohort studies, case-control studies, and analytical cross-sectional studies. Descriptive observational studies, such as case series, individual case reports, and descriptive cross-sectional studies, were also not considered for inclusion. Additionally, qualitative studies focused on qualitative data—such as phenomenology, grounded theory, ethnography, qualitative description, action research, and feminist research—were excluded. Systematic reviews, meta-analyses, and other scoping reviews were also not included. Only original research studies were considered for this review, and opinion papers and study protocols were excluded.

Inclusion

- RCTs,
- Quasi-experimental studies
- Other study designs, such as those focused on quantitative data or those involving randomized controlled trials or quasi-experimental studies, are also part of their studies, including action research and research and development.

Exclusion

- Reviews
- Guidelines
- Systematic reviews
- Editorials
- Protocols
- Meta-analysis
- Observational studies
- Prospective studies
- Comparative studies
- Cohort studies

Inclusion and Exclusion Criteria for This Scoping Review

Our study selection process was thorough and comprehensive, which involved identifying keywords using the PCC with T as a type of study and providing inclusion and exclusion for each principle. This ensured that we included all articles

suit this scoping review. The inclusion and exclusion criteria for each principle were rigorously applied during the screening and inclusion of studies for this scoping review, and the summarization of them is provided as follows.

- Types of studies: This scoping review focused exclusively on experimental and quasi-experimental study designs. We aimed to identify and summarize the most effective interventions that promote self-care and self-monitoring, thereby preventing hypertension among at-risk individuals.
- Types of participants: This scoping review focused on Thai adults aged 18 and above at risk for hypertension based on the inclusion and exclusion criteria.
- Types of intervention: Studies were included if participants were prescribed self-care and self-monitoring to prevent hypertension, such as diet control, salt intake control, physical activity, and blood pressure monitoring.
- Types of outcome measures: The outcomes of this review were divided into three parts. First, the primary outcomes are self-care, self-monitoring, and blood pressure. Second, secondary outcomes are knowledge, attitude, and health behaviors (diet consumption, smoking, drinking, exercising, body weighting, and stress management). Finally, we extracted intervention training content: methods related to prescription, progression, structure, content (massages) and delivery (pathways), providers, and series of intervention.

Search Strategy

The search strategy was designed to identify both published and unpublished studies. A preliminary search of PubMed and CINAHL was conducted to locate articles related to the topic. The search terms, derived from the titles and abstracts of relevant articles as well as the index terms used to categorize them, were then used to develop a comprehensive search strategy for 11 databases, including ThaiLis, ThaiJo, SCOPUS, PubMed, CINAHL, PsycINFO, ProQuest, EMBASE, Ageline, Cochrane, and E-thesis. This strategy, incorporating all identified keywords and index terms, was tailored to each database and information source. Additionally, the reference lists of all included studies were reviewed to identify further relevant research. Only studies published in Thai or English were included, and the review covered publications from 2012 to December 20, 2024. To gather further material, the first and corresponding authors known for publishing in this area were contacted to inquire about any additional published or unpublished works. Two conference abstracts were identified during the search, and contact with the principal investigators was made, acquiring two complete reports.

Study/Source of Evidence Selection

After the search, all identified citations were collected and uploaded into EndNote version X8, where duplicates were removed. The references were then imported into Rayyan, a systematic review management program. Following a pilot test, the titles and abstracts were screened by two independent reviewers to assess their eligibility against the inclusion criteria. Relevant sources were fully retrieved, and their citation details were added to Rayyan. The two reviewers independently assessed the full texts of the selected citations based on the inclusion criteria. The scoping review documented and reported reasons for excluding full-text sources that did not meet the criteria. Any disagreements between the two reviewers during the selection process were resolved through discussion with a third reviewer. The search results and the study inclusion process were comprehensively reported in the final scoping review and presented in the Preferred Reporting Items for Systematic Reviews and Meta-Analyses Extension for Scoping Reviews (PRISMA-ScR) flow diagram.[12]

Data Extraction

Two independent reviewers used a data extraction tool developed by the reviewers to extract data from the included studies. The first five studies were reviewed initially, and an initial form was piloted. Based on feedback, the form was finalized and refined. The extraction form captured key information from each full-text article, including citation details, participant characteristics, study concepts, context, methods, intervention specifics, and critical findings related to the review questions. If clarification was needed, a third author was consulted.

A draft extraction form was created to initiate a flexible and adaptive process. As data extraction progressed, the form was modified and revised as necessary to reflect the evolving nature of the research. Any changes were documented in

the scoping review to ensure transparency and shared understanding. Disagreements between the reviewers were resolved through discussion with the third reviewer or, when necessary, additional reviewers. If required, the authors of the papers were contacted to request missing or supplementary data, further demonstrating our adaptability. Ultimately, we obtained access to all relevant articles by contacting the two principal investigators.

Data Analysis and Presentation

The data were presented in a diagrammatic format using mapping to offer an overview of the review findings and clarify the phenomena. A numerical summary, utilizing descriptive statistics, was provided to present an overall view of the included studies. Additionally, a narrative review was included, detailing the studies according to the specific objectives of the scoping review. This narrative covered aspects such as methods related to prescription, progression, structure, content (messages), delivery (pathways), providers, and the series of interventions.

Validity, Reliability, and Rigor

This study was carried out by a research team composed of members from various institutions, disciplines, and areas of expertise. Scoping review specialists collaborated with librarians to formulate the search strategy, select relevant databases, and conduct the article search. The team carefully developed and validated the scoping review protocol and search statement. The principal researcher registered the study protocol prospectively and adhered strictly to it to minimize bias and ensure the validity and reliability of the process. All steps were independently reviewed, and disagreements were resolved through consultation with a third independent researcher. In cases where accessing full papers proved difficult, we reached out to our international team members, who successfully obtained the necessary articles.

Results

General Information of the Selected Studies

The initial search found 3,426 studies; however, this number went down to 41 after considering inclusion and exclusion criteria (Figure 1). Among the 41 selected studies, 35 were conducted in community settings, with two initiating the intervention at a hospital clinic, and four in the Buddhist Temple. The target populations were categorized into five groups: public health volunteers, menopausal women, individuals with obesity, older adults, and Buddhist monks. Collectively, the studies included a total of 16,401 participants, with sample sizes ranging from 32 to 4,786. The age of participants across the studies ranged from 18 to 74 years, with the mean and standard deviation ranging from 36.26–68.00 and 2.95–11.05, respectively (Table 1).

Scoping Review Findings

Research Designs

This scoping review included 41 studies: quasi-experimental research, randomized controlled trials, action research, and research and development. The majority of included studies were 32 quasi-experimental research, seven RCTs, one action research, and one research and development (Figure 2).

Interventionists/Health Educators

The interventionists or health educators in the studies reviewed were categorized into four groups: healthcare providers, village health volunteers or family leaders, specialists, and researchers. Among these groups, researchers constituted the majority, delivering interventions or programs to target populations in 35 studies. Healthcare providers with none specifying a particular profession were involved in 11 studies. Village health volunteers or family leaders took part in providing interventions in six studies. Lastly, specialists were identified as interventionists in two studies—one involving a nutritionist and a medical doctor and the other featuring a community pharmacist (Figure 3).

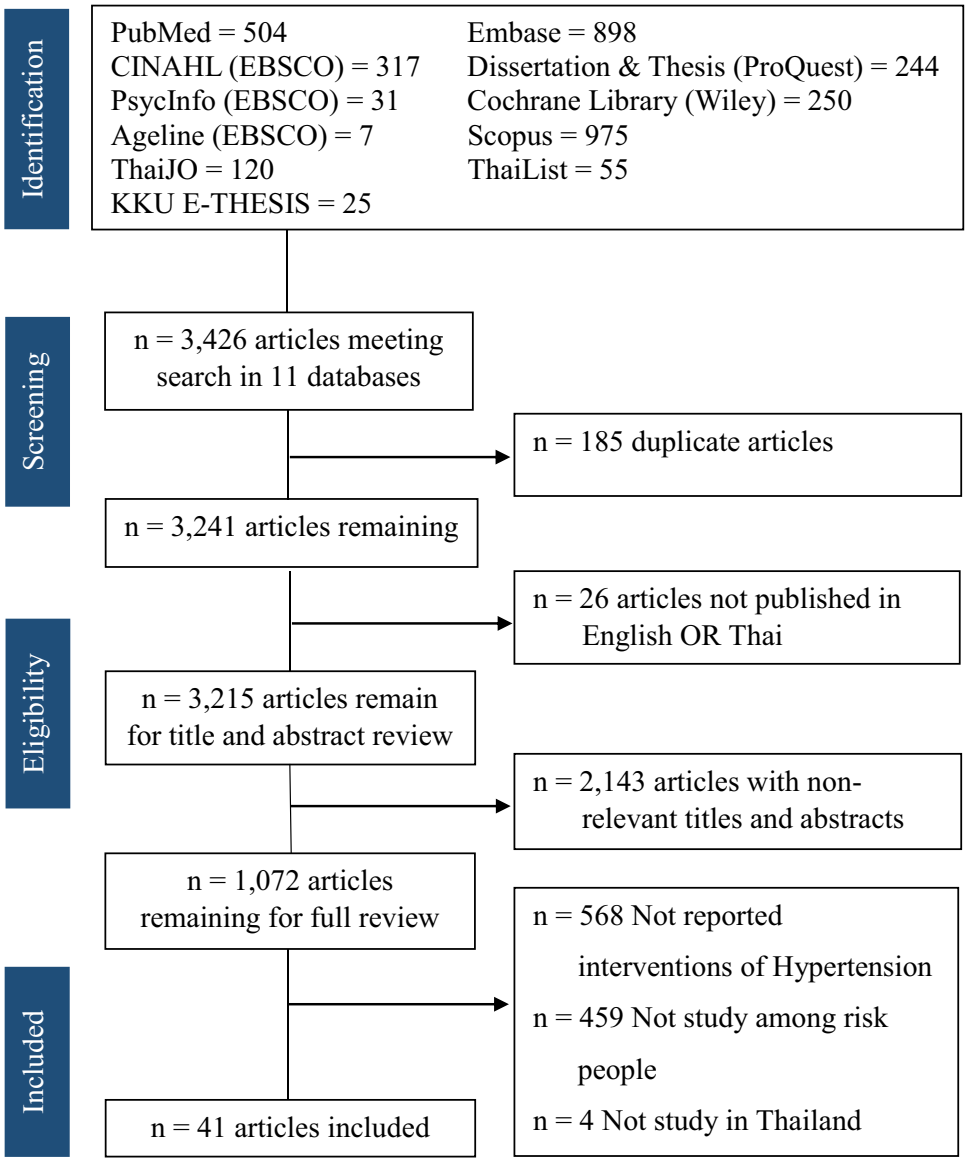

Figure 1 PRISMA Flow chart of the review process and results.
Notes: PRISMA figure adapted from Page MJ, McKenzie JE, Bossuyt PM et al. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. *BMJ*. 2021;372:n71. Creative Commons.[12]

Scope of Interventions/Techniques

The scope of interventions and techniques examined in the selected studies encompassed essential hypertension monitoring techniques, knowledge promotion, health behavior modification, social support, and counseling. Essential hypertension monitoring techniques included blood pressure measurement in seven studies and body mass index (BMI) assessment in 11 studies. Knowledge promotion was addressed in 18 studies focusing on overall preventive strategies, 17 studies on nutrition promotion, 12 studies on obesity and weight control, 12 studies on exercise promotion, and 12 studies on hypertension risk factor management. Regarding health behavior modification, 20 studies promoted preventive behaviors, 20 focused on dietary modifications, 16 emphasized exercise promotion, and 17 targeted risk factor prevention. The final two intervention approaches—social support and counseling—were often combined with group discussions to assist target populations and were reported in 12 studies (Figure 4).

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Table 1 Summary of the Selected Studies

Author	Design/ Setting	Population/ Age	Provision/Media	Content Intervention	Time to Measure Results	Outcome Measured	Research Note
No. 01 Getpreechaswas et.al. (2007)[13]	Quasi-experimental study/ community	Three groups with a total of 540 people/aged 18–59 years 1. Persons aged 18–59 years 2. Total 540 people in 3. Age: no report	1. Group health education 2. Group I: Trained health personnel, village health volunteers (VHVs) and family health leaders (FHLs); community-initiated activities such as exercise clubs, health parks, and self-help groups. 3. Motivation/Empowerment 4. Manuals	1. Prevention strategies 2. Nutrition promotion 3. Weight control 4. Exercise promotion 5. Hypertension risk factor management 6. Preventive behaviors 7. Monitoring technique (blood pressure measurement and BMI determining)	1. Before attending intervention 2. One year after intervention only	1. Knowledge 2. Attitude 3. Health behaviors 4. Body mass index 5. Units cost effective 6. Satisfaction	1. Forgotten content by the interventionist may affect outcomes; prepared manuals or content guidelines can address this gap. 2. Time constraints may be their limitations; a self-study application is a better option.
No.02 Intarakamhang (2011)[14]	Quasi-experimental study/ community	1. Persons aged over 18 years 2. Total 4,649 people 3. Age: no report	1. Provided manuals and logbooks for training the providers of health behavior modification on accurate modification techniques, methods, and procedures. Training was conducted by experienced personal, with regular follow-ups to ensure the achievement of set goals.	1. Nutrition promotion 2. Exercise promotion 3. Dietary modification	1. Pretest 2. Week 2 3. Week 4 4. Week 12 5. Week 16	1. Self-efficacy, self-regulation, and self-care 2. Biomedical indicators (BMI, blood pressure, waist circumference, blood glucose, lipid profiles, cholesterol and HbA1C)	1. The program lacked details about its components, application process, frequency, and duration. 2. Enhanced communication is needed through suitable platforms such as Line Official or Facebook groups.
No.03 Pongwecharak & Treeranurat (2011)[15]	Quasi-experimental study/ community	1. Persons aged over 35 years 2. Total 400 people 3. Age: mean 48.7 ± 10.0	1. Provided education pamphlet and health education. Participants were evaluated using the stages of change model, categorizing them into precontemplation, contemplation, preparation, or action stages. Patients received counseling and educational materials about hypertension and CVD risk factors.	1. Hypertension risk factor management 2. Targeted risk factor prevention	1. Before the start of the program 2. After 12th week of the program	1. Number of pre-hypertensive/ hypertensive participants, patient return rate at 3-month follow-up 2. Blood pressure 3. Blood glucose 4. Blood cholesterol	1. The pamphlet may be effective for individuals without smartphones; however, most Thai people own smartphones. Better outcomes could be achieved through a Line Official account 2. The researcher provided insufficient details about the suggestions given to participants.

No.04 Singha-Dong et.al. (2011)[16]	Quasi-experimental study/ community	1. Persons at risks, pre-hypertension, and live in rural area 2. Total 193 people in 3 groups 3. Age: no report	1. Provided health education, including individualized counseling from researchers, health workers, and health volunteers. A comprehensive comorbidity assessment was conducted, accompanied by home visits and focus group discussions. Grand rounds were organized to promote community participation and ensure continuity of care	1. Hypertensive screening 2. Lifestyle changes 3. Salt intake reduction 4. Exercise promotion	No report.	1. Health-behaviors 2. Blood pressure 3. Salt intake	1. Inadequate insight information and lack of detail of the intervention.
No.05 Saensak et.al. (2015)[17]	Randomized control trial/ hospital	1. Hypertensive menopausal women 2. Total 432 people 3. Age: no report	1. Received the modified mind-body relaxation (MMBR) program, which included a 60-minute session and encouragement for 15–20 minutes of daily practice then record in logbook.	1. Modified mind-body relaxation (MMBR) program 2. Lifestyle changes	1. Pretest 2. Week 2 3. Week 4 4. Week 12 5. Week 16	1. Blood pressure 2. BMI	1. Lack of insight detail of the intervention procedure.
No.06 Tantiprasoplap et. al. (2018)[18]	Randomized control trial/ community	1. Post-menopausal women with prehypertension 2. Total 84 people in 2 groups 3. Age: mean 55.15 ± 7.01	1. Received an arm-swing exercise (ASE) program combined with low sodium intake education, given a handbook, an activity logbook, and a heart rate monitoring watch. The ASE program was introduced and explained in two-hour sessions held monthly for three months.	1. Exercise promotion 2. Dietary modification	1. Before the start of the program 2. After 12th week of the program 3. After 24th week of the program	1. Blood pressure 2. Body weight 3. Heart rate 4. Sodium intake behaviors	1. The sodium intake should be monitored after providing sodium education.
No.07 Chongthawonsatid & Chinjenpradit (2017)[19]	Randomized control trial/ hospital	1. Person aged 30–65 years 2. Total 60 people in two groups 3. Age: intervention/ control 36.70 ± 8.42/49.58 ± 7.12	1. Supervised fitness program at Medical Fitness Center, combining aerobic exercise (30 minutes) and weight training (15 × 3 sets), along with health education using manuals, videos, and supervise.	1. Exercise and dietary supervise 2. Exercise promotion 3. Nutrition promotion 4. Dietary modification	1. Before the start of the program 2. After 12th week of the program 3. After 24th week of the program	1. Blood pressure 2. BMI 3. Waist circumference 4. Lipid profile 5. Fasting blood sugar	1. The factor of motivation should be included.

(*Continued*)

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Table 1 (Continued).

Author	Design/ Setting	Population/ Age	Provision/Media	Content Intervention	Time to Measure Results	Outcome Measured	Research Note
No.08 Yuenyongchaiwat et.al. (2018)[20]	Quasi-experimental study/ community	1. Persons aged 35–59 years 2. Total 35 people in one group 3. Age: mean 49.40 ± 6.9	1. Participants wore a pedometer and tracked daily steps for 5 days. 2. Instructed to walk 10,000 steps daily for 12 weeks.	1. Exercise promotion	1. Before the start of the program 2. After 12th week of the program	1. Blood pressure 2. BMI 3. Waist circumference 4. Heart rate 5. Blood glucose 6. Step walked	1. Lack of comparison group might not reflect the actual effects of intervention. Future studies should include the control group.
No.9 Pengpid et.al. (2019)[21]	Randomized control trial/ Buddhist temple	1. Persons aged 35–65 years 2. Total 443 people in two groups 3. Age: no report	1. Assessed a group-based program in 12 Buddhist temples, involving six diet and physical activity counseling sessions over six months.	1. Exercise promotion 2. Nutrition promotion 3. Dietary modification	1. Before the start of the program 2. After 12th month of the program 3. After 24th month of the program	1. Blood pressure 2. BMI 3. Waist circumference 4. Lipid profile 5. Fasting blood sugar 6. Psycho-behavioral	1. The study did not provide detailed characteristics of the population. However, it reported that some participants' characteristics differed, and an adjusted analysis was applied.
No.10 Pengpid et.al. (2019)[22]	Randomized control trial/ Buddhist temple	1. Persons aged 35–65 years who visit temple. 2. Total 443 people in two groups 3. Age: Intervention/ control 51.0 ± 11.00/52.0± 11.00	1. Provided 60–90-minute group counseling sessions over six months, including feedback, education on healthy eating, and strategies for overcoming barriers to maintaining lifestyle changes.	1. Exercise promotion 2. Nutrition promotion 3. Dietary modification 4. Monitoring technique 5. Behavior monitoring	1. Before the start of the program 2. After 6th month of the program 3. After 12th month of the program	1. Blood pressure 2. BMI 3. Waist circumference 4. Lipid profile 5. Fasting blood sugar	1. Some indicators are self-reported. Self-reporting may introduce bias, which potentially affects the validity of the data.
No.11 Tongvicheanet.al. (2019)[23]	Quasi-experimental study/ community	1. Person aged 35–59 years 2. Total 32 people in two groups 3. Age: intervention/ control 52.06 ± 4.43/53.13 ± 6.02	1. Physical fitness composed of cardiorespiratory fitness, muscular endurance, and flexibility. 2. The self-management exercise program consisted of group discussions, home visits, and telephone calls.	1. Exercise promotion 2. Nutrition promotion 3. Lifestyle modification 4. Self-management program	1. Before the start of the program 2. After 12th week of the program	1. Heart rate 2. Muscular endurance 3. Flexibility	1. The study did not control or include a program to monitor dietary patterns.

No.12 Thatthong et.al. (2020)[24]	Randomized control trial/ community	1. Person aged 19–59 years 2. Total 67 people in 2 group 3. Age: intervention/ control 40.04 ± 6.61/41.76 ± 8.12	1. Provided sodium reduction counseling program in weeks 2 and 6. 2. Received key sodium reduction messages from the innovative technology (LINE) on their smartphones twice a week.	1. Sodium restriction 2. Nutrition promotion	1. Before the start of the program 2. After 8th week of the program	1. Knowledge 2. Blood pressure 3. Urine sodium 24-hour	1. Knowledge and key message lack the motivation needed to adhere to the program. Therefore, it is necessary to provide motivation and empowerment.
No.13 Boonyathee et.al. (2021)[25]	Quasi-experimental study/ community	1. Person aged over 60 years 2. Total 268 people in 2 group 3. Age: mean 68.0 ± 7.5	1. Provided weekly group discussions (180–240 minutes), focusing on skill-building, shared experiences, and video-based learning. 2. Caregivers and older adults received diaries and self-care manuals for daily activity tracking, supported by counseling and follow-ups.	1. Exercise promotion 2. Nutrition promotion 3. Dietary modification 4. Behaviors monitoring 5. Preventive behaviors 6. BMI determining	1. Before the start of the program 2. After 12th week of the program 3. Follow up 3 months after end of intervention	1. Knowledge 2. Self-efficacy 3. Preventive behaviors 4. Blood pressure 5. Total cholesterol 6. High-density lipoprotein	1. This may limiting for older adults who do not have caregivers.
No.14 Intarakamhang & Macaskill (2022)[26]	Randomized control trial/ community	1. Person aged 41–59 years 2. Total 200 people in two groups 3. Age: no report	1. Provided behavior modification techniques, including homework assignment set between sessions, which were discussed and debated weekly. Also, the researcher provided mindfulness practice, telephone counselling, encouragement for self-management brainstorming, role-playing, safe use of social media, and exchanging experiences.	1. Behaviors monitoring 2. Preventive behaviors 3. Risk factors management	1. Before the start of the program 2. After 8th week of the program 3. Follow up on week-12 after end of intervention	1. Health literacy 2. Health behaviors 3. Family well-being 4. Blood pressure	1. Homework may not effectively encourage individual engagement. Therefore, promoting adherence to health literacy might be essential to inspire and motivate older adults through gamification or two-way communication techniques.
No.15 Noo-in et.al. (2022)[27]	Quasi-experimental study/ Buddhist temple	1. Person aged over 25 years 2. Total 23,261 of Thai monks in 7 provinces 3. Age: mean 58.0 ± 9.21	1. Provided health Beliefs model and empowerment, including health examinations, encouragement of knowledge, perceived behavioral control, and empowerment for healthy behavior change, followed by health visits.	1. Behaviors monitoring 2. Preventive behaviors 3. Lifestyle modification	1. Before the start of the program 2. After 6th month of the program	1. Fasting blood sugar 2. BMI 3. Risk score 4. Smoking score 5. Blood pressure	1. Lack of detailed information about the intervention and research instruments. 2. Insufficient details of the results.

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Table 1 (Continued).

Author	Design/ Setting	Population/ Age	Provision/Media	Content Intervention	Time to Measure Results	Outcome Measured	Research Note
No.16 Pengleng, Therawiwat, Imamee & Tansakul (2013)[28]	Quasi-experimental study/ community	1. Person aged 35–65 years 2. Total 40 people in two groups 3. Age: mean 49.50 ± 8.003	1. Provided learning management and social support to change food consumption with records maintained in a logbook. 2. Lecture slides on high blood pressure: causes, risk factors, symptoms and complications. 3. Provided knowledge through both lectures and real food models. 4. Guidelines for food exchange and healthy menu planning. 5. Reminded and encouraged correct behavior while sharing experiences in the group.	1. Dietary modification 2. Nutrition promotion 3. Behaviors monitoring 4. Preventive behaviors 5. BMI determining 6. Blood pressure measuring	1. Before the start of the program 2. After 10th week of the program	1. Knowledge 2. Self-efficacy 3. Benefit expectation 4. Health behaviors	1. There is no control group. 2. Including many interventions and spending a long time in each session may burden participants and cause fatigue.
No.17 Thanasan, Homsin, Srisuriyawet & Klajon (2015)[29]	Quasi-experimental study/ community	1. Person aged 35–59 years 2. Total 60 people in two groups 3. Age: no report	1. Learned and practiced self-observation, decision-making, and goal-setting in four areas: balanced eating, brisk walking, relaxation techniques, and progress tracking. 2. Involved following a self-regulation plan with one home visit for support. 3. Group meeting reviewed progress, provide praise, and offered additional guidance.	1. Nutrition promotion 2. Exercise promotion 3. Stress management 4. Blood pressure measuring	1. Before the start of the program 2. After 6th week of the program	1. Health behavior 2. Blood pressure	1. Including many interventions and spending a long time in each session may burden participants and cause them to become tired. 2. A 6-week intervention may be too short to provide ineffective results for behavioral change.
No.18 Wongtib, Udomvong & Narin (2015)[30]	Research and development/ community	1. Adult: age not reported 2. Total 41 people in two groups 3. Age: intervention/ control 48.65-/ 54.72-	1. Used the Precede-Proceed model to develop the program. 2. Provided knowledge about hypertension and demonstrated exercises, including Rum Wong dance and Pas Lop dance. 3. Raised awareness through the village voice lines or public relations every Sunday evening. 4. Organized exercise activities through the village voice lines or public relations every Monday, Wednesday, Friday, and Saturday.	1. Nutrition promotion 2. Exercise promotion 3. Lifestyle modification 4. Blood pressure measuring	1. Before the start of the program 2. After 16th week of the program	1. Knowledge 2. Health behaviors 4. Blood pressure 5. BMI	1. There is no control group. 2. The village voice lines may not suit other activities and contexts. 3. Providing knowledge via the village voice lines in the evening may not attract the attention of all participants.
No.19 Pichayapong (2016)[31]	Quasi-experimental study/ community	1. Person aged 25–74 years 2. Total 68 people in two groups 3. Age: 51.35± 7.79	1. Provided health education combined with skill practice, goal setting, and family involvement. Key activities included videos, lectures, practical sessions, and home visits for motivation.	1. Nutrition promotion 2. Exercise promotion 3. Lifestyle modification 4. Stress management 5. Risk factor management	1. Before the start of the program 2. After 12th week of the program	1. Knowledge 2. Self- efficacy 3. Perception of benefit and barrier 4. Stress level 5. Blood pressure	1. Food and behavior are recorded in the logbook by individuals. This may cause some bias.

No.20 Seeda & Tritipsombut (2016)[32]	Quasi-experimental study/ community	1. Person aged 35–59 years 2. Total 175 people in two groups 3. Age: intervention/ control 47.1/ 47.3	1. Provided health education, skill-building, and social support to control blood pressure in high-risk people. 2. Conducted weekly lectures and group discussions with ongoing encouragement, follow-ups, and home visits.	1. Nutrition promotion 2. Exercise promotion 3. Lifestyle modification 4. Stress management 5. Risk factor management	1. Before the start of the program 2. After 12th week of the program	1. Hypertension perception 2. Awareness 3. Self-efficacy 4. Health behaviors 5. Blood pressure	1. External validity is limited due to purposive sampling.
No.21 Srimonkol, Kengganpanich, Kengganpanich, Benjakul, Lattanad (2017)[33]	Quasi-experimental study/ community	1. Person aged 35–70 years 2. Total 50 people in two groups 3. Age: intervention/ control 51.2/ 52.4	1. Delivered health education, skill-building, and goal-setting interventions to prevent hypertension. 2. Implemented food selection strategies, goal-setting, and behavior tracking.	1. Nutrition promotion 2. Preventive behaviors 3. Behaviors monitoring	1. Before the start of the program 2. After 12^{th} week of the program	1. Perceived severity and risk. 2. Expectations of effectiveness 3. Self-efficacy 4. Practice 4. Health behaviors 5. Blood pressure	1. There is a limitation in external validity due to purposive sampling. 2. Lack of activities to encourage continuity and consistently during the 4th-8th week and the 9^{th}- 12^{th} week
No.22 Boonngam, Toonsiri & Janprasert (2017)[34]	Quasi-experimental study/ community	1. Person aged 35–59 years 2. Total 60 people in two groups 3. Age: intervention/ control 51.40 ±6.94/46.73 ±6.68	1. Provided Qigong exercises 60 minutes, 4 times weekly, for 8 weeks with blood pressure monitoring.	1. Exercise promotion	1. Before the start of the program 2. After 12^{th} week of the program	1. Health behaviors 2. Systolic blood pressure levels. 3. Diastolic blood pressure levels.	1. Lack of exercise monitoring or provision of a logbook to track participant activity.
No.23 Arahung, Hoontrakul & Roojanavech (2018)[35]	Quasi-experimental study/ community	1. Person aged 35–59 years 2. Total 60 people in two groups 3. Age: intervention/ control 45.40-/ 49.00-	1. Provided participatory learning, goal setting, and skill training through PowerPoint lectures followed by individual follow-ups. 2. Line application-based monitoring and guidance.	1. Exercise promotion 2. Risk factor management	1. Before the start of the program 2. After 8^{th} week of the program	1. Health literacy 2. Preventive behaviors 3. Mean blood pressure	1. The intervention group has a significantly higher education level than the control group, which might affect the actual results. 2. The media content is limited.

(*Continued*)

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Table 1 (Continued).

Author	Design/ Setting	Population/ Age	Provision/Media	Content Intervention	Time to Measure Results	Outcome Measured	Research Note
No.24 Siripat, Moolsart & Chantawong (2019)[36]	Quasi-experimental study/ community	1. Person aged 35–59 years 2. Total 70 people in two groups 3. Age: no report	1. Promoted hypertension prevention through self-awareness, goal setting, video, and group activities, incorporating success stories shared by role models, awards for motivational awards, and post-tests to evaluate outcomes.	1. Nutrition promotion 2. Exercise promotion 3. Lifestyle modification 4. Stress management 5. Risk factor management 6. Weight control	1. Before the start of the program 2. After 10th week of the program	1. Self-awareness 2. Self-efficacy 3. Health behaviors 4. Outcome expectation 5. Mean arterial pressure	1. Significant pre-intervention differences and uncontrolled variables, such as education level, may impact the interpretation of post-intervention results.
No.25 Hetthong & Tongchouy (2019)[37]	Quasi-experimental study/ community	1. Person aged over 35 years 2. Total 63 people in two groups 3. Age: no report	1. Practiced Samatha-Kammathana-Thapana (SKT) meditation postures 1 and 2, 30–40 breaths twice daily for 8 weeks. 2. Health education program focusing on exercise, diet, and mood control.	1. Nutrition promotion 2. Exercise promotion 3. Stress management	1. Before the start of the program 2. After 8th week of the program	1. Knowledge 2. Belief 3. Health behavior 4. Blood pressure	1. The environment is crucial for successful SKT meditation. Distractions, such as pets, may interfere, and limited mobility due to elbow joint stiffness or pain can also pose challenges.
No.26 Khoaom, Aungsuroch &Polsook (2019)[38]	Quasi-experimental study/ community	1. Person aged 35–59 years 2. Total 44 people in two groups 3. Age: mean 50.64 ± 5.8	1. Provided Paslop (Traditional Dance) exercise training (40 minutes/day, 4 days/week). 2. Provided hypertension education, and motivation through weekly calls and a home visit.	1. Exercise promotion 2. Risk factor management	1. Before the start of the program 2. After 8th week of the program	1. Blood pressure	1. The motivation was not reported. 2. No logbook for monitor exercise.
No.27 Nasa-arn and Rachagrai (2020)[39]	Action research/ community	1. Person aged 35 years and over 2. Total 900 people in one group 3. Age: mean 56.29 ± 11.05	1. Reducing salt consumption in the community through caregiver training, policy promotion, and community campaigns. 2. Included problem analysis, planning and action involving six networks: relatives, shop operators, volunteers, leaders, and health officials, and monitoring through home visits.	1. Dietary modification 2. Sodium restriction	1. Before the start of the program 2. After 12th week of the program	1. Knowledge 2. Level of salinity in food	1. The study did not monitor changes in blood pressure levels.

No.28 Trinnawoottipong, Rachagrai, Tumala & Nasa-arn (2021)[40]	Quasi-experimental study/ community	1. Person aged 35 years and over 2. Total 1,903 people in one group 3. Age: mean 56.44 ± 10.47	1. Reducing sodium consumption through community engagement and education. 2. Implemented campaigns, health education, food label reading, and blood pressure monitoring, and home visits.	1. Dietary modification 2. Sodium restriction	1. Before the start of the program 2. A month after starting intervention 3. Two months after starting intervention	1. Knowledge 2. Level of salinity in food 3. Blood pressure	1. No control group 2. Study measure three times but analyze by *t*-test instead of ANNOVA which may cause unreliable result and more error.
No.29 Thrungthong, Iemsawasdikul & Photisubsuk (2022)[41]	Quasi-experimental study/ community	1. Person aged 35–59 years 2. Total 52 people in two groups 3. Age: intervention/ control 47.73 ±6.48/48.63 ±6.84	1. Provided health education on hypertension, eating behaviors, daily monitoring with feedback via Line application. 2. Conducted Group discussions to promote healthy behaviors. 3. Tracked meals, received feedback, and underwent logbook reviews, with recognition given for achieving blood pressure goals.	1. Dietary modification 2. Behaviors monitoring 3. Sodium restriction	1. Before the start of the program 2. After 7th week of the program	1. Knowledge 2. Hypertension Perception 3. Severity of hypertension 4. Self-efficacy 5. Perception about benefit 6. Obstacles perceived 7. Blood pressure	1. Involving the family in tracking the diet of the sample group may be a better choice and lead to better control of sodium intake behavior.
No.30 Kaewchandee, Krainara, Wangsawat & Boonsuk, (2023)[42]	Quasi-experimental study/ community	1. Person aged 35–59 years 2. Total 80 people in two groups 3. Age: intervention/ control 48.03 ±2.95/52.50 ±3.44	1. Provided health education on hypertension, role model inspiration, and weekly revisions. 2. Participants shared experiences and were empowered to practice prevention.	1. Risk factors management 2. Behaviors monitoring	1. Before the start of the program 2. After 12th week of the program	1. Knowledge 2. Awareness about severity 3. Risk awareness 4. Health behavior 5. Self-efficacy	1. The study should include blood pressure level as a dependent variable to ensure that changes in blood pressure directly resulted from the program.
No.31 Songwatthanayuth, Watthanakorn, Klainhom & Ratanapak (2016)[43]	Quasi-experimental study/ community	1. Person aged 35–60 years 2. Total 76 people in two groups 3. Age: no report	1. Engaged families and communities to support at-risk individuals in managing hypertension through weekly follow-ups, with each session lasting 90 minutes.	1. Nutrition promotion 2. Exercise promotion 3. Stress management 4. Lifestyle modification 5. Weight control	1. Before the start of the program 2. After 4th week of the program	1. Health behaviors 2. Blood pressure	1. The 4-week intervention suggests the need for a longer duration for measurement and intervention.

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Table 1 (Continued).

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No.32 Noktajun (2016)[44]	Quasi-experimental study/ community	1. Person aged 35 years and over 2. Total 70 people in two groups 3. Age: no report	1. Provided health education, with home visits for monitoring and guidance.	1. Risk factor management 2. Preventive behaviors 3. Lifestyle modification 4. Stress management 5. Weight control	1. Before the start of the program 2. After 12th week of the program	1. Knowledge 2. Perception of severity 3. Risk expected 4. Self-efficacy 5. Health behaviors	1. While self-reported behaviors are useful, they may lack accuracy; direct observation or objective measurements, such as physical activity and dietary intake, are recommended.
No.33 Hosutisima (2018)[45]	Quasi-experimental study/ community	1. Person aged 35 years and over 2. Total 70 people in two groups 3. Age: no report	1. Provided education on preventive strategies through group sessions, demonstrations, and workshops, supported by home visits for individualized advice and knowledge exchange to sustain lifestyle changes.	1. Risk factor management 2. Preventive behaviors 3. Lifestyle modification 4. Nutrition promotion 5. Weight control	1. Before the start of the program 2. After 12th week of the program	1. Knowledge 2. Perceived severity and risk of hypertension 3. Self-efficacy 4. Expectations of benefits 5. Health behavior 6. Blood pressure	1. The study lacks details on participant adherence and dropouts.
No.34 Siripat, Moolsart & Chantawong (2019)[36]	Quasi-experimental study/ community	1. Person aged 35–50 years 2. Total 70 people in two groups 3. Age: no report	1. The intervention combined health education, health monitoring, and behavioral modification through inspiring activities, tracking health behaviors, and practical lifestyle changes.	1. Risk factor management 2. Preventive behaviors 3. Lifestyle modification 4. Preventive strategies 5. Dietary modification 6. Exercise promotion	1. Before the start of the program 2. After 10th week of the program	1. Awareness 2. Self-efficacy 3. Prevention behavior 4. Outcome expectations 5. Mean arterial blood pressure	1. While self-reported behaviors are useful, they may lack accuracy; direct observation or objective measurements, such as physical activity and dietary intake, are recommended.
No.35 Srisai & Piyabanditkul (2021)[46]	Quasi-experimental study/ community	1. Person aged 35 years and over 2. Total 68 people in two groups 3. Age: intervention/ control 49.33 ± 6.04/46.06 ± 6.71	1. Promoted hypertension awareness, enhanced self-efficacy, provided support through home visits and peer interactions, and emphasized follow-up and evaluation to sustain healthy behaviors.	1. Preventive strategies 2. Nutrition promotion 3. Weight control 4. BMI determining 5. Exercise promotion 6. Risk factor management 7. Health behavior monitoring	1. Before the start of the program 2. After 12th week of the program	1. Perceived benefits 2. Perceived barriers 3. Self-efficacy 4. Health behavior	The study lacked control for seasonal variations and did not account for underlying health conditions.
No.36 Pinkam & Nguanjairak (2024)[47]	Quasi-experimental study/ community	1. Person aged 35–59 years 2. Total 82 people in two groups 3. Age: intervention/ control 46.53 ± 8.03/48.00 ± 6.16	1. Provided health education, daily motivational messages via Line application, and fostered community support through reflective group sessions.	1. Preventive strategies 2. Nutrition promotion 3. Weight control 4. Exercise promotion 5. Health behavior monitoring	1. Before the start of the program 2. After 8th week of the program	1. Knowledge 2. Severity 3. Perceived risk 4. Self-efficacy 5. Health behaviors 7. Blood pressure	1. Lack of behavior tracking; there is a need to utilize a logbook or another wearable device.

No.37 Makbun & Rasiri (2023)[48]	Quasi-experimental study/ community	1. Person aged 35 years and over 2. Total 96 people in one group 3. Age: 51.65	1. Guided by the PRECEED-PROCEED model, involved community engagement. It emphasized community participation and tailored activities to local contexts for hypertension prevention.	1. Preventive strategies 2. Nutrition promotion 3. Weight control 4. BMI determining 5. Exercise promotion 6. Risk factor management 7. Health behavior monitoring	1. Before the start of the program 2. After 12th week of the program	1. Knowledge 2. Health behaviors 3. Blood pressure 4. Body Mass Index	1. This study utilizes a one-group pre-posttest design, which lacks a comparison group, making it challenging to attribute observed changes directly to the intervention.
No.38 Chanarat (2024).[49]	Quasi-experimental study/ Buddhist temple	1. Person aged 20–52 years 2. Total 34 people in one group 3. Age: 36.26 ± 7.58	1. Raised awareness about diabetes and hypertension, promoted healthy dietary habits through food demonstrations, encouraged self-monitoring of health metrics, simple advice, and monk-friendly physical activities.	1. Preventive strategies 2. Risk factor management 3. Exercise promotion 4. Nutrition promotion	1. Before the start of the program 2. After 12th week of the program	1. Perceived threat 2. Behaviors assessment 3. Health behaviors	1. The study faced potential selection bias due to convenience sampling and lacked a comparison group, making it challenging to attribute outcome changes directly to the intervention.
No.39 Nonlaopon (2024)[50]	Quasi-experimental study/ community	1. Person aged 35–59 years 2. Total 35 people in one group 3. Age: 41±9.22	1. Provided health education on hypertension, addressed barriers, built self-efficacy, and reinforced behaviors through home visits and follow-ups.	1. Preventive strategies 2. Risk factor management 3. Exercise promotion 4. Nutrition promotion	1. Before the start of the program 2. After 12th week of the program.	1. Health belief perception 2. Health behavior 3. Blood pressure	1. Convenience sampling posted a risked of selection bias, and the lack of a comparison group limited the ability to attribute changes in outcomes.
No.40 Kantee & Chankrachang (2023)[51]	Quasi-experimental study/ community	1. Person aged 35–70 years 2. Total 30 people in one group 3. Age: 50.00	1. Promoted self-reliance, improved decision-making, and reinforced preventive health practices for managing diabetes and hypertension.	1. Preventive strategies 2. Risk factor management 3. Exercise promotion 4. Nutrition promotion	1. Before the start of the program 2. After 12th week of the program	1. Health literacy 2. Preventive health behaviors	1. The one-group pre-posttest design limits the ability to attribute outcome changes solely to the intervention.
No.41 Youngiam & Therawiwat (2024)[52]	Quasi-experimental study/ community	1. Person aged 35–59 years 2. Total 80 people in two groups 3. Age: intervention/ control 38.80-/ 40.68-	1. Provided a mobile application for health tracking, health education, goal setting, self-monitoring with a sodium diary, and interactive quizzes to promote sodium reduction and adherence to the DASH diet.	1. Preventive strategies 2. Risk factor management 3. Exercise promotion 4. Nutrition promotion 5. BMI determining	1. Before the start of the program 2. After 12th week of the program	1. Health literacy 2. Sodium consumption 3. DASH-Diet behavior 4. Sodium intake 5. Blood Pressure	1. Self-reported sodium diaries might cause recall bias. Moreover, the stand-alone application may lack motivation and two-way communication, reducing engagement and effectiveness.

Notes: The researchers indicated the included studies in Figure 2–7, the same number as in Table 1 (summary of the included studies), to make it easy to group them and recheck with evidence.
Abbreviations: BMI, body mass index; CVD, cardiovascular; DASH, dietary approaches to stop hypertension.

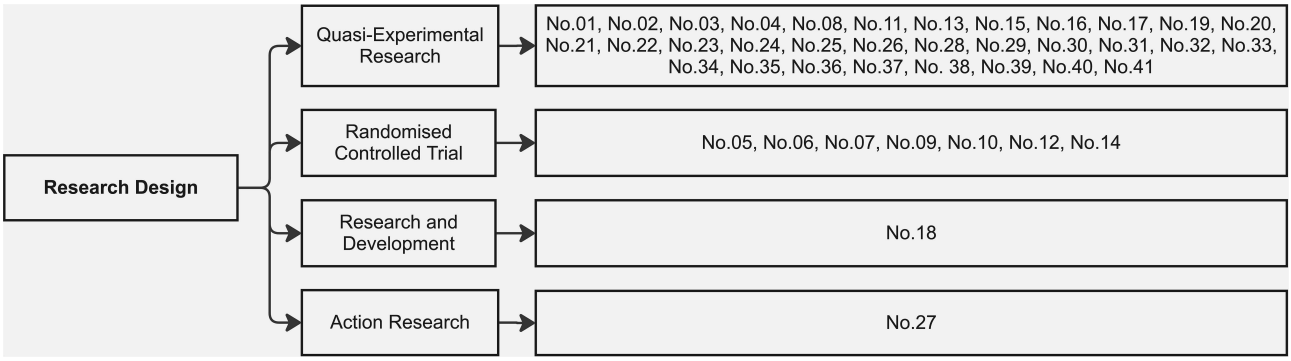

Figure 2 Research designs of the included studies.

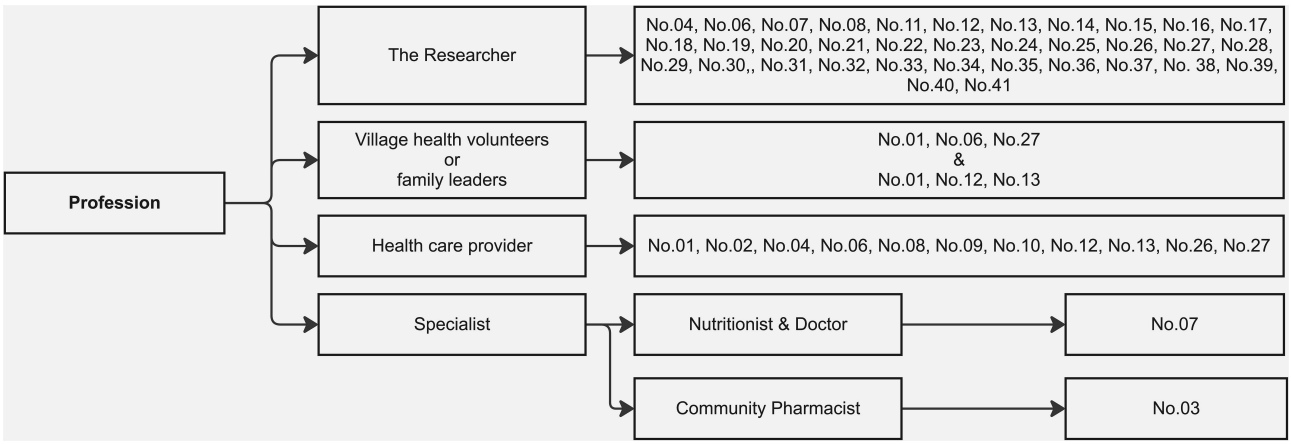

Figure 3 Profession of health educators from the included studies.

Outcome Measured Time/Outcomes Monitoring

A variety of outcome measurement timeframes were identified across the selected studies. The most common timeframe for assessing outcomes was before and after a 12-week intervention to ensure lasting impact, reported in 17 studies. This timeframe was followed by assessments conducted before and after 8- and 10-week interventions, each reported in four studies. Three studies measured outcomes before and after 8- and 10-week interventions. Additionally, assessments conducted before and after weeks 4, 8, 12, and 16, as well as before and after months 6, 12, and 24, were each reported in two studies. Other timeframes were observed in a single study (Figure 5).

Intervention Platforms/Intervention Pathways

The selected studies utilized 14 distinct intervention platforms or delivery pathways. These included manuals, logbooks, educational pamphlets, supervision, group discussions, videos, social media applications (eg, Line), lectures and presentation slides, village voice lines or public relations, food and simulation models, role modeling and practice, salt meters, pedometers, and methods such as grand rounds, telephone consultations, or home visits. Among these, the three most commonly employed platforms were manuals, reported in 26 studies; logbooks, used in 22 studies; and lectures and presentation slides, implemented in 15 studies. The delivery methods that integrate into modern lifestyles, such as AI chatbots, machine learning, and mobile applications were notably absent from reported intervention methods. Understanding these as they are increasingly available in Thai culture is an important future consideration (Figure 6).

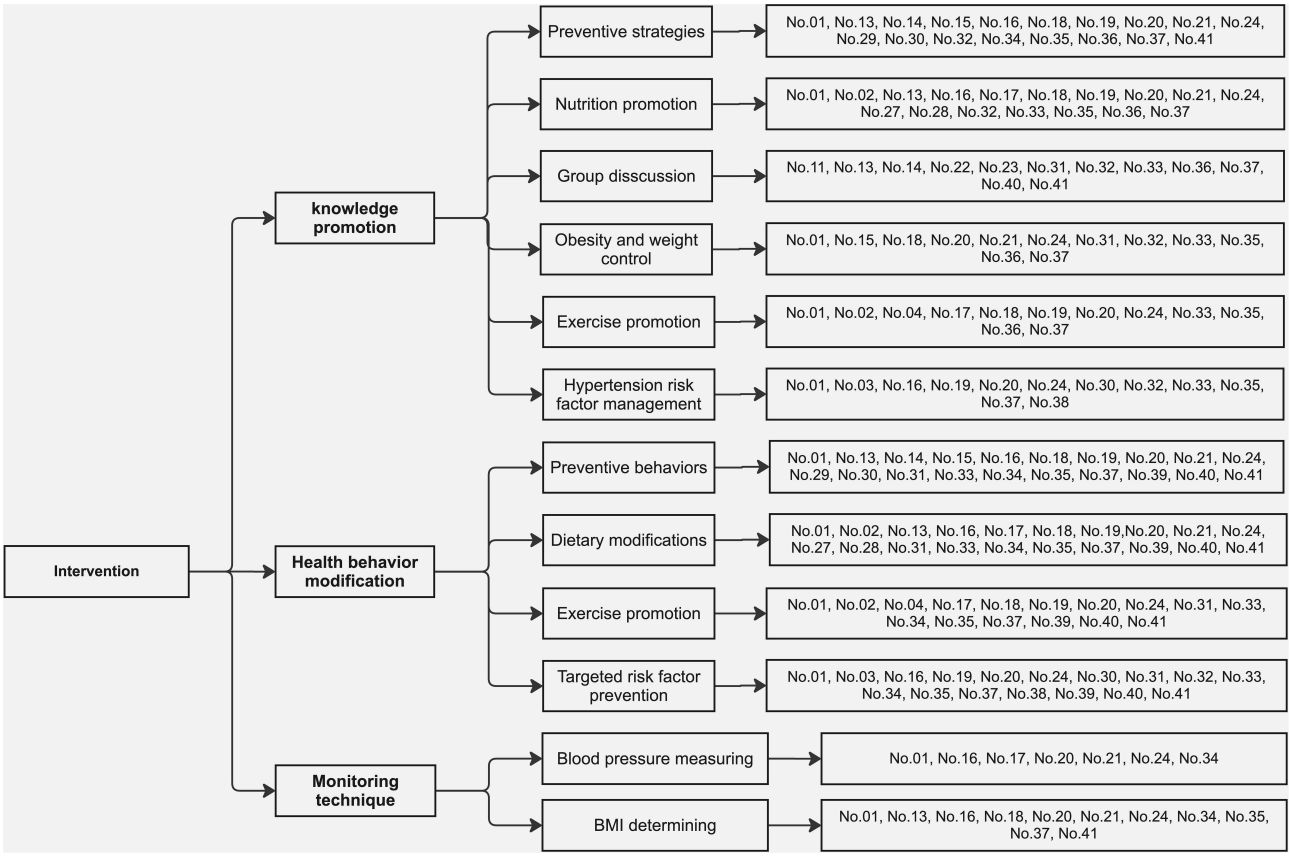

Figure 4 Focused interventions from the included studies.

Figure 5 Duration of measure of the included studies.

Research Measurements/Outcomes Variables

Based on our review, the outcome variables measured in the 41 selected studies were categorized into six groups: knowledge, attitude, and practice (KAP model), health related behaviors, biomarkers (including both direct biomarkers such as blood pressure and cholesterol levels, and indirect biomarkers–anthropometric measures such as body mass index and waist circumference), and research instruments related to Bandura's theory, such as self-efficacy and self-regulation, health literacy, and health beliefs. Knowledge was the most commonly assessed outcome within the KAP model, reported in 18 studies. Health behaviors were measured in 17 studies. Biomarkers included body mass index (BMI), blood pressure, heart rate, waist circumference, muscle mass, body fat percentage, blood glucose levels, lipid profiles, lactate levels, urinary sodium, and salt intake. Among these

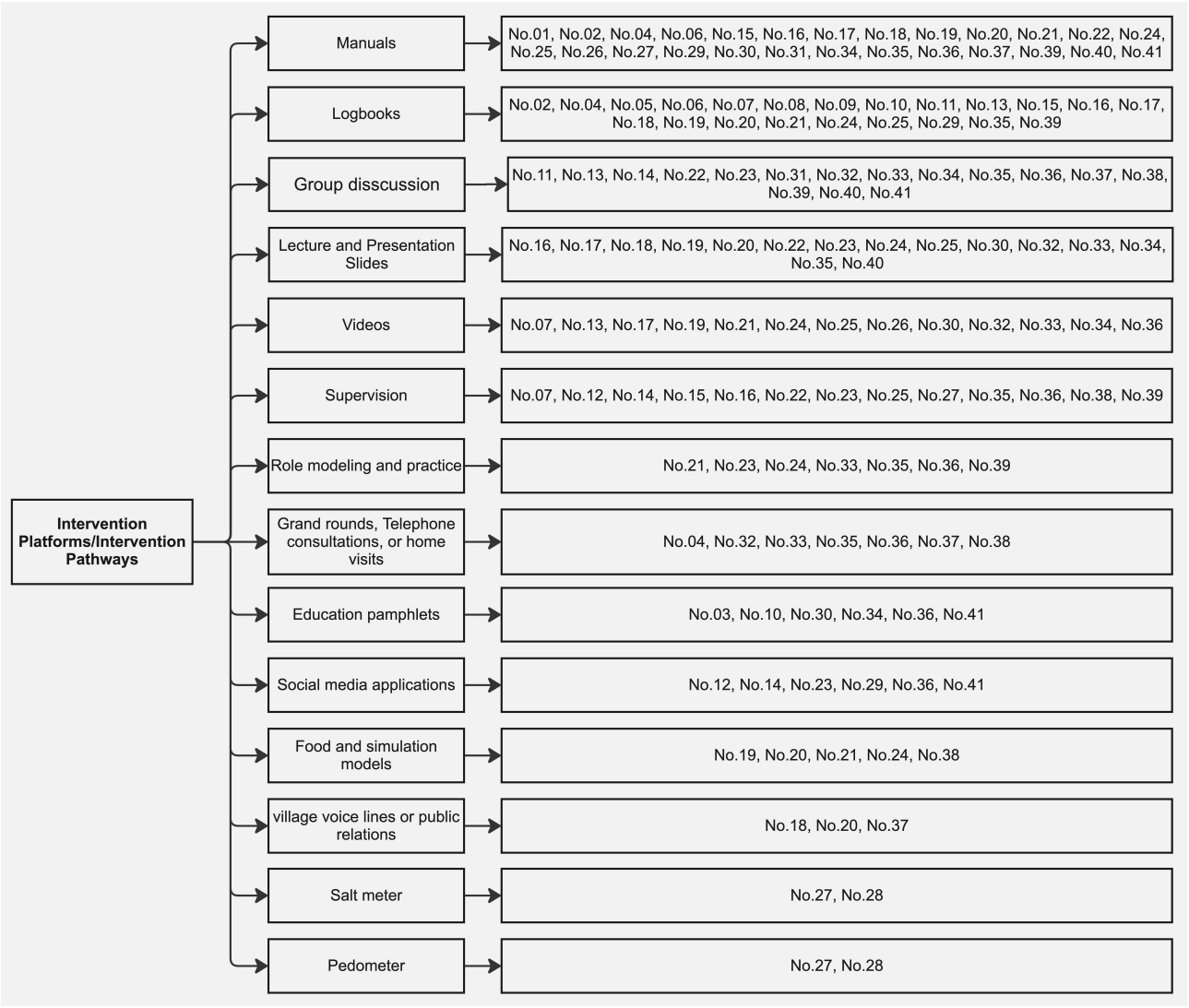

Figure 6 Intervention platforms/intervention pathways of the included studies.

biomarkers, blood pressure was the most frequently measured, reported in 37 studies, followed by BMI in 12 and blood glucose in eight studies. Additionally, 14 studies assessed research instruments related to Bandura's theory, while four studies each measured health literacy and health beliefs (Figure 7).

Discussion

Our study aims to examine hypertension prevention among at-risk populations in Thailand, including diverse groups such as public health volunteers, menopausal women, individuals with obesity, older adults, and Buddhist monks. These groups are not only considered people at risk of hypertension but also represent individuals who influence and are influenced by health-related behaviors and issues within their communities. Similarly, previous studies have primarily focused on individuals at risk for hypertension, encompassing broader demographic groups and stakeholders involved in addressing this health concern.[51,53] However, a key distinction identified in our scoping review is the inclusion of Buddhist monks and public health volunteers, who are unique to the Thai cultural context and underscore the necessity of tailoring interventions to specific sociocultural settings. Most of the studies in our review are quasi-experimental in design, offering practical feasibility within the Thai context and ensuring high internal validity for this target population. Nonetheless, the generalizability of findings may be limited compared to randomized controlled trials, necessitating

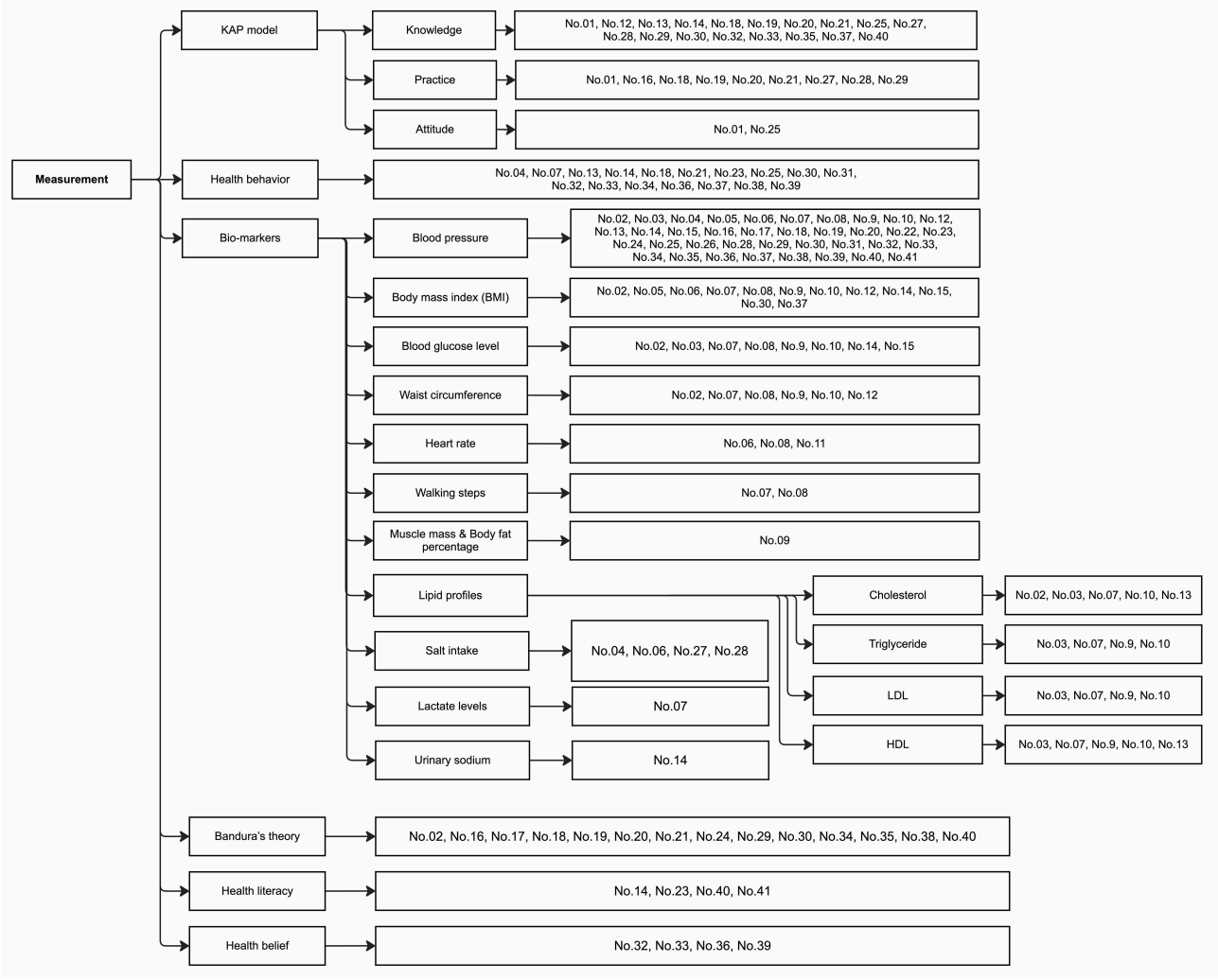

Figure 7 Research measurements or outcomes variables found from the included studies.

careful consideration when applying these findings to different populations and settings. The large sample sizes reported in the included studies contribute to a robust dataset for hypertension intervention research; however, the variability in sample sizes across studies (32–4,786) presents challenges in synthesizing the findings into a comprehensive meta-analysis.[54]

The majority of intervention providers are researchers, followed by healthcare professionals, while specialists are the group that provides the fewest interventions. However, interventions delivered by medical or public health professionals also enhance credibility, offer personalized recommendations, enable continuous monitoring of research outcomes, and provide improvement after receiving intervention.[55] These professionals bring holistic expertise in health promotion, disease prevention, treatment, and post-illness rehabilitation. Furthermore, they motivate participants and enforce stricter access to high-risk groups, thereby increasing the effectiveness of interventions in sustainably preventing and controlling hypertension.[53] Casiglia and Tikhonoff (2018) also supported that interventions provided by specialists significantly lower blood pressure levels and reduce the incidence of stroke among participants.[56] Additionally, guidance from specialists fosters behavioral changes and improves blood pressure control in hypertensive patients.[56] However, which groups of intervention providers can provide the most effective outcomes still needs to be explored. While waiting for this answer, future research on hypertension prevention should focus on increasing the involvement of specialists in delivering interventions or include a multidisciplinary healthcare team to provide hypertension prevention interventions.

Finally, technological advancements should complement specialist involvement to ensure continuous and sustainable care, enhancing the management of high-risk groups and hypertension more effectively.

This review highlights the comprehensive range of interventions to address essential hypertension, encompassing clinical monitoring techniques, health behavior modification, and psychosocial support. The frequent emphasis on knowledge promotion and preventive strategies underscores the multi-dimensional approach necessary for effectively managing hypertension. Van der Linden (2021) indicated that knowledge and perception are the initial and essential parts of changing health behaviors in the case of hypertension prevention and control.[57] These findings are also consistent with the American Heart Association guidelines; most included studies prioritize dietary modification and preventive behaviors, which have been identified as key factors in reducing systolic blood pressure (SBP) among individuals with early-stage hypertension.[58]

However, this review identified a notable gap in considering sleep, psychological well-being, and stress management as components of intervention strategies. These factors, recognized in previous research and reflected in the "Life's Essential 8" framework for improving and maintaining cardiovascular health, present potential areas for future exploration and intervention development.[59,60] Integrating interventions related to these significant variables or addressing these gaps further enhances the effectiveness of hypertension management strategies.

The intervention platforms and delivery pathways identified in this review included manuals, logbooks, educational pamphlets, supervision, group discussions, videos, social media applications (eg, Line), lectures and presentation slides, village voice lines or public relations, food and simulation models, role modeling and practice, salt meters, pedometers, and methods such as grand rounds, telephone consultations, and home visits. These findings align with prior scoping reviews, systematic reviews, and meta-analyses on hypertension prevention[53,61] and management[10,57,62] across Asian, European, and global contexts. Notably, village voice lines and public relations strategies reflect approaches tailored to the Thai context, particularly in rural and community settings, and differences from other studies. Consistent with previous studies, behavior modifications were the most common preventive strategies,[53] while hypertension management predominantly emphasized medication adherence for blood pressure control.[62] This review also highlighted the effective use of the Line application on mobile phones; however, its limitations include the absence of two-way communication and immediate feedback. Rahman et al (2024) and Irwan et al (2022) emphasized that improving hypertension management requires broader access to affordable information and easy pathways.[10,62] Future research should explore integrating modern technologies, such as artificial intelligence chatbots, into mobile applications to enable two-way communication, easy access, and timely responses, thereby enhancing hypertension prevention and management strategies.

This study identified a wide range of outcome measurement timeframes across the selected studies, reflecting variability in how interventions were evaluated. The most common timeframe was pre- and post-12-week intervention, reported in 17 studies. This timeframe aligns with findings from a previous study,[63] which highlighted that 12 weeks is the guideline recommended for non-pharmacological therapy and behavior modification interventions, offering sufficient time to observe meaningful changes in health behaviors and biomarkers. Similarly, a previous study by Bullard et al (2019) highlighted that 10–12 weeks balances participant adherence and measurable outcomes, particularly for interventions involving lifestyle changes like dietary adjustments and physical activity.[64] However, three studies measured outcomes before and after 8- and 10-week interventions. This shorter duration corresponds to findings from Compernolle et al (2019) and Corrêa et al (2024), presented that interventions with short durations less than 12 weeks often focus on immediate behavior changes, such as improving self-monitoring skills or enhancing disease awareness, rather than long-term outcomes.[65,66] Finally, our study identified assessments conducted up to 24 months; these extended timeframes align with the study from Hinderliter et al (2014)[67] and Rodriguez et al (2021),[68] which showed that longer follow-ups, such as 6–24 months, are crucial for understanding the sustainability of intervention impacts, particularly for chronic conditions like hypertension.[53] However, Charchar et al (2024) also emphasized that follow-ups beyond 12 weeks are enough to ensure long-term adherence to health-promoting behaviors and assess whether biomarker improvements are sustained over time.[69] Then, this scoping review recommended that future research include follow-ups at least 12 weeks to ensure a lasting impact.

Based on our review, knowledge was the most assessed outcome within the KAP model, reported in 18 studies. Xu et al (2024) indicated that knowledge improvement is critical to hypertension prevention programs.[70] Andrew et al (2022) highlighted the importance of knowledge dissemination in improving hypertension awareness and control.[71] Health behaviors were measured in 17 studies, emphasizing that they were key strategies in hypertension management.[72] Among the biomarkers, previous studies also emphasize the importance of blood pressure in monitoring hypertension and its related risks.[73] Blood pressure and BMI are commonly used indicators in hypertension studies due to their strong association with cardiovascular risk.[74] In addition, Mujadzic et al (2022) pointed out that blood pressure alone may not adequately detect or predict pre-existing, imminent, or incident hypertension-induced end-organ damage.[73] Bandura's theory has been widely utilized in health behavior research to understand better and improve self-management practices, emphasizing that self-efficacy and self-regulation are critical for effective self-care and disease management.[75] Finally, health literacy and health beliefs were also used by Du et al (2018), who highlighted that individuals with low health literacy are likelier to have poor hypertension knowledge.[76] However, more recently, novel biomarkers have been utilized, as Trillaud et al (2023) highlighted, suggesting their potential for inclusion in future studies.[77]

Limitations

This scoping review has three notable limitations. First, most of the included studies employed quasi-experimental designs characterized by low external validity. Second, the review focused exclusively on the Thai population, encompassing interventions or strategies specific to particular groups, such as Buddhist monks and village health volunteers, which may not be applicable to other contexts. This cultural specificity limits the generalizability of the findings. Lastly, most studies reported that the researchers delivered interventions by themselves, raising potential concerns regarding evaluation bias. Further exploration of the roles and impartiality of outcome evaluators in these included studies could enhance the accuracy and credibility of the findings.

Conclusion and Recommendations

This scoping review included 41 studies to identify gaps in hypertension prevention interventions among the Thai population. Most of the selected studies employed a quasi-experimental design conducted within community settings. Principal researchers were the primary providers of interventions to target populations. The scope of interventions primarily focused on promoting health behaviors, followed by enhancing knowledge, providing social support, and offering counseling. The most common timeframe for outcome measurement was before and after a 12-week intervention period. Frequently utilized intervention platforms included manuals, logbooks, and lectures with presentation slides.

Regarding outcome measurements, biomarkers—particularly blood pressure—were the most commonly assessed variables, followed by health behaviors and knowledge. Based on these findings, future interventions should incorporate diverse scopes, intervention types, and outcome variables, with particular emphasis on biomarkers.

Furthermore, future research should prioritize innovative delivery methods that integrate seamlessly into modern lifestyles, such as AI chatbots and mobile applications enabling two-way communication. Lastly, to ensure meaningful and sustainable outcomes, post-intervention measurements should be conducted at least 12 weeks after program completion.

Data Sharing Statement

The provided references and links allow researchers to search for the articles included in this scoping review. Moreover, they are available from the corresponding author upon reasonable request.

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Author Contributions

All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis and interpretation, or in all these areas; took part in drafting, revising or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

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