ORIGINAL ARTICLE

The effectiveness of a self-management and multifactorial program for blood pressure control among older home-based workers in Urban Bangkok, Thailand

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ABSTRACT

Older adults aged between 50-65 years old have a high risk of hypertension. With the growing numbers of home-based workers among adults and older adults in Thailand, this study aimed to evaluate the effectiveness of self-management with a multifactorial program to control blood pressure among older adults. A randomized controlled trial was conducted. Participants who worked as home-based workers aged between 50-65 years old were recruited from a community in the western area of Bangkok. Approximately 70 participants were randomly and equally assigned to the intervention and control groups (35 participants in each group). Participants in the intervention group received the program that consisted of education regarding food selection, work time management and arm swinging; a practical protocol, an exercise program, a heart rate monitor, a recorded book for facilitating participants' progress to ensure their safety and efficiency in a health professional manner for a week/month. While those in the control group received usual care. A Knowledge Attitude Practice questionnaire was utilized to assess their knowledge, attitude, and practice, which demonstrated a content validity index and Cronbach alpha of 0.80, respectively. The Citizen CH-403C was utilized to measure blood pressure and heart rate. Two-way Repeated Measures ANOVA was employed to analyze the differences in outcome scores at baseline, 3-month after program, and 6-month follow up.

The results showed a significant increase in participant's knowledge, attitudes, and behaviors toward hypertension and a decrease in blood pressure to nearly normal after 3months following the completion of the program and 6-month follow-up. Therefore, the self-management and multifactorial program could be an effective preventive intervention for older adults with pre-hypertension conditions to offer them valuable knowledge on work-life balance as well as to help prevent hypertension, and related stroke complications.

Key words:
hypertension; older adult; home-based workers; self-management; multifactorial program

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INTRODUCTION

Currently, hypertension is one of the major health problems worldwide. The prevalence of hypertension, which becomes higher with age, is considered as a treatable risk factor leading to fatal diseases such as stroke, ischemic heart disease, and dementia in older adults.[1-3] According to the World Health Organization (WHO), approximately one billion people worldwide are suffering from hypertension. Among them, two-thirds are living in developing countries and one-third in Southeast Asia. It is predicted that by the year 2025, the population with hypertension will reach up to 1.56 billion.[4]

Thailand has been transforming into an ageing society with 10% of the total population consisting of older adults aged 60 years or older since 2005.[5] The number of older adults aged 60 years or older has been increasing continuously from 5.87 million (9.5% of the total population) in 2000 to approximately 8.38 million (12.6%) in 2010, and it was expected to increase to 12.39 million (17.8%) in 2021.[6] A 2016 survey conducted nationwide in Thailand revealed that the prevalence of hypertension was 48.5% in older adults and its prevalence escalated to over 60% among senior adults aged 80 years or more.[7]

In Thailand, hypertension is one of the leading causes of death. The morbidity rate among the Thai population due to hypertension was 8.09% and 18.28% in 2013 and 2014, respectively, which increased to 25.32% in 2015. The morbidity rate among the Thai population caused by hypertension has increased by three times since 2013.[8] The Ministry of Public Health also reported that the morbidity rate caused by hypertension per 100,000 people was 389.80 in 2003, 860.53 in 2008 and 1,621.72 in 2013, indicating a substantial increase in the morbidity rate over the years.[9] Hypertension can lead to cardiovascular disease. Approximately 9% of hypertension cases result in major complications through heart diseases. Hypertension is one of the major risk factors for stroke, especially ischemic stroke; 50% of ischemic stroke incidences are caused by high blood pressure. Various factors contributing to the risks of hypertension include age, gender, excess weight, physical inactivity, smoking, alcohol consumption, and high salt consumption[10] as well as socioeconomic disparities related to careers and income.[11-13] A 2018 study discovered that Bangkok and its metropolitan areas were the areas with the highest prevalence of hypertension in Thailand based on the results of spatial pattern detection[13].

If a person is diagnosed with hypertension and does not receive treatment, the severity of health complications may increase. Only one-fourth of treated patients can control their blood pressure.[14] Exercise can be used as one of the public health interventions to prevent hypertension in older adults. Exercise refers to a consistent structured program of physical activity,[15] while physical activity means human movement including sports, exercise, hobbies, and activities involved in daily life.[16] In contrast, physical inactivity is defined as a state in which bodily movement is minimal and energy expenditure approximates the resting metabolic rate.[17]

Currently, in the densely populated areas of Bangkok, there is a high prevalence of chronic diseases, particularly hypertension, ranking among the top. This issue is particularly concerning among the elderly who need supplementary income and can work from home to help alleviate family expenses, and there is limited access to home-based care services. These services are essential for those elderly individuals lacking skills in avoiding high-sodium diets, managing working hours to include

rest breaks, and engaging in physical activities. This ensures proper attention to health care, addressing issues related to hypertension and its complications.

Effective blood pressure control is needed, especially for older adults, and therefore this study aimed to develop and implement a self-management and multifactorial program to control blood pressure in older adults working as home-based workers in Thawewathana District, Bangkok, Thailand, and to assess its effectiveness.

MATERIALS AND METHODS

Study design

A randomized control trial was conducted in this study, aiming to determine the effects of the self-management and multifactorial program on knowledge, attitude and practice, blood pressure, and heart rate among older adults who worked as home-based workers.

Participants

Participants were home-based working older adults aged between 50-65 years old diagnosed with stage I hypertension from Thawewathana District, Bangkok, Thailand. The workers who were recruited had been working at home in their community continuously for more than 1 year, working at least 4 hours per day for more than 5 days per week, diagnosed with stage I hypertension with systolic blood pressure up to 140 mmHg and diastolic blood pressure up to 100 mmHg in a resting position. Those workers who had diabetes mellitus, hyperlipidemia, stroke, renal failure or heart disease were excluded. The eligible participants were screened by the registered nurses.

Sample size calculation

The sample size was 70 home workers divided equally into the intervention group and the control group, with reduction in blood pressure as the major outcome variable. A previous study reported that the mean reduction of blood pressure in the intervention group was under 140/ 90 mmHg after 3 months following receiving the intervention[18]; this information was used to estimate the sample size per group at alpha (two-tailed) = 0.05, calculated with beta and power of 0.2 and 80%.

The intervention

The Self-Management and Multifactorial Program was developed by the researcher based on the self-management theory.[19] The Self-Management and Multifactorial Program is a group health educational program, designed for : 1) enhancing knowledge of exercise, namely arm swing, working hours management, guidelines on reducing salt consumption, and educating participants to observe hypertensive symptoms and monitor blood pressure, 2) enhancing attitudes to manage behaviors and control blood pressure, and to offer practical knowledge and self-confidence which the participants could possibly apply to manage their behaviors such as reducing salty food, changing posture every two hours during work for better blood circulation, and performing arm swings to improve blood circulation, 3) planning self-management for recording behaviors and monitoring blood pressure, and 4) supporting social networks and peers through additional advice on recommended behaviors for participants based on participant's contexts through 30-minute home visits by researchers and village health volunteers instructed and trained to assess the blood pressure by the researchers.

Procedures

After the list of eligible participants was obtained by applying inclusion and exclusion criteria, each participant was assigned an integer number**.** Simple random sampling was employed to allocate the participants into either the intervention

group or the control group. The intervention group followed the program for 4 weeks while the control group received standard treatments provided by the government.

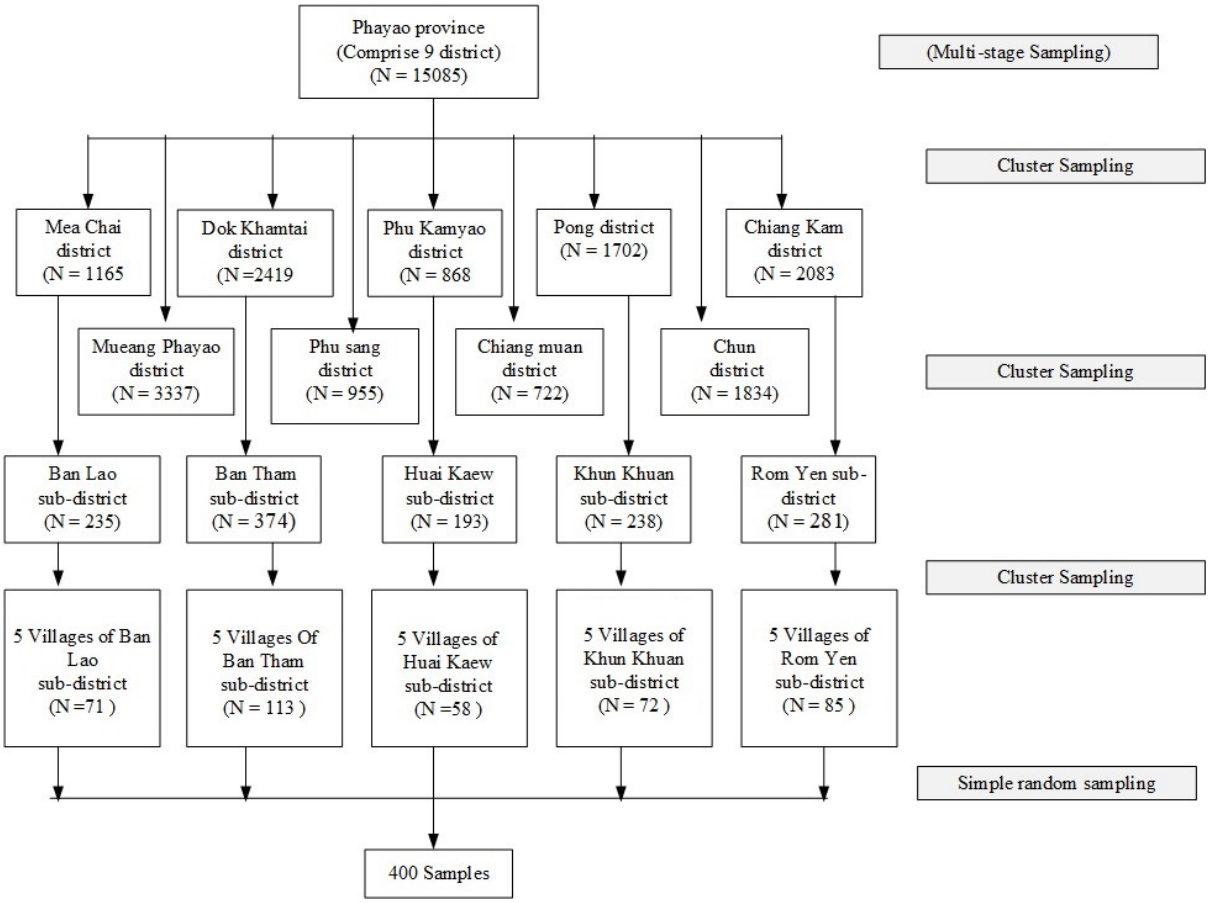

Figure 1. The schematic chart for participant allocation

Outcome measurements

The demographic characteristic questionnaire developed by the researchers included gender, age, marital status, education level, income, experience of home-based work, and working duration.

The Knowledge Attitude and Practice (KAP) questionnaire was developed by the researchers based on the reviewed literature and self-management model. This questionnaire consisted of 30 items. The questionnaire was utilized to assess knowledge regarding blood pressure control and hypertension, attitudes toward hypertension, and participants' practice on behavior management. The content validity verified by a panel of three experts demonstrated a content validity index of 0.8. The reliability of this 20-item questionnaire on attitude and practice and 10-item test on knowledge in 35 older adults in the community was measured by a Cronbach's alpha value of 0.8 and KR20 of 0.8. The measurements were taken at the baseline (day 0), 3 months after program implementation, and at the 6-month follow up.

The Citizen CH-403C was utilized to measure blood pressure and heart rate. The Citizen CH-403C was calibrated against a standardized sphygmomanometer before the start of the program. Two village

health volunteers who were trained in taking blood pressure with a standardized sphygmomanometer and Health Mate, using an appropriately sized cuff, served as researcher assistants (RAs) and measured the participants' blood pressure. Prior to the program, participants were instructed to avoid caffeine intake, exercise, and smoking for at least 30 minutes prior to their blood pressure measurements. In addition, participants were asked to sit for at least five minutes before having their blood pressure taken. Each participant had their blood pressure assessed twice. The results were then averaged and recorded. Blood pressure was obtained at the baseline (day 0), at 3 months after program implementation, and at the 6-month follow up.

Ethical considerations

All the participants received information regarding the research objectives and procedures of the study and had given their written informed consent before participating in the intervention program. Ethical consideration was approved by the Research Ethics Review Committee for Research Involving Human Research Participants, Health Sciences Group, a University (Blinded for review).

Data analysis

Data were analyzed using the SPSS statistical software version 25 with statistical significance set at $p < .05$. Chi-square test and independent *t*-test were employed to compare the baseline characteristics and outcomes for Knowledge Attitude and Practice (KAP), blood pressure, and heart rate between the experimental group and control groups. Repeated measures analysis of variance (ANOVA) was utilized to analyze differences in KAP, blood pressure, and heart rate over time. Post-hoc analysis was conducted using the Bonferroni-corrected *t*-test to compare specific differences between the changes that were statistically significant. Knowledge, attitude, practice (KAP), systolic blood pressure (SBP), diastolic blood pressure (DBP), and heart rate (HR) variables were tested for normality and homogeneity of variance.

RESULTS

A majority of the participants were female. They were married and had a primary school education level. In the intervention group, a majority of the participants were female with a mean age of 60.51 years old and had a primary school education. Over half of them were married. A majority of the participants earned 5,001-10,000 baht per month, had work experience of more than 10 years, and worked more than 8 hours a day. In the control group, a majority of the participants were female with a mean age of 61.83 years old. A majority of them were married, had a primary school education, earned more than 5,000 baht per month, had work experience of more than 10 years, and worked more than 8 hours a day. The socio-demographic characteristics of the two groups were not significantly different at the baseline (Table 1).

Table 1. Socio-demographic characteristics of the elderly home-based workers at the baseline

Socio-demographic	Total		Intervention group (n=35)		Control group (n=35)		*p-value* [a]
	n	%	n	%	n	%	
Gender (n, %)							0.550*
Male	14	20.00	8	22.86	6	17.14	
Female	56	80.00	27	77.14	29	82.86	
Age (n, %)							0.453**
50-60	34	48.57	15	42.86	19	54.29	
61-65	36	51.43	20	57.14	16	45.71	
	$\bar{x}$ = 61.25		$\bar{x}$ = 60.51		$\bar{x}$ = 61.83		
	SD = 4.53		*SD* = 3.63		*SD* = 4.83		
	Min = 50		*Min* = 50		*Min* = 50		
	Max = 65		*Max* = 65		*Max* = 65		
Marital Status							0.662**
Single/Widow/Divorce/ Separated	28	40.00	17	48.57	11	31.43	
Married	42	60.00	18	51.43	24	68.57	
Education Level							0.433**
Illiterate/ Primary School	61	87.14	32	91.43	29	82.86	
High School	9	12.86	3	8.57	6	17.14	
Personal Income (baht/month)							0.685**
≤ 5,000	17	24.29	8	22.86	9	25.71	
≥ 5,000	53	75.71	27	77.14	26	74.29	
Experience in Home-Based Work							0.727**
≤ 10years	39	55.72	19	54.29	20	57.14	
≥ 10 years	31	44.28	16	45.71	15	42.86	
Duration Working hours/day							0.593**
≤ 8 hours/day	23	32.86	11	31.42	12	34.29	
≥ 8 hours/day	47	67.14	24	68.57	23	65.71	

Note: [a] =* Chi-Square **Fisher's exact test significance at $p < 0.05$

Table 2. Knowledge, attitude, and behavior for reducing blood pressure, blood pressure, and heart rate at baseline, month 3, and month 6 of participants in the intervention and control groups

Outcomes	Intervention group (n=35)		Control group (n=35)		t	*p-value*
	Mean	**SD**	**Mean**	**SD**		
Knowledge **for** reducing blood pressure						
Baseline	1.17	1.25	1.57	1.58	1.17	0.240
Month 3	6.66	1.97	2.97	2.11	-7.56	0.001*
Month 6	5.77	1.22	1.49	1.82	-0.77	0.001*
p	0.001		0.624			
Attitude **for** reducing blood pressure						

Outcomes	Intervention group *(n=35)*		Control group *(n=35)*		t	*p-value*
	Mean	**SD**	**Mean**	**SD**		
Baseline	28.63	3.57	28.20	3.40	-.514	0.610
Month 3	36.51	2.79	24.34	2.15	-13.36	0.0001*
Month 6	39.20	2.89	25.20	1.93	-15.40	0.0001*
p	0.001		0.351			
Behavior **for** reducing blood pressure						
Baseline	32.54	1.97	32.54	1.97	0.00	1.0
Month 3	38.31	2.99	25.29	2.50	-19.73	0.001*
Month 6	38.91	3.22	23.97	1.93	-23.53	0.001*
p	0.001		0.334			
Systolic blood pressure (mmHg)						
Baseline	137.51	3.04	137.09	2.77	-0.616	0.540
Month 3	131.43	3.86	136.97	2.72	6.94	0.001*
Month 6	129.97	3.59	137.69	2.77	9.57	0.001*
p	0.001		0.471			
Diastolic blood pressure (mmHg)						
Baseline	90.71	6.74	89.62	6.50	0.687	0.500
Month 3	77.00	6.70	92.21	6.39	9.64	0.0001*
Month 6	74.74	6.16	90.71	6.84	10.19	0.0001*
p	0.001		0.938			
Heart rate (bpm)						
Baseline	81.65	10.24	80.23	9.05	-0.618	0.538
Month 3	81.65	10.04	80.20	7.72	-0.681	0.682
Month 6	80.71	8.87	81.00	8.50	0.138	0.891
p	0.001		0.334			

Note: *Significance at $p < 0.05$, mmHg = millimeters of mercury; bpm = beats per minute

Table 2 shows the comparison between both groups regarding the knowledge, attitude, and practice on managing working hours, reducing high sodium consumption, and performing arm swinging exercises at the baseline, month 3, and month 6. The effect of the self-management and multifactorial program could improve knowledge, attitude, and practice which seemed to have positive effects on blood pressure. Before the intervention program, the result showed that the mean scores for the knowledge, attitude, and practice were not different between groups. The mean values of the systolic blood pressure, diastolic blood pressure, and heart rate of the intervention group were 137.51 mmHg, 90.71 mmHg, and 81.65 bpm, respectively, while those of the control group were 137.09 mmHg, 89.62 mmHg, and 80.23 bpm, respectively.

Systolic and diastolic blood pressure at months 3 and 6 of the intervention group were statistically lower than those of the control group (p-value=0.001). The improvement in systolic and diastolic blood pressure was observed in the intervention group 3 months after the program intervention. Changes in blood pressure could not be found in the control group. Contrary to the blood pressure, the heart rate of the home-based workers was not significantly different during the intervention.

Table 3 shows comparisons of the knowledge, attitude, and behavior for reducing blood pressure, blood pressure, and heart rate mean scores between the intervention and control groups at each time point

Outcomes Bonferroni post-hoc analysis	Intervention group *(n=35)*	Control group *(n=35)*
	p	p
Knowledge **for** reducing blood pressure		
Baseline vs month 3	0.001	1.000
Baseline vs month 6	0.001	1.000
Month 3 vs month 6	0.003	1.000
Attitude **for** reducing blood pressure		
Baseline vs month 3	0.001	0.863
Baseline vs month 6	0.001	0.721
Month 3 vs month 6	0.001	0.933
Behavior **for** reducing blood pressure		
Baseline vs month 3	0.001	0.635
Baseline vs month 6	0.001	0.728
Month 3 vs month 6	0.001	1.000
Systolic blood pressure (mmHg)		
Baseline	0.001	1.000
Month 3	0.001	0.937
Month 6	0.004	0.536
Diastolic blood pressure (mmHg)		
Baseline	0.001	0.988
Month 3	0.001	0.506
Month 6	0.001	0.874
Heart rate (bpm)		
Baseline	0.001	0.768
Month 3	0.004	0.850
Month 6	0.031	0.935

Table 3 shows the outcomes after month 3 and month 6 of the intervention program, comparing knowledge, attitude, and behavior for reducing blood pressure, and mean scores of blood pressure and heart rate between the intervention and control groups at each time point. The intervention group showed significant improvements in knowledge, attitude, and practice from the baseline to month 3 and from the baseline to month 6, as indicated by the results of repeated measures ANOVA and post-hoc analysis. In contrast, the control group did not exhibit any significant changes in these parameters from the baseline to month 3 or from the baseline to month 6. The blood pressure and heart rate of these two groups were not significantly different at the baseline (Table 3).

DISCUSSION

Thailand is experiencing a demographic shift towards an aging society, with nearly 35% of older adults still working to support themselves and their

families. The older population has grown rapidly over the past few decades, reaching 19% of the total population by 2021.[20] However, many older adults are engaged in sedentary desk-based work, which can negatively impact their physical health and increase the risk of conditions like hypertension. To address these challenges, interventions have been implemented to promote healthier behaviors among older adults, particularly those working from home. These interventions include education on reducing salt intake,[21] engaging in physical activities such as arm swinging exercises, and modifying work postures to avoid prolonged periods of sitting. Research has shown that these interventions can lead to significant improvements in various health parameters, including blood pressure control and physical function. However, there are challenges such as the availability of low-salt meals and the temptation to consume high-salt ready-made foods, especially during long hours of working from home. To ensure the sustainability of these behavioral changes, ongoing support and monitoring are essential.[22] Village health volunteers play a crucial role in this regard, as they can provide continuous support and care to older adults within their communities, fostering trust and facilitating long-term behavior modification. Overall, these multifactorial interventions aim to empower older adults to take control of their health and well-being, ultimately contributing to the prevention and management of conditions like hypertension in this demographic group. This program integrates various activities such as controlling salt intake, changing postures during prolonged periods of work, and engaging in arm swinging exercises, which have shown better control over blood pressure in the intervention group compared to the control group. This research, viewed from the perspective of exercise, aligns with studies conducted by Prasertsri P,[23] which demonstrated the efficacy of arm swinging exercises in controlling factors contributing to high blood pressure in older adults. Additionally, reducing salt intake has been identified as another significant factor[24] in controlling high blood pressure,[25] consistent with research by He FJ,[26] which examined the benefits of reducing salt consumption to manage high blood pressure. It is evident that the approach to lowering blood pressure often involves a combination of self-care practices tailored to the lifestyle and age group,[27] emphasizing the importance of adapting interventions to suit different occupational and age groups.

The self-management and multifactorial program aimed at reducing blood pressure in older adults working as home-based workers provides education on attitude and behavior modification regarding salt consumption, engaging in physical activities such as arm swinging exercises and modifying postures during work.[28] These interventions have shown positive effects on controlling blood pressure levels in the older adult intervention group who work from home. However, this study has limitations, such as the inability to supply or cook low-salt meals. Continuous long hours of working from home may lead older adults to opt for ready-made meals containing high levels of salt. Therefore, it is essential to provide ongoing support and monitoring for the intervention group to ensure the sustainability of these behavioral changes. The role of village health volunteers in research is crucial due to their close proximity and residence within the same community as the participants. This allows them to continuously monitor and support the participants' health behaviors. Moreover, they gain trust from the participants, who are willing to confide in them regarding issues related to managing blood pressure. As a result, this fosters sustainable care within the participant group.

RECOMMENDATIONS

1. The long-term effects of the self-management and multifactorial program for home-based workers with prehypertension should be investigated.

2. This type of study can be replicated and implemented in other areas with similar characteristics for promoting knowledge, attitude, and behavior toward the prevention of new cases of hypertension.

3. Since the village health volunteers play a major role in any community, there should be training and development regularly regarding non-communicable diseases so that they can pass on knowledge to older adults living in the community.

4. Supporting policies that promote health among home-based workers to manage complications from high blood pressure is important, despite limitations in self-care.

5. This program can be adapted for home-based workers in other areas.

6. Healthcare providers and program developers should collaborate to design and implement self-management programs effectively. This approach could significantly improve outcomes for patients with hypertension in a sustainable manner.

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