Original Article

How a Self-Management Program Affects Blood Pressure Among Indonesians with Hypertension: A Quasi-Experimental Study

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Abstract

Background: The prevalence of persons with hypertension remains high, especially in Southeast Asia, such as in Indonesia. Therefore, an effort to control blood pressure is needed. This study aimed to examine the effect of a self-management program on blood pressure among persons with hypertension in Indonesia. **Materials and Methods:** A quasi-experimental study with pre-test post-test with control group design was used. Seventy-seven participants were selected using convenience sampling in Belitung, Indonesia. A digital sphygmomanometer was used to measure blood pressure. Paired t-test and independent t-test were used for data analysis. Knowledge of hypertension, diet, exercise, and medication records were measured via validated questionnaires and observation sheets. **Results:** There was a significant effect of the eight-week self-management program on systolic blood pressure (t_{30} = 6.45, p = 0.01) and diastolic blood pressure (t_{30} = 2.53, p = 0.02). A significant difference in blood pressure was also identified between the experiment and control group, particularly in systolic blood pressure (t_{59} = –2.89, p = 0.05) with a large effect size (0.71). **Conclusions:** Brisk walking with a duration of at least 30 minutes per day, dietary modification program specifically focusing on weight loss and anti-hypertensive food, monitoring program, and health education for eight weeks, are considered effective to control blood pressure among patients with hypertension, and these interventions should be a part of nursing interventions and sustainable health development programs in the community.

Keywords: *Hypertension, Indonesia, self-management*

Introduction

Hypertension is rapidly increasing and has become a global health challenge, which its prevalence remains high, particularly in developing countries, including Indonesia.[1] Of the total population of Indonesia (264 million), there are 31.6% of people living with hypertension in the age group of 31-44 years, 45.3% in the age group of 45-54 years, and 55.2% in the age group of 55-64 years.[2] According to basic health research of Indonesia,[2] the highest prevalence of hypertension among 34 provinces in Indonesia is found in Bangka Belitung province. This prevalence has to be the main concern of local government to provide better intervention to reduce hypertension. Otherwise, the number of hypertensions will be increased every year. It is predicted that there will be more than 1.56 billion people living with hypertension in 2025.[3]

Hypertension, a silent killer, has contributed to the high number of cardiovascular diseases, coronary heart disease, stroke, chronic renal failure, and other diseases globally, affecting physical and mental lives.[4] Similar to Indonesia, hypertension is the leading cause of stroke and coronary heart disease.[4] Thus, efforts to deal with hypertension are needed.

Since 2010, the Government of Indonesia has provided a chronic disease management program or called Program Pengelolaan Penyakit Kronis (PROLANIS) for those with diabetes mellitus, high blood pressure, and chronic renal disease cardiovascular diseases, which is in line with sustainable development goals.[5] PROLANIS consists of five core activities, including (i) providing a consultation, (ii) providing health educations, (iii) giving motivation using a text reminder via Short Message

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Service (SMS) gateway, (iv) home visit, and (v) gymnastics conducted once per week in every community health center.[5] However, the effect of PROLANIS has slow progress.

Our pilot study revealed that the majority of patients with hypertension in Belitung were well aware of their disease. They also liked to join the exercise program provided by PROLANIS but mostly ignored diet in dealing with hypertension. It is challenging for most participants to change their familiar food with the strict food for persons with hypertension. This may be one of the reasons that the prevalence of hypertension remains high. Therefore, our study aims to provide a self-management program as a complementary program of PROLANIS to control blood pressure.

The self-management program is developed based on a framework of Kanfer, Goelick-Buy[6] as an effective way to maintain and improve both health behaviors and health status, which consists of self-monitoring, self-evaluation, and self-reinforcement. The goal of the self-management program is to change healthy life behavior, including exercise, diet modification, and medication adherence to control blood pressure which therefore it is consistent with the goal of treatment for hypertension.[7] Previous studies[6,7] in a self-management program on blood pressure have been conducted in Thailand. However, no single study has been conducted in Indonesia, specifically to examine the impact of self-management programs compared to PROLANIS. A previous local study[8] was only undertaken to examine the factors related to self-management in people with hypertension in Jepara, Indonesia. Therefore, this study will provide input for the existing programs in Indonesia to manage hypertension effectively and provide evidence for maintaining sustainable health development goals among communities. This study aimed to examine the effect of a self-management program on blood pressure among persons with hypertension in Indonesia.

Materials and Methods

Quasi-experiment with pre-test post-test with control group design was used to measure the effect of a self-management program on blood pressure among persons with hypertension. The study was conducted from July to September 2019 in two different public health centers in Belitung, Indonesia. One public health center was assigned for an experimental group, and another was for a control group. Samples in this study were selected using convenience sampling based on inclusion criteria: (i) aged at least twenty years of age or older, (ii) blood pressure starts from 140 (systole) and/or 90 mmHg and more (diastole), and (iii) able to communicate, read, and write the Indonesian language. Power analysis and effect size were used to determine sample size with the following criteria: significance value = 0.05, power = 0.80, and medium effect size = 0.50.[9] An attrition rate of 10% was added, which at least 33 samples per group would be sufficient to examine differences between both groups. Matching based on personal and demographic characteristics was used to minimize potential bias due to non-randomization. The experimental group was recruited first, which further their personal and demographic data were used to match the criteria for recruiting the control group.

Samples in the experimental group received the conventional care from the community health centers and self-management program, which comprise three strategies of self-management method including self-monitoring, self-evaluation, and self-reinforcement adopted from the work of Tongvichean.[6] This program is composed of three sessions as follows: Session 1: problem assessment and motivation. The researchers and nurses listed the number of patients with hypertension and met all of them in the community health centers to qualitatively explore their self-management to control blood pressure using Focus Group Discussion (FGD) in the meeting room for 60-120 minutes. All samples were divided into three FGD groups led by one investigator in each group; Session 2: hypertension education. The health education was done for 60 minutes in a meeting room using a lecture with PowerPoint. All samples were invited to discuss any topics related to hypertension. The contents consisted of (i) knowledge of hypertension; (ii) diet, which the topics were related to sodium reduction, weight loss, the food guideline, number of servings in each diet group, and self-management dietary. Food proportions were divided into 2000, 1600, and 1100 kilocalories; (iii) exercise, related to the principle of exercise (frequency, intensity, and type), and assessment of exercise intensity (measuring heart rate and talk test), self-management skills for exercise, and brisk walking. Stretching and Interval walking should be performed about 50 minutes per day, but it could be broken down to walking every two hours for about 10-15 minutes per session (or walking in five sessions per day in five to seven days per week, within eight weeks); Session 3: following up by performing telephone call or Short-Message-Service (SMS) texting session and home visits, which varied among samples and most likely done if a samples did not join the exercise program every Friday, or if a participant did not do control when their medication was finished. Besides, the samples in the control group received conventional routine care by community health nurses in the PROLANIS program.

The measures in this study consisted of a personal information sheet consisting of gender, age, marital status, living with spouse/family member, educational level, occupation, smoking status, drinking alcohol, comorbidity, hypertension drug, and taking medication as prescribed, which were recorded at the baseline information. Digital sphygmomanometer OMRON HEM-8712 to measure samples' characteristics and their systolic and diastolic blood pressure. Blood pressure

of the samples were measured by the researcher and research assistants using the digital sphygmomanometer every week (every Friday) for eight weeks for the experimental group. For the control group, the blood pressure was only measured at baseline and after eight weeks. It was because the samples in the control group did not come to the community health center every week, but they came based on the schedule if the hypertension drug was finished, which could be in two or four weeks.

There are four parts of instruments to monitor the experiment, including self-management knowledge, diet, exercise, and medication record as the following (1) Self-management knowledge test to control blood pressure, adopted from Tongvichean,[6] which consists of 27 items with a dichotomous answer for choosing: "yes or no" (yes = 1 point, no = 0 point) in regards to hypertension, diet, and exercise. The total score ranges from 0-27; the higher score, the better knowledge. The instrument was administered before and after the health education session (lecture) for the experimental group. For the control group, a knowledge test was administered before and after a nurse explained healthy lifestyle behavior individually. Each samples should have at least 70% of the total score in this test (19 out of 27 scores). If the samples had less than 70%, the investigators provided another private health education section, and their knowledge score was re-evaluated until reaching the target; (2) Self-management dietary, adopted from Tongvichean[6] to monitor and record eating behavior related to food proportion, kilocalories, goal setting and challenges for eight weeks; (3) Exercise record, modified from Tongvichean[6] to measure the duration of exercise and frequency every week for eight weeks; (4) Medication records, modified from Tongvichean[6] to measure the self-reported compliance of participants to take the medication every day for eight weeks.

Data were collected by the researcher and research assistants. The research assistants were nurses who had research and clinical experience in caring for patients with hypertension. The research assistance's role was obtaining the pre-test and post-test data in both the experimental and control groups. Each participant was reminded by research assistants to measure blood pressure every week. The self-management diary record, exercise record, and medication record were completed every day by the samples.

The data were analyzed using International Business Machines (IBM) Statistical Package for Social Science (SPSS) software, version 22.0, for Mac OS X. Each pair of data was tested for normal distribution using Kolmogorov Smirnov, which revealed that all data were normally distributed ($p > 0.05$). Therefore, descriptive statistics, independent t-test, and Paired t-test were used for data analyses. The effect size was also calculated using a statistical formula (experimental group mean – control group mean/control group standard deviation). Cohen suggests that effect sizes of 0.80, 0.50, and 0.20 represent large, medium, and small effect sizes.[10]

Ethical consideration

The study was approved by the Local Research Ethics Committee of the Department of Health of Tanjung Pandan Belitung Indonesia (approval number: 440/1325/DINKES; approval date: April 10, 2019). The study permission was also obtained from the Public Health Centre of Tanjung Pandan and the Public Health Centre of Air Saga. All samples have been informed about the objective and procedures of the study. The researchers also emphasized that the participation in this study was voluntary and had no effect on their personal life. All samples' names were initially coded, and each of them was asked to sign a written informed consent.

Results

Response rate

Of the total samples, only 61 samples (92.42%) were able to complete the program, which could be grouped into the experimental group (31 samples), and the control group (30 samples). However, 30 samples per group are still sufficient to examine differences in both groups, with a medium to large effect size.

Characteristics of participants

The majority of the samples were females. All samples were married, except one samples in the experimental group. The mean (SD) of age of the samples was 59.81 (8.74) years in the experimental group and 60.20 (8.19) years in the control group. All samples were living with family members/spouses. Both groups most likely had senior high school (50.82%) as their educational background and worked as housewives (32.79%). There was no single samples drinking alcohol, and 27.87% of the samples had comorbidity. This should be 72.13% of samples had drugs for hypertension only, and 98.36% took the medication as prescribed. Based on statistical analysis, there was no significant difference in the characteristics of samples between both groups ($p > 0.05$) [Table 1].

Mean (SD) of blood pressure for experimental group in eight weeks

In the pre-test, the mean (SD) of Systolic Blood Pressure (SBP) was 154.13 (20.06), and Diastolic Blood Pressure (DBP) was 91.03 (18.61). In the post-test week 4, the mean (SD) of SDP and DBP were decreased to 142.10 (23.11) and 87.03 (14.89) and gradually reduced to 132.13 (15.01) and 82.55 (2.47) in the post-test week 8.

Table 1: Characteristics of samples (n=61)

Characteristics	Experiment Group (*n*=31) *n* (%)	Control Group (*n*=30) *n* (%)	Total *n* (%)	Statistic value (Chi Square/*t*)	*P*
Gender					
Male	11 (35.50%)	8 (26.67%)	19 (31.14%)	0.55	0.46
Female	20 (64.50%)	22 (73.33%)	42 (68.86%)		
Age (year)	Mean (SD)	Mean (SD)	-	-0.18	0.86
	59.81 (8.74)	60.20 (8.19)			
Marital Status					
Married	30 (96.77%)	30 (100%)	60 (98.36%)	0.98	0.32
Divorce	1 (3.23%)	0 (0%)	1 (1.64%)		
Living with Spouse/Family Member					
Yes	31 (100%)	30 (100%)	61 (100%)	.	.
No	0 (0%)	0 (0%)	0 (0%)		
Educational Level					
Elementary	8 (25.81%)	3 (10%)	11 (18.03%)	6.69	0.15
Junior high school	4 (12.90%)	1 (3.33%)	5 (8.20%)		
Senior high school	15 (48.39%)	16 (53.34%)	31 (50.82%)		
University level	4 (12.90%)	10 (33.33%)	14 (22.95%)		
Occupation					
Housewife	13 (41.94%)	7 (23.33%)	20 (32.79%)	7.45	0.11
Laborer	5 (16.13%)	2 (6.67%)	7 (11.48%)		
Civil Servant	2 (6.45%)	8 (26.67%)	10 (16.39%)		
Retirement	5 (16.13%)	8 (26.67%)	13 (21.31%)		
Private	6 (19.35%)	5 (16.66%)	11 (18.03%)		
Smoking Status					
Yes	3 (9.68%)	2 (6.67%)	5 (8.20%)	0.18	0.67
No	28 (90.32%)	28 (93.33%)	56 (91.80%)		
Drinking Alcohol					
Yes	0 (0%)	0 (0%)	0 (0%)	.	.
No	31 (100%)	30 (100%)	61 (100%)		
Comorbidity					
Yes	8 (25.81%)	9 (30%)	17 (27.87%)	0.13	0.72
No	23 (74.19%)	21 (70%)	44 (72.13%)		
Hypertension Drug					
Hypertension drug only (amlodipine, captopril)	23 (74.19%)	21 (70%)	44 (72.13%)	0.13	0.72
Other than hypertension drugs	8 (25.81%)	9 (30%)	17 (27.87%)		
Taking Medication as Prescribed					
Yes	30 (96.77%)	30 (100%)	60 (98.36%)	0.98	0.32
No	1 (3.23%)	0 (0%)	1 (1.64%)		

Energy (Kilocalorie), days for diet, frequency of exercise (brisk walk) in the experimental group

The mean (SD) of energy consumed each week for eight weeks by the samples in the experimental group was 1409.03 (166.34) kilocalories. There was a slight decrease in energy in food proportion in each week. The mean (SD) of days for diet followed by all samples were only 6.65 (0.53) days. Besides, the mean (SD) of days of exercise per week were 4.35 (2.45) days. The mean (SD) of average duration of exercise was 29.46 (16.65) minutes.

Effect of health education on knowledge of patients with hypertension in the experiment group and control group

The dependent t-test showed that health education had a significant effect on knowledge of hypertension in both the experimental group that used the lecture method (t_{30} = -5.09, p = 0.01) and the control group that used the individual-based method (t_{29} = -2.10, p = 0.04). The results of the independent t-test showed that the knowledge at baseline in both groups had no difference (t_{59} = -0.33, p = 0.74), with the mean (SD)

of knowledge of 75.39 (7.62) in the experimental group and 75.93 (4.74) in the control group. However, there was a significant difference of knowledge in the post-test (t_{59} = 3.88, p = 0.01), with the mean (SD) of knowledge of 83.51 (4.95) in the experimental group and 78.52 (5.09) in the control group.

Effect of intervention on blood pressure in the experiment group and control group

The self-management program in the experimental group had a significant effect in lowering systolic blood pressure (t_{30} = 6.45, p = 0.01) and diastolic blood pressure (t_{30} = 2.53, p = 0.02). Unfortunately, the conventional routine care in the control group did not affect systolic blood pressure (t_{29} = 0.72, p = 0.48) and diastolic blood pressure (t_{29} = 1.25, p = 0.22) [Table 2].

The difference in blood pressure in the experiment and control group

There was no significant difference in the systolic and diastolic blood pressure between the experiment and control group during the pre-test (t_{59} = 0.86, p = 0.39). However, after the intervention, there was a statistically significant difference between both groups in systolic blood pressure (t_{59} = -2.89, p = 0.05) but not in the diastolic blood pressure. However, the blood pressure in the experimental group was considered normal than it in the control group. Therefore, the self-management program was effective in reducing blood pressure among those with hypertension. The effect size for SBP was large (0.71), while the effect size for DBP was small (0.05) [Table 3].

Discussion

This study aimed to examine the effect of a self-management program in lowering blood pressure among persons with hypertension in Belitung, Indonesia. The results revealed a significant effect of an eight-week self-management program on systolic and diastolic blood pressure. This finding supports the study of Tongvichean,[6] which used the same self-management program on blood pressure, but was different in the length of intervention, from 12 weeks to eight weeks, as applied in our study. This indicates that the self-management program is not only effective in 12 weeks but also in eight weeks as long as it focuses on exercise, diet, and medication adherence in controlling blood pressure.

Our findings also revealed that there was a significant difference in blood pressure between the experiment group and control group, particularly in systolic blood pressure with a large effect size. Although diastolic blood pressure had no difference in both groups, it was still in the normal range. This indicates that the self-management program is more effective than the conventional care of PROLANIS program in controlling blood pressure.

In this study, the samples observed their daily behavior related to exercise, diet, medication, and related factors. In this way, they will indirectly pay more attention to their health conditions. Besides, nurses also play roles in motivating the samples, increasing their awareness, and reminding them to keep healthy. Nurses also texted each samples to come to join exercise together every Friday and rechecked their records and conditions.

Although the goal-setting of target energy might not work well among samples in the experimental group, but they tried to reduce the intake of energy or lose weight with 1409.03 kilocalories. Based on British Nutrition Foundation,[11] men are recommended to consume 2,313 kilocalories while women only consume 1,632 kilocalories per day. This indicates that the samples were trying to follow the recommendation of the program of this study for weight loss, as well as trying to consume anti-hypertensive food and a low sodium diet.

All samples in the experimental group were asked to do brisk walking every day, but the majority of them only did the exercise for days per week with a duration of 29 minutes each. Although the exercise was not done every day, there was progress for samples to change their behaviors. However, this finding was in line with a previous study,[12] which indicated that brisk walking could lower blood pressure.

In this study, it was also found that the health education program using both lecture and individual basis were effective in increasing the knowledge of hypertension treatment among samples in both groups. However, a significant difference was also revealed between the two groups, in which the knowledge in the experimental

Table 2: Effect of intervention on blood pressure in the experiment group and the control group by dependent t-test

Group	SBP**, mmHg		*t*	df	*p*
	Pre-test Mean (SD)	Post-test Mean (SD)			
Experimental group (*n*=31)	154.13 (20.06)	132.13 (15.01)	6.45	30	0.01*
Control group (*n*=30)	149.97 (17.59)	148.77 (15.51)	0.72	29	0.48
Group	**DBP***, mmHg**		***t***	**df**	***p***
	Pre-test Mean (SD)	**Post-test Mean (SD)**			
Experimental group (*n*=31)	91.03 (18.61)	82.55 (2.47)	2.53	30	0.02*
Control group (*n*=30)	85.23 (9.06)	82.03 (9.38)	1.25	29	0.22

*significant level (p<0.05), **SBP (Systolic Blood Pressure), ***DBP (Diastolic Blood Pressure)

Table 3: The difference in blood pressure in the experiment group and the control group by Independent *t*-test

Blood Pressure	Group	Mean (SD)	*t*	df	*p*	Effect size
Pre-test SBP**	Experiment (*n*=31)	154.13 (20.06)	0.86	59	0.39	0.24
	Control (*n*=30)	149.97 (17.59)				
Post-test SBP***	Experiment (*n*=31)	132.13 (15.01)	-2.89	59	0.05*	0.71
	Control (*n*=30)	143.70 (16.28)				
Pre-test DBP***	Experiment (*n*=31)	91.03 (18.61)	1.56	43.78	0.13	0.64
	Control (*n*=30)	85.23 (9.06)				
Post-test DBP***	Experiment (*n*=31)	82.55 (2.47)	0.29	32.93	0.77	0.05
	Control (*n*=30)	82.03 (9.34)				

*significant level ($P<0.05$), **SBP (Systolic Blood Pressure), ***DBP (Diastolic Blood Pressure)

group was higher than the knowledge in the control group. Therefore, having a lecture in one meeting room where patients could discuss each other should be an intervention rather than an individual approach alone. Additionally, the patient might feel that they were not the only one who got sick, encouraging them to support each other.

This study provides additional evidence in response to the findings of a previous study[8] which revealed a significant relationship between social support, knowledge of hypertension, and self-management. As indicated in our research, self-management would be effective if nurses acted as a social support group and health education was provided to increase the knowledge. In addition, the findings of this study serve as an input for the community for sustainable health to maintain a personal commitment to having regular exercise and taking care of diet, and maintaining medication compliance and a balanced state of mind.

Limitations of this study included that some samples might not cook by themselves; therefore, it was sometimes difficult to adjust how much salt or sugar was in their food. In addition, the calculation of kilocalories in this study was not getting into the detail of each portion of each kind of fruit, vegetable, meat, or any food. The calculation of kilocalories was based on the number of ladles, spoons, portions, and glass taken every day. Misinterpretation of kilocalories might be one of the limitations. Therefore, the use of a nutrition calculator for every meal should be performed for future studies.

Conclusion

There was a significant effect of an eight-week self-management program on blood pressure among persons with hypertension in Belitung, Indonesia, and it was more effective than the PROLANIS program in lowering blood pressure. Therefore, the self-management program should be added to the PROLANIS program and applied as one of the nursing interventions and sustainable health programs in the community. It is also suggested to policymakers to add several points in PROLANIS program as follows: 1) brisk walking with a duration of at least 30 minutes per day should be performed in addition to the aerobic program that is performed every Friday per week, 2) dietary modification program (weight loss and anti-hypertensive food) should be added. Exercise without diet is not effective, 3) monitoring and motivation program by nurses should be done in order to control and maintain healthy life behavior among patients, either by telephone follow-up or by home visits, and 4) health education using both lecture and individual approaches should be performed regularly to gain more understanding among persons with hypertension.

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Conflicts of interest

Nothing to declare.

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