ประสิทธิผลของโปรแกรมการควบคุมความดันโลหิตที่บ้านแบบบูรณาการต่อค่าความดันโลหิต เปอร์เซ็นต์ไขมันในร่างกาย และพฤติกรรมการบริโภคในผู้ป่วยความดันโลหิตสูงที่ไม่สามารถควบคุมได้

The Effectiveness of The Integrated Home-Based Program on Blood Pressure, Body Fat Percentage And Eating Behavior among Uncontrolled Hypertensive Patients

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บทคัดย่อ

การศึกษามีวัตถุประสงค์เพื่อศึกษาประสิทธิผลของโปรแกรมการควบคุมความดันโลหิตที่บ้านแบบบูรณาการ (IHB) ต่อค่าความดันโลหิต เปอร์เซ็นต์ไขมันในร่างกาย และพฤติกรรมการบริโภคในผู้ป่วยความดันโลหิตสูงที่ไม่สามารถควบคุมได้ โปรแกรมสร้างจากหลักฐานเชิงประจักษ์ บูรณาการ การกำหนดเป้าหมาย เทคนิคการให้คำปรึกษา การติดตามการเปลี่ยนแปลงของความดันโลหิต ใช้เวลา 6 สัปดาห์ เป็นการวิจัยกึ่งทดลอง กลุ่มตัวอย่างคือผู้ป่วยความดันโลหิตสูงที่ไม่สามารถควบคุมได้ จำนวน 80 คน แบ่งเป็นกลุ่มทดลอง 40 คน และกลุ่มควบคุม 40 คน กลุ่มทดลองได้รับการดูแลโดยโปรแกรม IHB ควบคู่กับการดูแลรักษาปกติ กลุ่มควบคุมจะได้รับการดูแลรักษาแบบปกติ เครื่องมือในการวิจัยคือ เครื่องวัดความดันโลหิต เปอร์เซ็นต์ไขมันในร่างกาย และแบบประเมินพฤติกรรมการรับประทานอาหาร (TFEQ) ใช้สถิติเชิงพรรณนา Chi-square, Paired t-tests และ Repeated Measures ANOVA วิเคราะห์ข้อมูล ผลการวิจัยพบว่า กลุ่มตัวอย่างส่วนมากเป็นผู้หญิง และมีสถานภาพสมรส อายุเฉลี่ย 60.9 ปี ระยะเวลาเฉลี่ยที่เป็นโรคความดันโลหิตสูงคือ 4.4 ปี ผู้ป่วยความดันโลหิตสูงที่ไม่สามารถควบคุมได้ ที่ได้รับโปรแกรม IHB มีค่าเฉลี่ยของ ค่าความดันโลหิต เปอร์เซ็นต์ไขมันในร่างกาย และพฤติกรรมการบริโภค ลดลง เมื่อเปรียบเทียบกับก่อนเข้าโปรแกรมและกลุ่มควบคุม โปรแกรมสามารถใช้ได้ผลดีในผู้ป่วยความดันโลหิตสูงที่ควบคุมความดันโลหิตไม่ได้และสามารถนำไปกับชุมชนได้ดี

คำสำคัญ : ผู้ป่วยความดันโลหิตสูงที่ไม่สามารถควบคุมได้ โปรแกรมการควบคุมความดันโลหิตที่บ้านแบบบูรณาการ เปอร์เซ็นต์ไขมันในร่างกาย พฤติกรรมการบริโภค

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Abstract

The study's aimed to determine the effects of an integrated home-based (IHB) program on blood pressure, body fat and eating behavior among patients with uncontrolled hypertension. The IHB was based on evidence-based practices and self-regulation concept. Program strategies included nurse counseling, goal setting, health education, home blood pressure monitoring, self-appraisal in making progress by an action plan, revision of goals and action plans, and telephone support within six weeks. Eighty patients with uncontrolled hypertension who met the inclusion criteria were recruited to participate in the study. A quasi-experimental design was used by assigning 40 participants to the IHB group and other 40 to the control group. Participants in the experimental group received IHB program as an intervention and usual care, while the control group received usual care. Blood pressure, body fat and the three-factors eating questionnaire (TFEQ) were measured at baseline, week 7 and week 11. Descriptive statistics, chi-square, paired t-tests, and Repeated Measures ANOVA were used to analyze the data. The results found that majority was female. Mean age was 60.9 years, and average duration of hypertension was 4.4 years. The IHB group had significantly lower systolic and diastolic blood pressures, lower percentages of body fat, and improved eating behavior compared to the baseline and the control group. The results suggested that The IHB program was benefits for uncontrolled HT and could be used in community setting.

Keywords: home-based program, uncontrolled hypertension, self-regulation, body fat, eating behavior

Introduction

Hypertension is a major risk factor for cardiovascular disease, chronic kidney disease, and death. An increasing blood pressure of 2 mmHg is associated with a 7% increased risk of mortality from ischemic heart disease and a 10% increased risk from stroke[1]. Literature review found that more than 50% of HT patients could not control there BP[2]. Uncontrolled hypertension is defined as an average systolic blood pressure (BP) ≥140 mmHg or an average diastolic BP ≥90 mmHg[3] as well as includes a time period of over an 18-consecutive month period[4] presence or absence of pharmacological treatment[5].

Several factors promote uncontrolled BP and its complication[6,7]. Patients with uncontrolled hypertension have a higher prevalence of obesity and diabetes[8]. A systolic BP ≥180 mmHg or diastolic BP ≥120 mmHg in uncontrolled hypertensive patients can lead to a nearly 80% chance of death in a year. Medication adherence improves BP control and reduces complications[9]. However, approximately half of patients prescribed antihypertensive medications discontinue therapy within one year of initiation. Patients are more likely to stop taking hypertensive medications when side effects are experienced without a perceived benefit of symptomatic relief[10]. Eating food high in sodium and fat increases the risk of uncontrolled hypertension[11]. A high-sodium diet is one of the most significant risk factors contributing to the development of hypertension[12]. Further an increase of uncontrolled hypertension in Thais has been related to changes in dietary patterns, from eating home-prepared meals to eating in restaurants and choosing to purchase ready-to-cook food[13]. A higher percentage of body fat generally indicates a higher level of risk for cardiovascular disease[14] and, more specifically, is a risk factor related to uncontrolled hypertension[15]. The percentage of body fat is significantly higher in hypertensive obese people than those who are normotensive and obese[16].

Existing interventions to control blood pressure among patients with uncontrolled hypertension include exercise, telephone-monitoring, education, medication adherence, and nurse-led support[17,18,19]. Exercise programs have been shown to decrease blood pressure[9], however, exercise in treating hypertension needs long-term outcomes evaluation[18]. The use of telephone-monitoring by nurses has shown potential to benefit patient outcomes20. Furthermore, several studies have indicated the effectiveness of an education approach to increase patients' understanding of their disease and to encourage them to be more active in controlling their blood pressure[19,21]. Medication interventions also appear to have a beneficial effect on patients' illness perceptions by contributing to a better understanding of hypertension and concerns about the associated risks, but not on patients' medication self-efficacy or their concerns about medication[19]. Nurse-led support programs also help patients achieve blood pressure control as well as home-based care may be required. A number of studies have reported using multi component intervention, such as home blood pressure monitoring combined with a nurse manager[22] or nurse-led telephone support[23] and medication-taking and dietary control[24]. The evidence suggests that to lower the blood pressure of patients with uncontrolled hypertension, changing their eating behaviors and decreasing the percentage of body fat were the best practices along with nurse counseling, home blood pressure monitoring, and telephone support. However, self-regulation was suggested to use as a process in which a person controls their behaviors toward desired goals and develops functional patterns of thinking and behaving to attain those goals[25]. The needed interventions would be proposed to have patients learn to set and achieve goals to control their blood pressure, change eating behaviors, and decrease the percentages of body fat.

Therefore, the aim of this study was to determine the effects of the new developed The Integrated Home-Based program on decreasing blood pressure, reducing the percentage of body fat, and improving eating behaviors among patients with uncontrolled hypertension.

Methods: Ethical Considerations: The institutional review committee for the protection of the human subjects, Faculty of Nursing, Burapha University (No. 02-06-2560). Information about the study was provided to the provincial head of public health, physicians, and health care providers of the patients with uncontrolled hypertension.

Design: A quasi-experimental design was used in this study.

Sample: The population of patients with uncontrolled hypertension were outpatients of 72 Tumbon Health Promoting Hospitals (THPHs) in Samutprakarn province, Thailand. Inclusion criteria were diagnosed hypertension for at least 18 months, systolic BP greater than or equal to 140 mmHg and/ or a diastolic BP greater than or equal to 90 mmHg for at least the last three consecutive visits, 25-65 years of age, taking antihypertensive medication, and an absence of symptoms related to uncontrolled blood pressure (e.g., headache, dizziness, palpitation, and easy fatigue). Exclusion criteria were pregnancy, severe headaches, shortness of breath, nosebleeds, severe anxiety, or hypertensive crisis.

Sample size: The sample size was determined by a power calculation, to study the implementation of an integrated home-based program, an alpha of .05 and a power of .80 was used for two groups with a minimum sample size of 33 participants per group. An attritional rate was expected to be approximately 20%[26], an additional 7 participants were recruited for a total of 40 participants per group.

Instruments for Intervention: A "Blood Pressure Control Handbook for People" was developed by the researcher. Contents included the instructions for body exercise, restricting and/or reducing sodium intake, eating a low-fat diet that is rich in fruit and vegetables, and medication adherence.

The Booklet of Blood Pressure Control was also created by the researcher for patients to self-monitor their blood pressure. Participants were shown how to read and record their blood pressure on a table in the blood pressure booklet. In addition, participants were shown how to read their daily self-regulation activities on a researcher developed work sheet.

The integrated home-based program (IHB) was a six-week, experimental intervention based on evidence-based practice that integrated a self-regulation concept to treat high blood pressure. The intervention included nurse counseling, goal setting, health education (medication adherence, exercise and food control), home blood pressure monitoring, appraisal of the progress of an action plan, revision of goals and action plans, encouragement of participants to focus on goal achievement, and t elephone support.

Week 1: The researcher, in the role of nurse counselor, incorporated strategic face-to-face counseling with participants, using self-regulation concept for setting goals for blood pressure control, reducing body fat and improving eating behaviors, and feedback on potential barriers and difficult situations. After counseling, participants could set a blood pressure control goal and formulate an implementation plan for each targeted blood pressure control. Participants learned how to select low sodium foods, choose less fatty foods, and eat more vegetables with each meal. Weeks 2-3: Using strategic face-to-face patient counseling, the researcher evaluated the progress of goals and self-regulation techniques that focused on appraising participant progress. Blood pressure booklets were reveiwed. The researcher encouraged participants to focus on goal achievement and blood pressure control in the past week and gave feedback on their progress. Weeks 4-5: The researcher phoned participants to reinforce their focus on self-appraising their progress. The researcher encouraged participants to focus on goal achievement and their action plans, share their experiences since the last meeting, and receive feedback. Week 6: The researcher phoned participants to further reinforce self-appraising their progress in the program. Participants were encouraged to share their experiences and revise their goals and action plans. The researcher evaluated the BP record, analyzed medication adherence, discussed goal reformulation (if needed), and encouraged participants to continue their progress with the program. Weeks 7 and 11: One week post program implemenation and four weeks later, data collection was finalized for statistical comparisons.

Instruments for data collection: A demographic information questionnaire was created by the researcher. The data collected include participants' gender, age, education, occupation, and duration of hypertension.

An Omron digital blood pressure instrument (model HEM-8712) was used to record participants' systolic and diastolic BPs every week at the same time.

The Omron body fat percentage (BFP) monitor (model BF 306) was used to measure the percentage of body fat at baseline, week 7, and week 11. The BFP is a hand-held impedance analyzer that sends a weak electrical current through the body to determine the among of fat tissue. Measures have been closely correlated with the underwater weighing method and the DEXA (Dual Energy X-ray Absorbtiometry) method.

A three-factor eating questionnaire (TFEQ) was developed by Stunkard and Messick[27,28] and back translated to Thai by Wattanakorn, Deenan, Puapan, and Schneider[29]. The TFEQ is a 51-item questionnaire that measures eating behaviors by assessing the cognitive, affective, and behavioral dimensions. Its consists of dietary restraints, disinhibition, and hunger. Test-retest reliabilities for the TFEQ were .81 for factor dietary restraints, .73 for factor disinhibition, and .77 for factor hunger. Higher scores indicate poor eating behavior.

Data analysis: Demographic data and the outcome measures were analyzed by descriptive statistics. A chi-square test compared nominal level data. Repeated measures ANOVA examined whether differences existed in systolic and diastolic BPs across time periods. paired t-tests compared the experimental and control group's percentages of body fat and eating behaviors at baseline, week 7 and 11.

Results: In the control group, 27 participants (67.5%) were female and 13 were male (32.5%). The average age was 59.4 years (SD = 9.24), and the average duration of hypertension was 4.1 years (SD = 1.76). Half the participants were married (50%). More than half (52.5%) of the participants reported a sufficient income, whereas less than half (37.5%) were employed. At program baseline, the mean score for eating behavior was 53.2 (SD = 6.43). The average percentage of body fat was 31.8% (SD = 8.43).

In the IHB group, 20 participants (50%) were female and 20 were male (50%). The mean age was 62.5 years (SD = 10.17), and the average duration of hypertension was 4.6 years (SD = 2.53). Most participants were married (55%) and housewives (55%). More than 40% reported a poor income. At baseline, the mean score for eating behavior was 52.6 (SD = 6.31). The average percentage of body fat was 31.9% (SD = 7.79).

At program baseline, there were no significant differences between the control and the IHB groups in gender, marital status, occupation, income, age, duration of hypertension, and blood pressure ($p > .05$). Table 1 shows that participants in both the control and IHB had decreasing systolic and diastolic blood pressures over time. However, the extent of decrease in mean scores of both systolic and diastolic BPs in the IHB group was greater than those of the control group. Pairwise comparisons showed significant differences in mean systolic BP between baseline and week 7 ($p = .03$), baseline and week 11 ($p < .001$), and weeks 7 and 11 ($p = .004$). Pairwise comparisons of mean diastolic BP also showed significant differences between baseline and week 7 ($p = .002$) and baseline and week 11 ($p < .02$), but there was no difference between weeks 7 and 11 ($p = .26$). Therefore, mean diastolic BPs at week 7 and week 11 were significantly lower than those at baseline, though no difference was found between week 7 and week 11.

Table 1 Comparison of Mean Differences in Systolic Blood Pressure Between Each Pair of Time Difference Using the Least Significant Difference (LSD) Test in IHB group

Time	Mean Difference	Standard Error	p-value
Systolic blood pressure			
Baseline vs. Week 7	4.89	2.24	.03
Baseline vs. Week 11	10.95	2.29	< .001
Week 7 vs. Week 11	6.06	2.05	.004
Diastolic blood pressure			
Baseline vs. Week 7	5.31	1.64	.002
Baseline vs. Week 11	3.93	1.66	.020
Week 7 vs. Week 11	-1.39	1.22	.26

Table 2 shows there were significant differences in systolic BP mean scores between at least one pair at the three-time points ($F = 12.47$, $p < .001$). The IHB program group's mean systolic BPs at weeks 7 and 11 were lower than at baseline. The IHB program had a significant effect on participants in that they had a lower systolic BP on average than those in the control group ($F = 4.02$, $p = .05$). Although the control group's mean systolic BPs at weeks 7 and 11 were lower than at baseline, the interaction effect (time x group) was not significantly different.

Table 2 shows that there were also significant differences in mean diastolic BPs between at least one pair of the three-time points ($F = 6.58$, $p = .003$). The IHB group's mean diastolic BPs at weeks 7 and 11 were lower than at baseline. The IHB program had a similar effect on participants' diastolic BPs in that they had a lower diastolic BP on average than compared to those in the control group ($F = 6.16$, $p = .02$). Similar to the mean systolic BPs, the control group's mean diastolic BPs at weeks 7 and 11 were lower than at the baseline, but there was no significant interaction effect (time x group).

Table 3 indicates that at baseline there were no significant differences in the mean percentages of body fat nor eating behaviors between the participants in the control group and IHB group ($p > .05$). There were significant differences, however, at week 11 in the mean percentages of body fat and eating behaviors. Although the IHB group's mean percentage of body fat decreased at week 11, for participants in the control group the mean percentage of body fat actually increased. Eating behaviors at week 11 decreased on average for both IHB and control groups, though the extent of decrease was greater for the IHB group.

Table 2 Effect of the Integrated Home-Based Program on Systolic and Diastolic Blood Pressures using Repeated Measures ANOVA

Source of variation	SS	df	MS	F	p-value
Systolic blood pressure					
Between subjects	16895.27	79	828.82	4.02	.050
Group	828.82	1			
Error	16066.45	78	205.98		
Within subjects	35384.67	160			
Time	4814.51	2	24.7.25	12.47	< .001
Time x Group	453.41	2	226.70	1.17	.31
Error	30116.75	156	193.06		
Total	52279.94	239			
Diastolic blood pressure					
Between subjects	8799.33	79			
Group	643.54	1	643.54	6.16	.020
Error	8155.79	78	104.56		
Within subjects	15928.67	141.78			
Time	1214.76	1.77	685.41	6.58	.003
Time x Group	313.98	1.77	177.16	1.70	.19
Error	14399.93	138.24	104.17		
Total	24728	220.78			

Table 3 Changes and Comparison of Body Fat Percentages and Eating Behavior at Week 11

Time period	Control (n = 40) Mean% (SD)	IHB Program (n = 40) Mean% (SD)	t	p-value
Percentages of body fat				
Baseline	31.8 (8.44)	35.0 (6.66)	.02	.49
Week 11	33.8 (10.3)	29.8 (7.99)	3.17	.001
Eating behavior scores				
Baseline	53.2 (6.43)	52.6 (6.31)	.40	.34
Week 11	47.8 (5.22)	45.4 (9.93)	3.88	< .001

Discussion

Change of blood pressure. Participants were reduced as a result of the IHB program. The IHB program guides patients to understand the dangers associated with uncontrolled hypertension. Patients learn to select healthy foods and respond to feedback by the nurse counselor about avoiding potential barriers and difficult situations. Telephone support is especially important in the education of patients on all aspects of the self-appraisal process as they learn to make choices and take responsibility for their own health. The self-regulation concept to reduce their blood pressure by themselves is sustainable. The effect of the IHB program on participants' average systolic BP was similar to what has been reported elsewhere. For example, Kongjarern, Wattana and Harnirattisai[21] found that the systolic BP in an experimental group significantly decreased at 3 months for a mean of 125.93. The physiological explanation is that when intrinsic renal sodium concentrating mechanisms achieve maximum capacity during high-salt loads, the body increases blood pressure by increasing total peripheral vascular resistance[30]. This increase is produced by direct effects of sodium on the vascular endothelium. Lowering of total peripheral vascular resistance includes dietary changes to restrict the effects of sodium and volume retention that lead to a decrease in peripheral vascular resistance and lower cardiac index. The blood pressure returns to baseline.

Change of percentage of body fat. The participants in the IHB program lowered their mean percentage of body fat. The nurse counselor encourages the self-regulation concept for patients to set their action plans to alter the amount of fat in their diets by reducing fatty foods, eating more boiled foods, reducing fatty meat, eating more fish, and exercising. Exercise is a key feature in limiting or decreasing the percentage of body fat and its hypertensive effects. The physiological explanation about the concern for percentage of body fat is associated with activation of the sympathetic nervous system in diverse tissues and with the baroreflex dysfunction31. This leads to an increase in blood pressure. Participants who have an increase in the percentage of body fat also have an increased renal sympathetic nervous system activity compared with healthy individuals. This is found by an elevation in renal norepinephrine levels. Based on the physiology, it was assumed that participants in the IHB program, who had a high percentage of body fat and were hypertensive, had elevated cardiac sympathetic nervous system activity.

Change of eating behavior. The reasons for improved eating behaviors in the IHB program participants are the same as the actions taken to lower the percentage of body fat. Participants learned to select healthier foods that lowered body fat achieved the same results. Wattanakorn, Deenan, Puapan, and Schneider[29] found similar results when studying the effects of an eating behavior modification program on Thai people with diabetes and obesity. They showed that the intervention group had significantly higher scores on eating behavior and were effective in maintaining healthy eating behaviors. The National High Blood Pressure Education Program[32] recommends that reducing food portion sizes and limiting fat intake can reducing overall calorie intake. High-sodium diets are especially harm in unhealthy eating behavior. Specific nutrient intakes for patients with hypertension should be based on lipoprotein levels, blood pressure, and the presence of co-existing heart disease, diabetes, and other risk factors. Adoption of the well-studied low sodium DASH eating plan provides heart healthy foods to promote reduce blood pressure, including a diet rich in fruits, vegetables, low fat and salt dairy products with a reduced content of dietary cholesterol, as well as

saturated and total fat. Consuming these recommended foods reduces systolic BP 8-14 mmHg[33].

Conclusions:

The IHB was developed based on evidence-based practices. Its core components consist of nurse counseling, home blood pressure monitoring, telephone support, and self-regulation concepts. The IHB program showed positive effects on systolic and diastolic blood pressure and showed effects on eating behavior and body fat percentage among uncontrolled hypertensive patients. Therefore, this program can be used to control blood pressure in uncontrolled hypertensive patients.

Recommendations:

Future researchers might consider the quantitative measures and evaluation for medication adherence and physical activity, such as aerobic exercise, to correlate between with the effects on BP, body fat, and eating behavior. A lengthier implementation period to determine the long-term effects of changing behaviors and health outcomes is strongly recommended.

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