Outcomes of a Self and Family Management Support Program in Balinese Older People with Uncontrolled Hypertension: A Quasi-Experimental Study

Ni Putu Kamaryati, Porntip Malathum, Supreeda Monkong, Pratana Satitvipawee*

Abstract: Hypertension is highly prevalent and is difficult to control among older people worldwide, including in Indonesia, which is the setting for this study. Family involvement in self-management is crucial to controlling hypertension. This quasi-experimental study aimed to evaluate the effects of a self and family management support program for blood pressure control on health outcomes over time among Balinese older people with uncontrolled hypertension. One hundred and forty-one dyads of older people and their caregivers from three primary health centers in Mengwi, Bali province, Indonesia, were included in this study. The participants were categorized into the experimental group (n = 70) or control group (n = 71) using random assignment for their locations and then recruited with matching by age and gender. The experiment group received the Self and Family Management Support Program plus usual care for 12 weeks, while the control group received only usual care. Outcomes of the program were measured at baseline, 4 weeks, 8 weeks, and 12 weeks from baseline by the Hypertension Knowledge Scale, the Self-Management Behavior Questionnaire, the Hypertension Quality of Life Questionnaire, and sphygmomanometers. Data analysis utilized descriptive statistics, chi-square test, independent samples t-test, Mann-Whitney U test, Friedman test, and Wilcoxon signed-rank test.

The findings indicated that the experimental group's knowledge about hypertension, self-management behavior, systolic and diastolic blood pressure, and health-related quality of life significantly improved over time compared to the control group. These findings demonstrate the program's benefits in improving blood pressure control in older people and enhancing their quality of life. Nurses can apply this intervention to coach older people and encourage family caregivers to support them. However, further testing should be conducted in various settings before the program is widely used.

Keywords: Blood pressure control, Family caregivers, Hypertension, Older people, Quality of life, Quasi-experimental study, Self-management, Uncontrolled hypertension

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Introduction

Hypertension (HT) is a public health challenge and the main factor contributing to the worldwide disease burden. The World Health Organization (WHO) defines HT as high blood pressure with a value of 140 mmHg for systolic and 90 mmHg for diastolic or higher. It estimates that two-thirds of the 1.28 billion people with HT worldwide reside in low- and middle-income nations,[1] with the prevalence in low- and middle-income and high-income countries at 31.5% and 28.5%, respectively.[1-2] HT affects 58.3% of stroke deaths and 54.5% of heart disease deaths.[3] In Indonesia, the prevalence of HT is 30.8%, which has increased significantly and was reported as the highest number of diseases in older people.[4-5] In Bali, a province of Indonesia, HT is becoming the first ranked among non-communicable diseases (NCDs) in the primary health center (PHC), and two-thirds of older people have uncontrolled HT. Many cases are reported as inappropriate management,[1] which increases hospitalization and healthcare costs.[5]

Studies showed that the effectiveness of the intervention program, which supports knowledge, self-management behavior, and blood pressure (BP) control combined with teaching and behavior modification techniques, was more beneficial than using the educational program alone.[6-8] Moreover, using technology and home visit programs was more effective in achieving desirable outcomes and enhancing health-related quality of life (HRQOL).[7,9-10,] Although those studies revealed significant findings in education and follow-up programs, older people with their own culture might need a more specific approach by involving the family in an intervention program.[11-12]

In Indonesia, Balinese people consider the family to be an important part of their lives, and older people still interact with others to do social activities. Balinese people have a strong belief and culture that older people should live with their families. A prior study reported that family support for older people with HT has been associated with controlling and improving BP.[11] However, there are a limited number of studies involving the family as a support system in such programs,[13] and the intensity of their participation is still unclear.[14] Previous studies in Indonesia tended to focus on complementary therapies, such as back massage,[15] and yoga,[16] in older people with HT. These interventions might not be adequate to control BP effectively because they require an understanding of diet, medication, and lifestyle behaviors. Also, those studies used a one-group, pretest-posttest design in small sample sizes within a short period without the follow-up, so it is difficult to conclude the effectiveness of the intervention program on the outcome. Therefore, this study aimed to develop the Self and Family Management Support Program (SFMSP) for BP control and examine whether it could improve knowledge about HT, self-management behavior, blood pressure, and HRQOL in Balinese older people with uncontrolled HT (OPW-UHT).

Conceptual Framework and Review of Literature

This study used the revised Self and Family Management Framework for chronic conditions by Grey et al.[17] and literature reviews on the HT control program.[18-21] The framework portrays the connections of four conceptual elements among "facilitators and barriers, processes of self-management, proximal outcomes, and distal outcomes."[17(p165)] Facilitators and barriers can influence the self-management process, leading to proximal and distal outcomes. The family is an important sociocultural environment in conjunction with an individual's self-management, such as understanding treatment goals, helping in daily life, encouraging disease control, and decision-making in health care.[17]

OPW-UHT's essential tasks are to be responsible for BP control through lifestyle modification and to adhere to all treatments and regular follow-ups.[4,18] Reviews

of the literature show the benefits of self-management programs in improving knowledge,[6] self-management behaviors,[10,19] BP control,[20] and HRQOL.[21] However, older people may have constraints in controlling BP and need support from others. A prior study revealed that family members were vital in enhancing self-management among individuals with chronic diseases,[22] offering instrumental, informational, and emotional support.[12] Family members are responsible for aiding older people residing with them and providing support in alignment with Balinese cultural practices.

Self-management programs have various aspects that can improve health outcomes. Most older people with HT experience difficulties in managing their disease throughout their lifespan. Approximately half of the people with HT worldwide can control and manage their BP and achieve the BP threshold.[4] Self-management is crucial to the effectiveness of chronic condition management, especially in HT. For example, Packer et al.[23] highlighted that self-management is a task that individuals must commit to maintaining good health while managing one or more chronic conditions. The responsibilities encompass the confidence to navigate medications and manage stress and conditions. HT management is organized by monitoring BP with cardiovascular risk factors and implementing lifestyle interventions, typically in conjunction with antihypertensive treatment, to decrease BP and achieve treatment thresholds. Treatment is usually lifelong, with adjustments to antihypertensive regimens and lifestyle over time. Consequently, quality of life can be attained in all its dimensions, such as physical and mental domains.[10,24]

Numerous elements may influence people's self-management, which include clinical aspects (e.g., comorbidities and the complexity of the treatment regimen), system aspects (e.g., communication and relationship with health care personnel), and demographic aspects (e.g., socioeconomic status and culture). These characteristics can potentially impact an individual's motivation and capacity to self-manage.[17] If self-management is inadequate and barriers are numerous, it is implied that the likelihood of disease-related complications is raised. The family also significantly influences an individual's adherence to self-management by providing numerous forms of support.[12] A study indicated that family involvement is crucial for enhancing self-management.[11] Whitehead et al.[25] suggested that in designing and developing an intervention program to increase self-management of HT and lifestyle behavior, it is necessary to encourage persons individually to self-manage their disease. Further, it is essential to include the nature of motivation in the program. This motivation consists of the capacity to utilize technology for disseminating information and offering feedback or rewards, potentially fostering new behaviors related to self-management and family involvement.

The SFMSP for BP control provides knowledge about HT and training older people to live with uncontrolled HT. Based on the theory application,[17] the self-management process comprises three components: 1) addressing HT-related requirements, 2) mobilizing available resources, and 3) living and integrating with HT. In the present study, the strategies included the establishment of a mutual goal, instruction about HT control and prevention of complications, group discussions, training, and motivation to do necessary tasks (e.g., physical activities, breathing techniques, blood pressure checking, medication use, diet, and self-checking of warning alerts). The program encompassed the enhancement of family caregivers to support OPW-UHT in need, mobilization of resources to manage BP, facilitation of follow-up calls, home visits with individual coaching, demonstration, and practice tasks to document in a *Lansia* diary (log book) for self-monitoring at home. In this study, knowledge about HT and self-management behavior were considered proximal outcomes, while BP control and HRQOL were identified as distal outcomes.

Study Aim and Hypotheses

This study aimed to evaluate the effects of the SFMSP on knowledge about HT, self-management behavior, BP, and HRQOL over time among Balinese OPW-UHT. The hypotheses were 1) participants in the experimental group would have higher knowledge about HT, higher self-management behavior, and lower systolic blood pressure (SBP) and diastolic blood pressure (DBP) compared to the control group at Weeks 4, 8, and 12 from baseline, and 2) participants in the experimental group would have a better HRQOL than those in the control group at Week 12 from baseline.

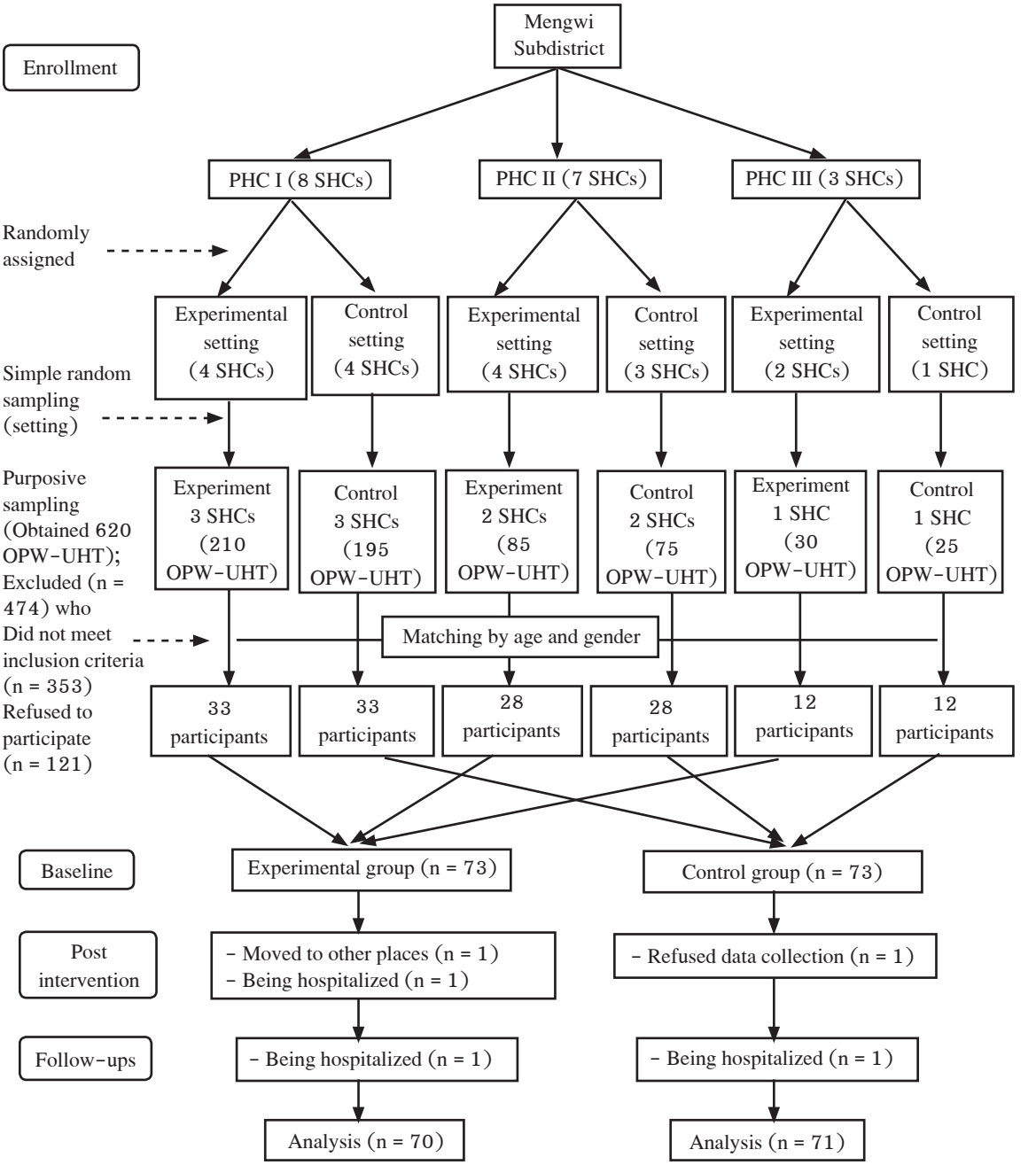
Methods

Design: The study employed a quasi-experimental pretest-posttest with repeated measures design. The Transparent Reporting of Evaluations with Nonrandomized Designs (TREND) Statement checklist guided the study's reporting.

Sample and Setting: The study was performed at three PHCs in Mengwi Sub-district, Bali Province, Indonesia. Inclusion criteria of the participants were: 1) aged 60 years and older, 2) being treated with prescribed HT medications for at least 3 months, 3) having SBP ≥ 150 mmHg and/or DBP ≥ 90 mmHg from the last two follow-ups at out-patient units in the PHCs, 4) having good cognitive function with the score ≤ 7 out of 28 points on the Six Item Cognitive Impairment Test (6 CIT),[26] and 5) being able to undertake basic activities of daily living (ADL) independently with the score of 18 out of 20 on the Indonesian Barthel ADL Index,[27-28] 6) having at least one family caregiver, 7) being able to speak Indonesian or Balinese. Exclusion criteria were being diagnosed with a stroke or asymptomatic chronic kidney disease and being unable to attend all activities of the SFMSP. The termination criteria included older people who had severe fatigue, severe shortness of breath, chest pain, or any other acute illness/problems. For the family caregiver, the inclusion criteria were: 1) aged 18 years and over, 2) being a relative by blood, law, or marriage, such as a spouse, daughter-in-law, children, or grandchildren, 3) living with and being responsible for providing care of the older participants, and 4) being able to communicate Indonesian or Balinese verbally.

The sample size calculation was based on Rosner's formula.29 The means and variances of the two groups used in the formula based on the value of BP of a similar study.[30] The required sample size was 59 per group, and 20% was added to consider the possible attrition rate.[31] Thus, the number of participants was 73 per group.

As shown in **Figure 1**, the three PHCs I, II, and III have eight, seven, and three sub-health centers (SHC), respectively. To prevent contamination of the intervention program to the control group, all the SHCs in each PHC were matched by similar characteristics and close numbers of the population. Then, they were randomly assigned into two settings: the experimental and control settings, using the lottery method. Then, simple random sampling was used to draw three, two, and one SHC(s) equally for each experimental and control setting under PHCs I, II, and III, respectively, resulting in six SHCs in each of the experiment and control settings with a total population of 620. From this population, 474 were excluded (353 did not meet inclusion criteria, and 121 refused to participate in the study). Thus, the eligible participants were 146. Next, the participants in each of the six SHCs were matched by age and gender, resulting in 73 participants in each group. During the study, three participants from the experimental group and two from the control group withdrew because they were hospitalized, refused data collection, or moved to other places. Therefore, 141 participants completed the study, with 70 in the experimental group and 71 in the control group.



Note. PHC = Primary health center, SHC = Sub-health center, OPW-UHT = Older people with uncontrolled hypertension

Figure 1. Flowchart of participants' recruitment throughout the study

Ethical Considerations: The study received approval from the Human Research Ethics Committee, Faculty of Medicine Ramathibodi Hospital, Mahidol University (Number COA.MURA2020/601), the Research Ethics Committee of Udayana University/Sanglah Hospital Denpasar, Bali (Number 1249/UN14.2.2.VII. 14/LT/2020), and the research setting, before data collection. Every participant received the study's information, containing its objectives and procedures, confidentiality and anonymity protection, advantages, risks, and their rights. They were able to leave the study at any time and ask questions without facing any consequences. All participants gave informed consent and signed the consent form before data collection began.

Research Instruments: The research instruments consisted of data collection instruments and the SFMSP. Five experts, a cardiologist, a geriatric nurse, two community nurse instructors, and a community nurse caring for HT, evaluated the content validity of all instruments for data collection and interventions. All instruments, except the personal information form, were used with permission from the developers.

Instruments for data collection

*The Personal Information Form (PIF) w*as developed by the primary investigator (PI) to acquire information on the characteristics of the OPW-UHT and their family caregivers. The information of the older participants included age, gender, marital status, education, occupation, religion, income, health insurance, living arrangement, primary caregiver, duration of HT, body mass index, and comorbidity. Likewise, family caregivers' characteristics involved age, gender, education, marital status, occupation, religion, income, source of income, health insurance, and current disease.

The Hypertension Knowledge Level Scale (HK-LS) was employed to assess knowledge about HT, with the original version developed by Ercoc et al.[32] It was translated from English to Indonesian using the forward and back translation methods.[33] It consists of 22 items divided into six domains: "definition (2 items), medical treatment (4 items), drug compliance (4 items), lifestyle (5 items), diet (2 items), and complications (5 items)."[32(p1022)] There are 14 positive and eight negative items; the negative scores were reversed before summing the score. It was used to measure the knowledge about medical treatment (e.g., "Individuals with increased blood pressure must take their medication only when they feel ill"[32(p1023)]). The correct answer is 1, and the 'incorrect' or 'don't know' answer is 0. The possible score ranges from 0 to 22 for all domains. The higher scores indicate better knowledge. The item content validity index (I-CVI) was 0.99, and the scale content validity index (S-CVI) was 0.95. The Kudar-Richardson 20 (KR-20) reliability coefficients were 0.85 in the pilot study among 30 OPW-UHT and 0.86 in the main study.

The Hypertension Self-Management Behavior Questionnaire (HSMBQ) was developed by Akhter et al.[34] It measures how older people can self-manage their disease. It was translated into Indonesian using the same method[33] as the previous instruments. It comprises 40 items with five domains: "self-integration, self-regulation, interaction with health professionals and significant others, self-monitoring, and adherence to recommended regimen."[34(p32)] Example of an item is "I have thought that my hypertension is a part of my life."[34(p72)] The response is given on a 4-point Likert scale, with values from 1 (never) to 4 (always). The score ranges from 40 to 160 for all domains. Higher scores indicate good self-management behavior. The I-CVI was 0.98, and the S-CVI was 0.90. Cronbach's alpha coefficients were 0.92 in the pilot study among 30 OPW-UHT and 0.97 in the main study.

A sphygmomanometer, Omron automatic blood pressure monitor HEM 7130-L, a standard BP measurement device with the appropriate cuff size and calibration, was used to measure BP in this study. The measurement procedure was that the participants were asked to sit for five minutes. After five minutes, in a sitting position with back supported, feet on the floor, and arm position equal at the heart level, SBP

and DBP were measured twice, two minutes apart, and the average value was recorded. Before measurement, the participants were assessed for smoking, caffeine consumption, and physical exercise 30 minutes ago. In total, they were asked to sit for 10 minutes. The criterion of controlled BP is when the SBP is less than 150 mmHg, and the DBP is less than 90 mmHg.[35]

The Hypertension Quality of Life Questionnaire (MINICHAL) was used to measure the HRQOL. It was initially developed in Spain and translated into English by Schulz et al.[36] In this study, it was translated into Indonesian using the same method[30] as the previous instruments. It consists of 17 items organized into two domains: the mental status/MS (9 items) and somatic manifestations/SM (7 items), and one question to evaluate an individual's perception of how HT and its treatment affect their QOL. The participants were asked to answer the questions considering the seven preceding days (e.g., "Have you felt continuously distressed and tense?"[36(p130)] A Likert-type frequency scale is used with four options ranging from 0 (No, not at all) to 3 (Yes, very much). The MS scores range from 0 to 27, while the SM scores range from 0 to 21. The closer the overall score of each domain is to zero, the higher or better the QOL. The I-CVI was 0.98, and the S-CVI was 0.88. Cronbach's alpha coefficients of MS and SM domains were 0.84 and 0.88, respectively, in the pilot study among 30 OPW-UHT, and they were 0.86 and 0.85, respectively, in the main study.

The Self and Family Management Support Program (SFMSP)

The SFMSP is a 12-week individual intervention program based on the revised Self and Family Management Theory.[17] It aimed to guide OPW-UHT on living with HT and promote them to control the disease complications in conjunction with family caregivers' involvement. There are two sessions in the SFMSP: 1) self-and family education (SFM-E), including knowledge about HT, complications of the disease, prevention, and how to manage the disease, and 2) self-and family training (SFM-T). This part focuses on healthy dietary management, BP measurement, self-monitoring using a logbook, stress management, relaxation, medication adherence, and physical activity. The motivational interviewing technique and individual coaching were used to train participants and their families.

The same five experts validating the instruments also reviewed the program's content validity. A pilot test was conducted to assess understanding and program practicality with ten OPW-UHT and their family caregivers but was not included in the main study. The program's information and implementation are shown in **Appendix Table A1.**

Usual care: Usual care was provided at the health services of PHCs. It included BP measurement, consultation with physicians and nurses, prescription of antihypertensive medications, and an appointment for the next consultation.

Data Collection: The study was conducted from September 2020 to February 2021. After the IRB approval, the PI met with the heads of PHCs and the heads of villages to request permission to undertake the study. The PI performed all the sampling procedures and approached all potential participants to obtain informed consent. Data collection was conducted by two research assistants (RAs) who did not know the sample group status. They were nurses trained by the PI on the study protocol, the contents of questionnaires, and data collection procedures. The PI delivered the intervention, including follow-up and home visit schedules.

Knowledge about HT was measured with the HK-LS three times at baseline and Weeks 4 and 8 from baseline. Self-management behavior was measured with the HSMBQ four times: at baseline and Weeks 4, 8, and 12. SBP and DBP were measured with sphygmomanometers at the same time. HRQOL was measured with the MINICHAL twice at baseline and Week 12. When this data collection ended, the participants in the control group were also coached and delivered with the intervention package by the PI.

Data Analysis: Data analysis was conducted using SPSS Version 18.0 (SPSS Inc., Chicago, IL, USA). Descriptive statistics, including mean, standard deviation, median, interquartile range, and percentage, were utilized to describe the characteristics of OPW-UHT and their family caregivers. The chi-square test was employed for categorical data to compare the differences between two groups at baseline, while the Mann-Whitney U test and independent samples t-test were used for continuous data. Since the knowledge about HT, self-management behavior, SBP, DBP, mental status, and somatic manifestation domains of HRQOL violated the assumptions of parametric analysis, non-parametric statistics were applied in this study. The Friedman test detected changes in knowledge about HT, self-management behavior, SBP, and DBP. Then, the post hoc test of individual Wilcoxon signed-rank tests employed a Bonferroni correction to adjust the alpha value to control for Type I errors between two groups across time points. Furthermore, the Wilcoxon signed-rank test was used to identify changes in HRQOL and its domains: mental status and somatic manifestation.

Results

A total of 141 OPW-UHT and 141 family caregivers participated in the study, comprising 70 dyads in the experimental group and 71 in the control group. When compared, statistically significant differences were not found in all characteristics of OPW-UHT between the experimental and control groups (**Table 1**). For the family caregivers, their median ages in the experimental and control groups were 56.50 (IQR = 30) and 58 (IQR = 30) years, respectively. The family caregivers' characteristics in both groups were not significantly different, except that the control group had more unemployed participants with monthly incomes less than Indonesian Rp. 2,500,000 (< 155 USD) compared to those in the experimental group.

Table 1. Comparison of characteristics of older people with uncontrolled hypertension in the experimental and control groups at baseline

Characteristics	Experimental group (n = 70)	Control group (n = 71)	Statistics	p-value
Age (years), mean (SD)	70.6 (5.9)	69.4 (5.3)	1.27[b]	0.207
Gender, n (%)			0.01[a]	0.922
Female	41 (58.6)	40 (56.3)		
Male	29 (41.4)	31 (43.7)		
Marital status, n (%)			0.56[a]	0.756
Married	56 (80)	60 (84.5)		
Other (widowed, divorced)	14 (20)	11 (15.5)		
Education, n (%)			8.79[a]	0.118
Primary	53 (75.7)	44 (61.9)		
Secondary or higher	17 (24.3)	27 (38.1)		
Occupation, n (%)			3.87[a]	0.569
Government employee	8 (11.4)	10 (14)		
Other (farmer, seller, fisherman)	62 (88.6)	60 (85)		
Religion, n (%)			3.40[a]	0.334
Hinduism	64 (91.4)	63 (88.7)		
Others (Islam, Christianity)	6 (8.6)	8 (11.3)		

Table 1. Comparison of characteristics of older people with uncontrolled hypertension in the experimental and control groups at baseline (Cont.)

Characteristics	Experimental group (n = 70)	Control group (n = 71)	Statistics	p-value
Monthly income (IDR), n (%)			0.61[a]	0.738
< 2,500,000 (< 155 USD)	57 (81.4)	54 (76.1)		
≥ 2,500,000 (≥ 155 USD)	13 (18.6)	17 (23.9)		
Living arrangement, n (%)			2.04[a]	0.153
With nuclear family	37 (52.9)	28 (39.4)		
With extended family	33 (47.1)	43 (60.6)		
Family member, n (%)			0.68[a]	0.877
Husband/wife	32 (45.7)	32 (45.1)		
Others (son, daughter, daughter-in-law, relatives)	38 (54.3)	39 (54.9)		
Hypertension duration (months), mean (SD)	67.9 (58.6)	55.9 (47.5)	-0.88[c]	0.377
Type of antihypertensive medication			3.75[a]	0.053
Amlodipine	42 (60)	40 (56.3)		
Amlodipine + Captopril	28 (40)	31 (43.7)		
Treatment duration (months), mean (SD)	67.9 (58.6)	55.9 (47.5)	-0.88[c]	0.377
Body mass index,* median (IQR)	24 (4)	25 (4)	-0.38[c]	0.705
Normal, n (%)	36 (51.4)	30 (42.3)	0.89[a]	0.828
Overweight or obese, n (%)	34 (48.6)	41 (57.7)		
Comorbidities, n (%)			0.01[a]	0.921
Yes	41 (58.6)	41 (57.8)	1.24[a]	0.266
1 disease	26 (63.4)	20 (48.8)		
2 diseases	15 (36.6)	21 (51.2)		
No	29 (41.4)	30 (42.3)		

Note. SD = Standard deviation, IQR = Interquartile range, [a] Chi-square test, [b] Independent samples t-test, [c] Mann-Whitney U test, * Based on the World Health Organization criteria

Table 2 indicates that all outcome variables between the two groups at the baseline did not significantly differ. To examine the differences in the study variables over time in each group, the analysis revealed statistically significant differences in knowledge about HT, self-management behavior, SBP, DBP, and HRQOL across time points (**Table 3**). The post hoc testing demonstrated significant improvement in the scores of knowledge about HT, self-management behavior, SBP, and DBP, by which the SBP and DBP values decreased in the experimental group across all time points. Although those four variables showed significant improvement in the control group at some points, they were inconsistent over time (**Table 4**).

Table 2. Comparison of outcome variables of older people with uncontrolled hypertension between the experimental and control groups at baseline

Outcome variables	Experimental group (n = 70)	Control group (n = 71)	Statistics (z, t)	p-value
Knowledge about hypertension, median (IQR)	11 (8.5)	13 (7)	-0.41[a]	0.681
Self-management behavior, median (IQR)	101 (29)	105 (30)	-1.31[a]	0.189
Blood pressure				
Systolic, mean (SD)	155 (10.1)	154 (11)	0.27[b]	0.790
Diastolic, median (IQR)	85.5 (10)	85 (9)	-1.39[a]	0.164
Health-related quality of life, median (IQR)	33.50 (14)	34 (11)	-0.24[a]	0.811
Mental status domain, median (IQR)	15 (11.3)	17 (8)	-0.71[a]	0.481
Somatic manifestation domain, median (IQR)	15 (9.5)	13 (9)	-0.52[a]	0.603

Note. IQR = Interquartile range, SD = Standard deviation, [a]Mann-Whitney U test (Z), [b]Independent samples t-test

Table 3. Comparison of knowledge about hypertension, self-management behavior, systolic blood pressure, diastolic blood pressure, and health-related quality of life measured in each group across time points

Outcome variables	T1	T2	T3	T4	Statistics (χ^2, Z)	p-value
	Mean rank					
Experimental group (n = 70)						
Knowledge about hypertension	1.34	2.06	2.60	-	68.93[a]	< 0.001
Self-management behavior	1.30	2.06	2.88	3.76	150.07[a]	< 0.001
Systolic blood pressure	3.60	2.72	2.20	1.48	112.18[a]	< 0.001
Diastolic blood pressure	3.20	2.89	2.31	1.60	68.57[a]	< 0.001
Health-related quality of life*	12.33[c] (Mdn = 31.50)	-	-	35.52[d] (Mdn = 22.50)	-6.95[b]	< 0.001
Mental status*	22.71[c] (Mdn =15.00)	-	-	33.16[d] (Mdn = 12.50)	-5.82[b]	< 0.001
Somatic manifestations*	19.50[c] (Mdn = 15.00)	-	-	32.71[d] (Mdn = 10.00)	-6.85[b]	< 0.001
Control group (n = 71)						
Knowledge about hypertension	1.73	2.04	2.23	-	12.27[a]	0.002
Self-management behavior	1.80	2.40	2.71	3.08	44.76[a]	< 0.001
Systolic blood pressure	2.77	2.29	2.18	2.76	13.18[a]	0.004
Diastolic blood pressure	2.13	2.27	2.50	3.09	25.43[a]	< 0.001
Health-related quality of life*	27.21[c] (Mdn = 32.00)	-	-	28.11[d] (Mdn = 30.00)	-4.90[b]	< 0.001
Mental status*	19.43[c] (Mdn =17.00)	-	-	19.52[d] (Mdn = 16.00)	-3.48[b]	< 0.001
Somatic manifestations*	19.00[c] (Mdn =13.00)	-	-	20.67[d] (Mdn = 13.00)	-4.58[b]	< 0.001

Note. T1 = baseline, T2 = Week 4, T3 = Week 8, T4 = Week 12; Mdn = Median;
[a] Friedman test (χ^2); [b] Wilcoxon signed-rank test (Z); [c] Positive ranks = T4 > T1;
[d] Negative ranks = T4 < T1; *The lower score, the better health-related quality of life.

Table 4. Comparison of post-hoc test results in knowledge about hypertension, self-management behavior, systolic blood pressure, and diastolic blood pressure between the experimental and control groups across time points

Time	Experimental group (n = 70) (z, p-value)	Control group (n = 71) (z, p-value)
Knowledge about hypertension*		
T1 vs T2	-4.96, < 0.001	-2.00, 0.045
T1 vs T3	-6.05, < 0.001	-2.35, 0.019
T2 vs T3	-4.57, < 0.001	-0.98, 0.329
Self-management behavior**		
T1 vs T2	-5.65, < 0.001	-2.48, 0.013
T1 vs T3	-6.29, < 0.001	-3.35, 0.001
T1 vs T4	-6.95, < 0.001	-4.43, < 0.001
T2 vs T3	-5.30, < 0.001	-2.38, 0.017
T2 vs T4	-6.65, < 0.001	-3.28, 0.001
T3 vs T4	-6.15, < 0.001	-2.09, 0.037
Systolic blood pressure**		
T1 vs T2	-5.70, < 0.001	-3.16, 0.002
T1 vs T3	-6.20, < 0.001	-3.63, < 0.001
T1 vs T4	-6.73, < 0.001	-0.97, 0.332
T2 vs T3	-3.86, < 0.001	-1.10, 0.269
T2 vs T4	-5.72, < 0.001	-1.80, 0.073
T3 vs T4	-5.71, < 0.001	-3.73, < 0.001
Diastolic blood pressure**		
T1 vs T2	-2.81, 0.005	-1.91, 0.057
T1 vs T3	-4.51, < 0.001	-1.57, 0.116
T1 vs T4	-5.72, < 0.001	-3.95, < 0.001
T2 vs T3	-4.37, < 0.001	-0.69, 0.490
T2 vs T4	-6.23, < 0.001	-3.66, < 0.001
T3 vs T4	-5.07, < 0.001	-3.74, < 0.001

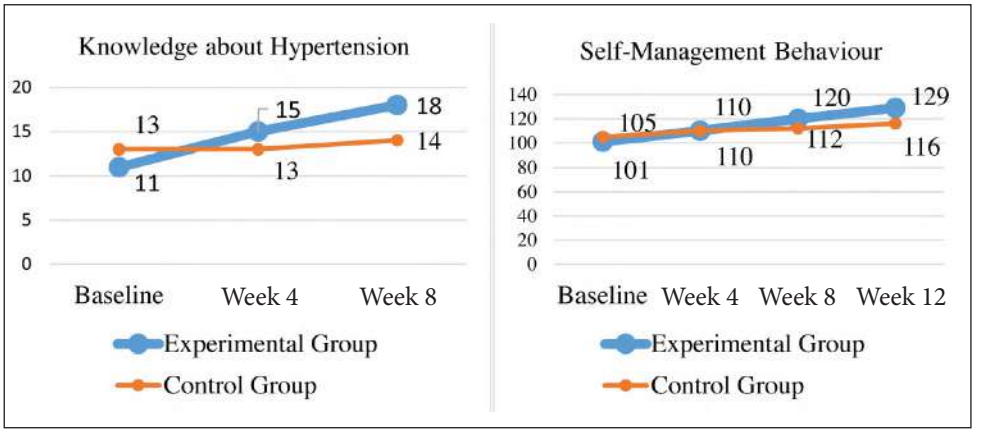
Note. T1 = baseline, T2 = Week 4, T3 = Week 8, T4 = Week 12; *Bonferroni correction significance level at p < 0.017, **Bonferroni correction significance level at p < 0.008; Z = Wilcoxon signed-rank test

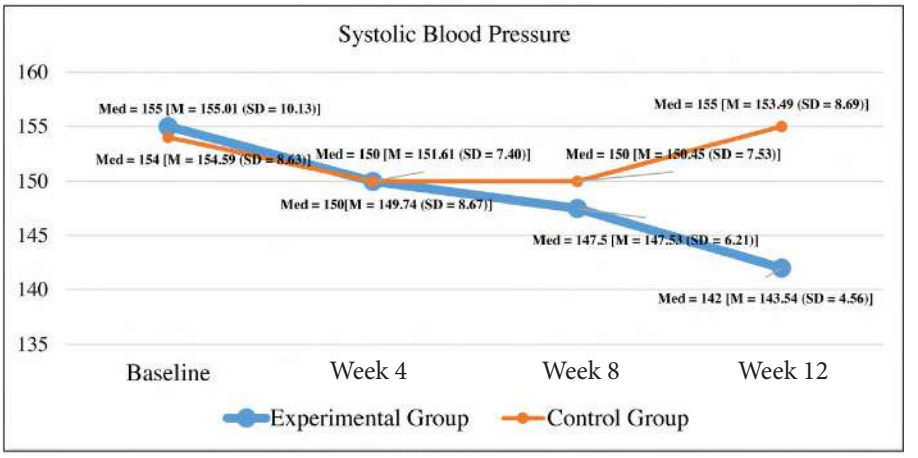
When the study variables were compared between the experimental and control groups across time points, the results revealed that knowledge about HT in the experimental group was significantly better than in the control group at Week 8. However, self-management behavior and SBP in the experimental group were significantly better than in the control group at Weeks 8 and 12, while DBP in the experimental group was significantly better than in the control group at Weeks 4, 8, and 12. For HRQOL, the results indicated that the overall HRQOL and both domains (mental status and somatic manifestation) in the experimental group were significantly better than those in the control group at Week 12. At the same time, they were not significantly different between the two groups at baseline (**Table 5**). The results indicated that the SFMSP improved the knowledge of hypertension, self-management behaviors, and HRQOL and reduced SDP and DBP of OPW-UHT over time in this study (**Figure 2**).

Table 5. Comparisons of mean ranks of knowledge about hypertension, self-management behavior, systolic blood pressure, diastolic blood pressure, and health-related quality of life between groups at each time point

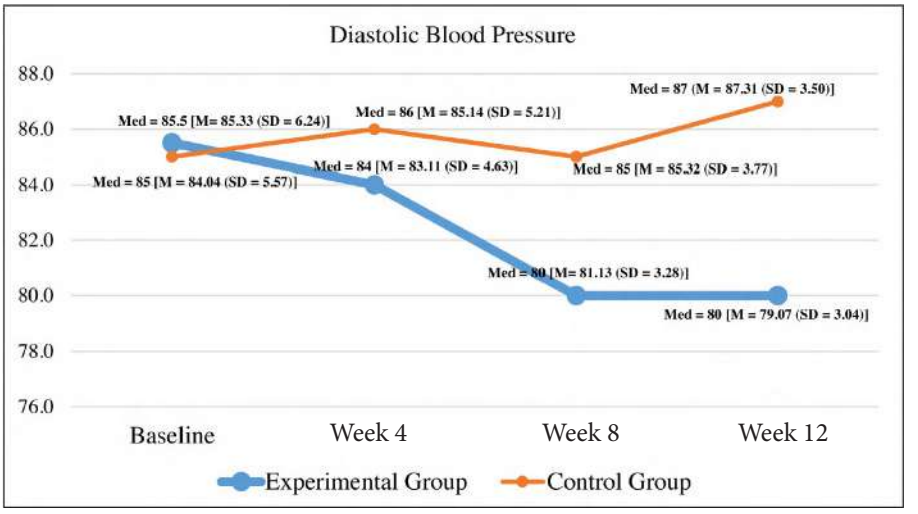
Variables	Time	Mean rank		Z	p-value
		Experimental group (n = 70)	Control group (n = 71)		
Knowledge about hypertension	T1	69.58	72.40	-0.41	0.681
	T2	76.54	65.54	-1.61	0.108
	T3	83.50	58.68	-3.63	< 0.001
Self-management behavior	T1	66.46	75.48	-1.13	0.189
	T2	72.31	69.71	-0.38	0.705
	T3	78.16	63.94	-2.07	0.038
	T4	84.08	58.11	-3.78	< 0.001
Systolic blood pressure	T1	71.59	70.42	-0.17	0.864
	T2	66.21	75.73	-1.40	0.163
	T3	62.74	79.14	-2.42	0.016
	T4	47.91	93.76	-6.72	< 0.001
Diastolic blood pressure	T1	75.78	66.29	-1.39	0.164
	T2	63.51	78.38	-2.19	0.028
	T3	50.73	90.99	-6.00	< 0.001
	T4	38.58	102.96	-9.47	< 0.001
Health-related quality of life*	T1	69.84	72.14	-0.33	0.738
	T4	56.02	85.77	-4.33	< 0.001
Mental status*	T1	68.56	73.40	-0.71	0.481
	T4	57.74	84.07	-3.84	< 0.001
Somatic manifestations*	T1	72.79	69.23	-0.52	0.603
	T4	61.22	80.64	-2.83	0.005

Note. T1 = baseline, T2 = Week 4, T3 = Week 8, T4 = Week 12; Z = Mann-Whitney U test;
*The lower score indicates the better health-related quality of life.

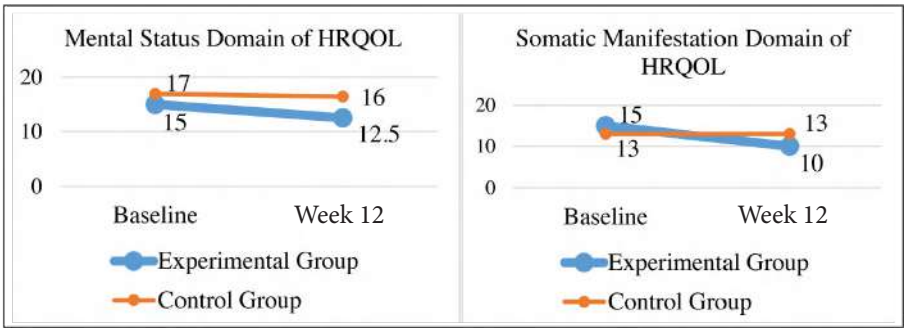




Note. The lower value within a normal range indicates a better outcome.



Note. The lower value within a normal range indicates a better outcome.



Note. The lower score indicates better health-related quality of life (HRQOL).

Figure 2. Changes in knowledge about hypertension, self-management behavior, systolic blood pressure, diastolic blood pressure, and health-related quality of life between groups at each time point; the higher values indicate better outcomes, except for systolic and diastolic blood pressure and health-related quality of life, where the values are inverted.

Discussion

The study results demonstrated that the SFMSP effectively increased knowledge about HT, self-management behavior, HRQOL and reduced SBP and DBP across time points during the 12 weeks from baseline.

An improvement in knowledge scores was found across time points in the experimental group but was inconsistent in the control group in this study. These findings were in line with previous studies.[13,37] Based on Grey et al.'s framework,[17] personal knowledge is one of the facilitators that can influence the self-management process. In this study, it can be explained that the promotion of learning strategies included teaching and training the participants in small groups about the self-management of HT and enhancing their self-efficacy to perform activities pertinent to managing their illnesses.

In addition, family caregivers were involved as resources to encourage and assist older people during the program's implementation. Family support is essential in helping people cope with their chronic conditions.[12,17] Support from family is not only instrumental or emotional but also informational, related to knowledge of the disease. The family caregivers were proactive in group discussions and coaching sessions by assisting and sharing information with older people. Therefore, older people adhered to all treatments. In contrast, the inconsistent improvement of knowledge about HT in the control group could be explained by the fact that the usual care model did not provide specific teaching, coaching, telephone follow-ups, and home visits, resulting in a lack of updated information about healthcare, particularly during the pandemic of COVID-19 when most older people stayed at home and did not receive proactive care, unlike those in the experimental group receiving the SFMSP.

Regarding self-management behavior, the experimental group showed a noticeably greater improvement than the control group at Weeks 8 and 12. This finding was similar to prior studies.[6,8] Those studies emphasized that health education combined with training, including healthy diet, physical activities, self-monitoring, and others, along with follow-up, showed an increase in self-management behaviors mean scores in the experimental group compared to those in the control group. The self-management processes encompass addressing illness-related needs, mobilizing resources, and living with the illness.[17] The intervention program in this study provided teaching, group discussion, and training for older people to focus on their illness needs. The program activated older people's resources by involving family members to encourage and assist older people in taking medications, checking BP, selecting appropriate diets, exercising at home regularly, and managing stress. Furthermore, the program provided information about HT management, such as leaflets and logbook monitoring. It motivated older people and their family members to adjust their lifestyles to HT as part of life through telephone follow-ups and home visits with individual coaching. In addition, OPW-UHT in the experimental group possessed greater information regarding HT than those in the control group; thus, the first group had more understanding of HT and skills to manage HT than the latter.

Regarding consistent reduction over time of SBP and DBP in the experimental group, our findings were similar to those of prior studies,[8,38] with intervention components like the SFMSP for BP control in this study, such as dietary education, medication use, and regular exercise. The OPW-UHT in the experimental group improved knowledge and self-management behavior following the SFMSP, including adherence to the medication prescribed by the physician. In this study, all participants in both groups received amlodipine, a basic antihypertensive medication at the PHCs. Therefore, self-management practices with treatment adherence strengthened by the SFMSP among OPW-UHT could reduce their SBP and DBP.

The HRQOL in this study was a subjective perception of an individual's life of OPW-UHT comprising the MS and SM domains. We found that

OPW-UHT in the experimental group had a better overall HRQOL and its domains than those in the control group at Week 12. For the MS domain of HRQOL, the result is congruent with prior studies.[39-40] The SFMSP promoted strategies for managing stress and encouraged OPW-UHT to carry out their duties and abilities in their sociocultural context. Wardani and Dewi[40] pointed out that Balinese older people are still active in social and religious activities, such as praying and helping others in religious ceremonies. With their roles in helping the community, they might feel empowered because their communities accept their suggestions and ideas. Thus, the SFMSP, which promoted OPW-UHT to have social integration and interpersonal interaction, might help increase their HRQOL.

Also, this study found that older people in the experimental group had a better SM domain of HRQOL than those in the control group. This finding aligns with a prior study,[40] which found that after giving exercise training to older people, the HRQOL improved, particularly in the physical domain. The SFMSP in this study provided physical exercise training that should be done at home for 15 to 45 minutes three to four times a week. According to the diary log for self-monitoring at home, most OPW-UHT exercised frequently. Furthermore, all participants still worked to earn money, reflecting that their physical condition was not a burden for them to keep working, and they felt strong enough to do activities without complaining. Thus, the SMFSP that promotes physical activity and exercise might improve their physical health, thereby increasing the SM domain of the HRQOL. Our findings assure that the SFMSP, which encompasses individual health education, training, and coaching based on the revised self-and family management framework,[17] is beneficial.

Limitations and Recommendations

This study was conducted among older people aged 60 to 80 who lived in a suburban society in Bali, Indonesia; thus, the generalizability is limited to other age groups and those living in urban and rural areas because of different contexts. Since the study did not collect the family outcomes nor involve other disciplinary teams, this needs to be considered for future research. Furthermore, following participants in the SFMSP for BP control for only two months might not sustain self-management behaviors to control BP, and more extended studies are needed in the future.

Conclusions and Implications for Nursing Practice

The findings indicated that the SFMSP for BP control was an effective program to improve knowledge about HT and self-management behavior, reduce SBP and DBP, and enhance the HRQOL of OPW-UHT. This study's results also provide helpful information and strategies for nurses regarding self-management for controlling BP through education, skill training, follow-up phone calls, and home visits to encourage family caregivers to support OPW-UHT. However, assessment of family outcomes and multidisciplinary involvement are needed to support the program's success. Additionally, innovative strategies, such as age-friendly media for older people and their family caregivers, should be developed to increase accessibility to care, mainly when undesirable events, such as a pandemic or an emerging disease, may occur. Before the program is widely used, further testing using randomized control trials should be conducted in other areas, such as urban and rural areas. Lastly, for sustaining self-management behavior to control BP and enhance desirable outcomes, the program's implementation period should be longer than 12 weeks for the follow-ups.

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Appendix

Table A1. Schedule and contents of the SFMSP for blood pressure control

Time schedule	Topic	Method/Strategies	Media
At community Week 1 Day 1 90 mins	**Part 1:** **Self-and family management education (SFM-E)** *Topic 1:* Hypertension: definition, etiology, risk factors, classifications, signs and symptoms, complications, HT management and prevention by the CERDIK method (regular health assessments, cessation of smoking, consistent physical activity, a healthy diet, sufficient rest, and stress management) *Topic 2:* Self and family management tasks for older people and family caregivers	**Introduction:** Enlightening the objective and details of the SFMSP for blood pressure control program to older people and family caregivers **Teaching:** Providing knowledge about HT to older people and family caregivers **Group Discussion:** Giving motivation about self and family management of HT **Setting a goal:** Empowering to set the goal of blood pressure control and self-management behaviors including healthy diets, physical exercises, breathing exercises, and medication takin	**The Booklet:** The self-and family management for blood pressure control program **The Brochures:** "Hypertension" "What should I do if I have high blood pressure?"
Day 2 120 mins	**Part 2:** **Self- and Family Management Training (SFM-T)**	**Training:** Providing skills about self-monitoring of HT (BP measurement, relaxation exercise, healthy and diet plan, physical activity, and medicine taking **Demonstrations and return demonstrations:** Demonstrating basic skills in daily activities, e.g., blood pressure measurement, physical exercise, diet, and breathing exercise	**The Booklet:** The self-and family management for blood pressure control program **The Brochures:** "Blood pressure measurement and interpretation" "Physical exercise for older people" "Diet to control blood pressure" "Breathing exercise" "DASH (dietary approach to stop hypertension) diet display"

Table A1. Schedule and contents of the SFMSP for blood pressure control (Cont.)

Time schedule	Topic	Method/Strategies	Media
Weeks 2, 3, 4, 5		***Lansia* diary log usage:** Applying and documenting the SFMSP for blood pressure control program at home for older people and family caregivers **Encouraging:** Encouraging family caregivers to support the older people	***Lansia* diary log:** "Blood pressure monitoring and action" "Healthy dietary" "Physical exercise" "Breathing exercise and medication taking"
Telephone follow-up Weeks 6, 10 15 mins		**Reminding:** Reminding older people and family caregivers about self-management activities at home **To strengthen and support self-and family management:** Discussing and supporting self-management **Encouraging:** Encouraging family caregivers to support the older people **Providing:** Providing skills about self-monitoring of hypertension (BP measurement, relaxation exercise, healthy diet plan, physical activity, and medicine taking)	
Home visiting and individual coaching Weeks 7, 11 60 mins		**Activating:** Activating older people and family caregivers to perform activities following the intervention program	**The Booklet:** The self-and family management for blood pressure control program **The Brochures:** "Blood pressure measurement and interpretation" "Physical exercise for older people" "Diet to control blood pressure" "Breathing exercise" "DASH (dietary approach to stop hypertension) diet display"

Table A1. Schedule and contents of the SFMSP for blood pressure control (Cont.)

Time schedule	Topic	Method/Strategies	Media
Weeks 8, 9, 12		***Lansia* diary log usage:** Applying and documenting the SFMSP for blood pressure control program at home for older people and family caregivers	
		Giving feedback and rewarding: Giving feedback about participant's achievement and rewarding for their success	

ผลลัพธ์ของโปรแกรมสนับสนุนการจัดการตนเองและครอบครัวในผู้สูงอายุชาวบาหลีที่มีความดันโลหิตสูงที่ควบคุมไม่ได้ : การศึกษากึ่งทดลอง

Ni Putu Kamaryati พรทิพย์ มาลาธรรม สุปรีดา มั่นคง ปรารถนา สถิตย์วิภาวี*

บทคัดย่อ: ความดันโลหิตสูงเป็นความผิดปกติที่พบได้บ่อยและมักจัดการได้ยากในชีวิตประจำวันของผู้สูงอายุ การมีส่วนร่วมของครอบครัวในการจัดการตนเอง มีความสำคัญต่อการควบคุมความดันโลหิตสูง การศึกษากึ่งทดลองนี้มีวัตถุประสงค์เพื่อประเมินผลของโปรแกรมสนับสนุนการจัดการตนเองและครอบครัวในการควบคุมความดันโลหิตต่อผลลัพธ์ด้านสุขภาพในช่วงเวลาต่าง ๆ ในผู้สูงอายุชาวบาหลีที่มีความดันโลหิตสูงที่ควบคุมไม่ได้ ผู้เข้าร่วมการวิจัย คือ ผู้สูงอายุชาวบาหลีและญาติผู้ดูแลจำนวน 141 คู่ ได้รับการคัดเลือกจากศูนย์บริการสุขภาพปฐมภูมิ 3 แห่ง ในเขตเมงวี จังหวัดบาหลี ประเทศอินโดนีเซีย ผู้วิจัยจัดกลุ่มตัวอย่างเป็นกลุ่มทดลอง (n = 70) และกลุ่มควบคุม (n = 71) โดยการจับฉลากพื้นที่อยู่อาศัยก่อนแล้วคัดเลือกกลุ่มตัวอย่างโดยวิธีการจับคู่ตามอายุและเพศ กลุ่มทดลองได้รับโปรแกรมสนับสนุนการจัดการตนเองและครอบครัวร่วมกับการดูแลตามปกติ ในขณะที่กลุ่มควบคุมได้รับการดูแลตามปกติเท่านั้น วัดผลลัพธ์ของโปรแกรมที่จุดเริ่มต้น และ 4, 8, และ 12 สัปดาห์จากจุดเริ่มต้นโดยใช้แบบสอบถามวัดความรู้เกี่ยวกับความดันโลหิตสูง แบบสอบถามพฤติกรรมการจัดการตนเอง แบบสอบถามคุณภาพชีวิตของผู้ที่มีความดันโลหิตสูง และเครื่องวัดความดันโลหิต การวิเคราะห์ข้อมูลใช้สถิติเชิงพรรณนา การทดสอบไคสแควร์ การทดสอบค่าทีอิสระ Mann-Whitney U test, Friedman test, และ Wilcoxon signed-rank test

ผลการศึกษาแสดงให้เห็นว่าความรู้เกี่ยวกับความดันโลหิตสูง พฤติกรรมการจัดการตนเอง ความดันโลหิตซิสโทลิกและไดแอสโทลิก และคุณภาพชีวิตที่เกี่ยวข้องกับสุขภาพดีขึ้นอย่างมีนัยสำคัญทางสถิติ ณ ช่วงเวลาต่าง ๆ ในกลุ่มทดลองเมื่อเทียบกับกลุ่มควบคุม ผลการศึกษานี้แสดงให้เห็นถึงประโยชน์ของโปรแกรมสนับสนุนการจัดการตนเองและครอบครัวในการควบคุมความดันโลหิตในผู้สูงอายุและส่งเสริมคุณภาพชีวิตที่ดี ดังนั้น พยาบาลควรใช้โปรแกรมการช่วยเหลือนี้เพื่อให้ความรู้ คำแนะนำสำหรับผู้สูงอายุและสนับสนุนให้ผู้ดูแลในครอบครัวช่วยเหลือผู้สูงอายุ อย่างไรก็ตาม ควรมีการทดสอบเพิ่มเติมในกลุ่มตัวอย่าง ในพื้นที่ต่างๆ ก่อนที่จะใช้โปรแกรมนี้อย่างแพร่หลาย

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คำสำคัญ: การควบคุมความดันโลหิต ญาติผู้ดูแล ความดันโลหิตสูง ผู้สูงอายุ คุณภาพชีวิต การวิจัยกึ่งทดลอง การจัดการตนเอง ความดันโลหิตสูงที่ควบคุมไม่ได้

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