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Effect of Hypertension Exercise Education on Knowledge and Blood Pressure Among the Elderly

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Abstract

Hypertension is a major cardiovascular risk in the elderly. While non-pharmacological interventions like hypertension exercise are effective, knowledge and participation rates remain low in community settings. This study aimed to evaluate the effect of hypertension exercise education on knowledge enhancement and blood pressure reduction among the elderly. A pre-experimental study with a one-group pre-test and post-test design was conducted at Kembaran II Community Health Center, Banyumas Regency, from June to July 2026. A total of 21 elderly individuals with hypertension were selected using purposive sampling. The intervention consisted of a 90-minute structured session comprising health education (using audio-visual media and leaflets) and guided hypertension exercise practice. Data on knowledge and systolic/diastolic blood pressure were collected before and 10 minutes after the intervention. Data were analyzed using descriptive statistics and the Paired Sample T-test, following normality verification. The mean knowledge score increased significantly from 59.0 (SD = 9.4) to 80.5 (SD = 10.2) ($p < 0.001$). Systolic blood pressure decreased from 147.7 (SD = 16.5) mmHg to 138.3 (SD = 17.2) mmHg ($p < 0.001$), and diastolic blood pressure decreased from 92.5 (SD = 8.2) mmHg to 86.4 (SD = 7.5) mmHg ($p < 0.001$). Participants shifted predominantly from Grade 1 Hypertension to High-Normal/Normal categories. Hypertension exercise education is associated with significant improvements in knowledge and acute reductions in blood pressure in the elderly. Integrating structured exercise education into routine community nursing practice is recommended, though controlled trials are needed to confirm long-term efficacy.

Keywords: Blood Pressure, Health Education, Hypertension, Hypertension Exercise, Older Adults.

INTRODUCTION

The elderly population defined as individuals aged 60 and older is steadily growing alongside rising life expectancy, necessitating special attention across various aspects of life, including health. One health issue to which the elderly are particularly susceptible is hypertension, a condition characterized by arterial blood pressure exceeding normal limits ≥140/90 mmHg based on JNC 7 / PERKI guidelines, or ≥130/80 mmHg per AHA/ESC 2023 guidelines (Nightingale et al., 2025). Often referred to as a "silent killer," this condition rarely presents symptoms yet can damage the heart, kidneys, brain, and blood vessels if left uncontrolled (Isnadia et al., 2021).

The World Health Organization estimates that over 1.2 billion people worldwide suffer from hypertension, with the majority of cases occurring in developing countries, including Indonesia (Fitriani et al., 2025). Data from the 2023 Indonesian Health Survey (SKI) recorded a hypertension prevalence of approximately 30%. among individuals aged 18 and older, based on blood pressure

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measurements (Rahmadhani et al., 2023). Central Java Province ranks fifth nationally in terms of hypertension cases. In Banyumas Regency, 129,817 cases of hypertension were recorded across 40 Community Health Centers (Puskesmas) (Khotimah, 2023) Specifically, the Kembaran II Community Health Center recorded 239 cases of hypertension and 390 cases of hypertension-related complications in August 2025, indicating a high burden of this non-communicable disease in the area (Karmita et al., 2024).

Interviews and a preliminary survey involving 30 elderly patients with hypertension at the Kembaran II Community Health Center (Puskesmas) revealed that 21 of them had never participated in hypertension-specific exercises, primarily due to a lack of knowledge regarding the benefits of such exercises for blood pressure control. Health center staff noted that hypertension exercise sessions for the elderly were not being conducted regularly, owing to limited healthcare personnel and the absence of a dedicated educational program that simultaneously addresses both knowledge and physical practice. While previous studies have evaluated either health education or exercise in isolation, there is a lack of integrated community-based programs that combine both to address the cognitive and physiological aspects of hypertension management simultaneously. Managing hypertension in the elderly should ideally rely not only on adherence to antihypertensive medication but also on non-pharmacological interventions such as hypertension exercises which have been proven effective in lowering both systolic and diastolic blood pressure (Basuki & Barnawi, 2021).

The government, through BPJS Kesehatan, has implemented the Chronic Disease Management Program (Prolanis), which encompasses medical consultations, health education, and exercise sessions for individuals with chronic conditions, including hypertension in the elderly (Apriliani & Siregar, 2023). A combination of education and hypertension-specific exercise has proven more effective than employing either method in isolation; education enhances knowledge, whereas exercise yields direct physiological benefits in lowering blood pressure (Dewi & Nuraeni, 2022). Nurses play a vital role as educators and counselors in managing hypertension among the elderly, performing tasks such as providing nursing care, monitoring blood pressure, and offering guidance on healthy lifestyle practice (Prabasari, 2021). Therefore, this study aimed to evaluate the changes in hypertension-related knowledge and blood pressure following a combined hypertension exercise education program among the elderly.

METHODS

Research Design

This study employed a pre-experimental design with a one-group pre-test and post-test approach to measure the changes in knowledge and blood pressure following the intervention. This design was selected due to the community service nature of the activity and the limited availability of a comparable control group at the specific health center during the study period. The authors acknowledge that this design limits the ability to definitively attribute changes solely to the intervention, as external factors could not be fully controlled.

Setting and Study Period

The research was conducted at the Kembaran II Community Health Center (Puskesmas), Banyumas Regency, Central Java, Indonesia, between June and July 2026.

Population and Sample

The target population comprised elderly individuals with hypertension residing in the health center's service area. The sample consisted of 21 participants selected using a purposive sampling technique.

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No formal a priori sample size calculation was performed; the sample represents all eligible participants who met the inclusion criteria and were available during the study period.

Inclusion and Exclusion Criteria

Inclusion criteria were (1) lderly individuals (≥60 years) with a documented medical diagnosis of hypertension (≥140/90 mmHg), (2) Possessing good physical mobility as assessed by the ability to stand and walk without assistance, (3) Atively participating in the elderly integrated health post (Posyandu Lansia), (4) Willing to participate and capable of completing the questionnaire. Exclusion criteria included (1) severe cognitive impairment or dementia that would prevent informed consent, (2) severe physical mobility issues preventing exercise Participants who were unwilling to participate or dropped out during the intervention were excluded from the final analysis, but this was categorized as non-enrolment/withdrawal rather than a primary exclusion criterion.

Variables and Instruments

The independent variable was the hypertension exercise education intervention. The dependent variables were the level of knowledge and blood pressure (systolic and diastolic). Knowledge was measured using a structured questionnaire consisting of 10 true-false statements regarding hypertension and exercise. The questionnaire was developed by the researchers based on the Indonesian Ministry of Health guidelines and underwent content validation by two nursing experts (Content Validity Index = 0.85). A pilot test on 10 similar elderly individuals yielded a Cronbach's alpha of 0.72. Scores were calculated as percentages, classified as Poor (<60%), Fair (60-75%), and Good (>75%).

Blood pressure was measured using a calibrated digital sphygmomanometer (Omron HEM-7120) with an appropriate adult cuff size. The measurement procedure followed standard clinical guidelines: participants rested for 5 minutes in a seated position, with the right arm supported at heart level. Participants were instructed to avoid caffeine, heavy meals, and smoking for at least 30 minutes prior to measurement, and to continue their usual antihypertensive medication regimens. Medication timing was documented to ensure consistency between pretest and posttest measurements. Measurements were taken twice, and the average was recorded.

Intervention Procedure

The intervention was delivered in a single 90-minute structured session. The timeline was strictly standardized: 15 minutes for pre-test and baseline blood pressure measurement, 45 minutes for health education using audio-visual media (PowerPoint and videos) and leaflets, 20 minutes for guided hypertension exercise practice (based on the Indonesian Ministry of Health hypertension gymnastics protocol, consisting of warm-up, core movements, and cooling down at low-to-moderate intensity), and 10 minutes for post-test evaluation and final blood pressure measurement. The 10-minute recovery period before the post-test blood pressure measurement was implemented to allow heart rate to return closer to baseline, though the authors acknowledge this still captures acute post-exercise hypotension rather than long-term resting blood pressure. The session was supervised by a registered nurse.

Data Analysis

Data were analyzed using SPSS software. Descriptive statistics (frequency, percentage, mean, and standard deviation) were used to summarize participant characteristics and variable distributions. Normality of the difference scores was assessed using the Shapiro-Wilk test. Because the data were normally distributed, the Paired Sample T-test was applied to both knowledge scores and blood

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pressure variables. A p-value of < 0.05 was considered statistically significant. Effect sizes (Cohen's d) and 95% confidence intervals (CI) for the mean differences were also calculated.

Ethical Considerations

Ethical approval was obtained from the Ethics Committee of Universitas Harapan Bangsa No. B.LPPM-UHB/774/06/2026. Informed consent was secured from all participants prior to data collection. Participants were informed of their right to withdraw from the study at any time, and their confidentiality and anonymity were strictly maintained throughout the research process.

RESULTS

Participant Characteristics

A total of 21 elderly participants completed the study. Table 1 summarizes the demographic and clinical characteristics of the participants.

Table 1. Participant Characteristics (n=21)

Characteristic	Category	Frequency (f)	Percentage (%)
Age	60-69 years	14	66.67
	70-75 years	7	33.33
Gender	Male	9	42.86
	Female	12	57.14
Education	Elementary School	13	61.90
	Junior High School	6	28.57
	Senior High School	2	9.52
Hypertension	< 5 years	12	57.14
Duration	≥ 5 years	9	42.86

Effect of Intervention on Knowledge Level

The intervention resulted in a significant improvement in the participants' knowledge regarding hypertension and hypertension exercises. As shown in Table 2, the mean knowledge score increased from 59.0 (pre-test) to 80.5 (post-test). The Paired Sample T-test confirmed that this increase was statistically significant (t = -8.76, p < 0.001, mean difference = 21.43, 95% CI.

Table 2. Distribution of Knowledge Levels Before and After Intervention (n=21)

Level of Knowledge	Pre-test (f%)	Post-test (f%)
Good (>75%)	0 (0%)	16 (76,19%)
Fair (60-75%)	7 (33,33%)	5 (23,81%)
Poor (<60%)	14 (66,67%)	0 (0%)
Mean Score	**59.0**	**80.5**

The results above indicate that the majority of pre-test scores fell into the "poor" category, comprising 14 participants (66.67%). In contrast, the post-test results show that the majority fell into the "good" category, although some remained in the "fair" category. There was a significant rise in scores, with the percentage of participants in the "good" category increasing to 76.19%. To provide a clearer picture, Figure 1 is presented below.

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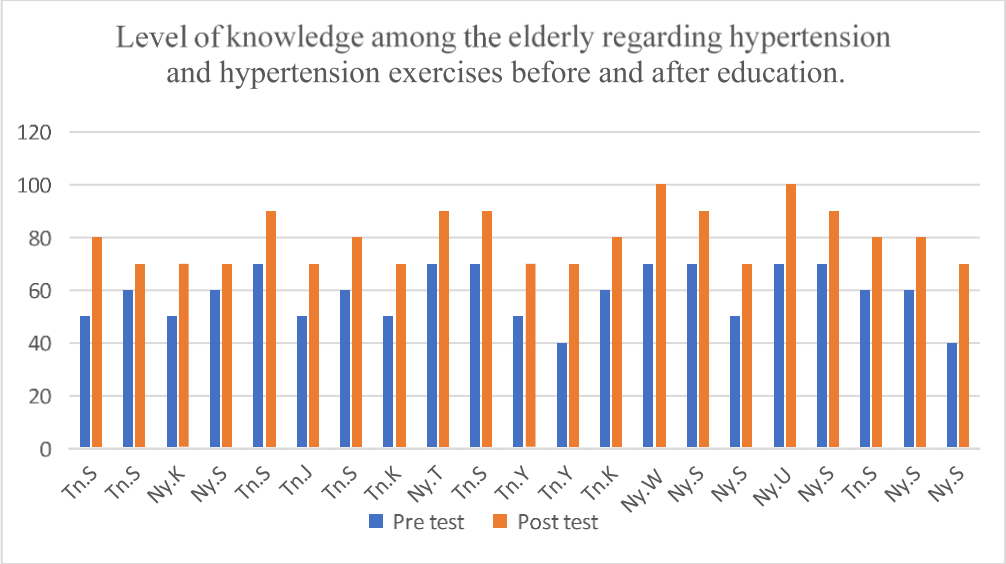


Figure 1. The level of knowledge among the elderly regarding hypertension and hypertension exercises before and after education at the Kembaran II Community Health Center (Puskesmas) in 2026

Effect of Intervention on Blood Pressure

Blood pressure measurements demonstrated a significant physiological response to the intervention. Table 3 and 4 presents the detailed pretest and posttest values for both systolic and diastolic blood pressure. The mean systolic blood pressure decreased from 147.7 (SD = 16.5) mmHg to 138.3 (SD = 17.2) mmHg ($t = 5.82$, $p < 0.001$, mean difference = 9.4 mmHg, 95% CI [5.8, 13.0]). The mean diastolic blood pressure decreased from 92.5 (SD = 8.2) mmHg to 86.4 (SD = 7.5) mmHg ($t = 4.15$, $p < 0.001$, mean difference = 6.1 mmHg, 95% CI.

Table 3. Blood Pressure Categories Before and After Intervention (n=21)

Variable	Before (Mean ± SD)	After (Mean ± SD)	Mean Diff (95% CI)	p-value
Systolic BP (mmHg)	147.7 ± 16.5	138.3 ± 17.2	9.4	<0.001
Diastolic BP (mmHg)	92.5 ± 8.2	86.4 ± 7.5	6.1	<0.001

Furthermore, the distribution of participants across hypertension categories shifted favorably, based on the JNC 7 guidelines (Normal: <120/<80; Prehypertension/High-Normal: 120-139/80-89; Stage 1: 140-159/90-99; Stage 2: ≥160/≥100). When systolic and diastolic measurements fell into different categories, the higher category was assigned.

Table 4. Blood Pressure Categories Before and After Intervention (n=21)

BP Category	Before (f%)	After (f%)
Normal (<120/<80)	0 (0%)	6 (28.57%)
High-Normal (120-139/80-89)	7 (33.33%)	7 (33.33%)
Stage 1 HT (140-159/90-99)	8 (38.10%)	5 (23.81%)
Stage 2 HT (≥160/≥100)	6 (28.57%)	3 (14.29%)

To provide a clearer picture of the changes in hypertension levels before and after the provision of education, Figure 2 illustrates the comparison of blood pressure among the elderly.

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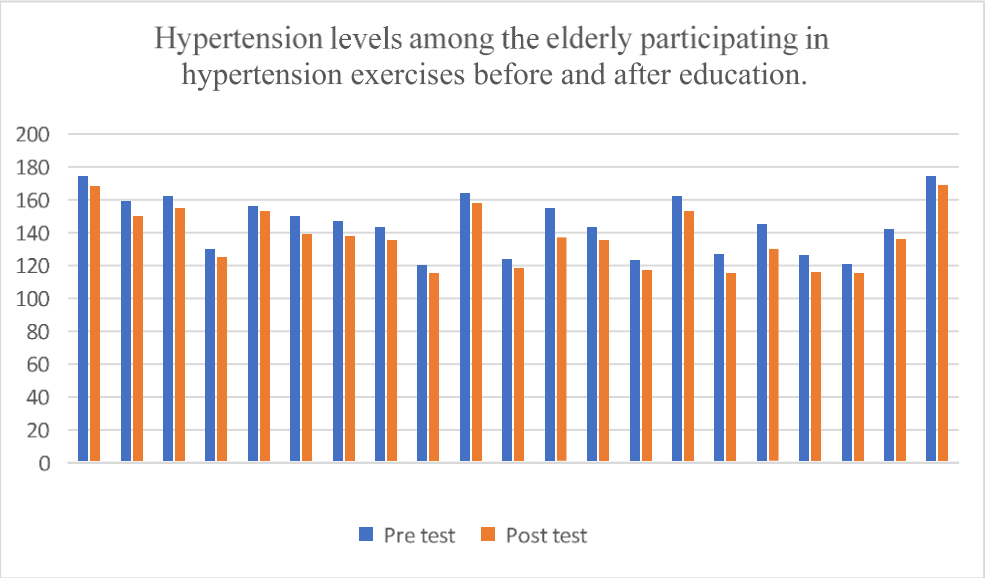


Figure 2. Systolic and diastolic blood pressure measurement results before and after participating in the hypertension exercise education program at Kembaran II Community Health Center (Puskesmas) in 2026.

DISCUSSION

The findings of this study demonstrate that structured hypertension exercise education is associated with significant improvements in knowledge and acute reductions in blood pressure among the elderly. The substantial increase in the "good" knowledge category (from 0% to 76.19%) indicates that the combination of audio-visual media and direct demonstration effectively overcomes the literacy and cognitive barriers often faced by the elderly (Astuti et al., 2024), which states that PowerPoint is effective in reducing the need for lengthy verbal explanations and in capturing attention. Furthermore, leaflets served as take-home reminders that enabled independent practice at home (Cahaya et al., 2025). While the study design does not allow us to isolate the individual contribution of the audiovisual media versus the direct demonstration, the combined approach aligns with adult learning theories that emphasize multimodal education.

The average reduction in systolic blood pressure of 9.4 mmHg indicates a favorable physiological response to hypertension-focused exercises. The mechanism behind this post-exercise blood pressure reduction involves physical activity inducing blood vessel relaxation (vasodilation), thereby lowering peripheral resistance and facilitating smoother blood flow ((Halliwill, 2021), (Putra & Utami, 2024). Beyond these physiological improvements, the group-based nature of hypertension exercise also offers significant psychological benefits. It creates a relaxed environment and encourages social interaction among older adults, which further supports their motivation and adherence to the exercise routine (Elviana et al., 2021). However, it is crucial to distinguish this acute post-exercise hypotension from sustained blood pressure control. The measurements were taken 10 minutes after the exercise session, meaning the observed reduction likely reflects an immediate physiological response rather than long-term resting blood pressure regulation. To achieve stable, long-term hypotensive effects, such exercises must be performed consistently as recommended by clinical guidelines.

Relevance to Nursing Practice

The results underscore the critical role of nurses as educators and facilitators in community health. By implementing structured, non-pharmacological interventions like hypertension gymnastics, nurses

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can empower the elderly to manage their condition independently, reducing reliance on medication and preventing severe cardiovascular complications. It is recommended that Community Health Centers integrate this combined educational and physical intervention into their routine monthly Posyandu Lansia schedules.

Limitations

This study has several limitations First, the pre-experimental one-group pre-post design without a control group limits definitive causal attribution. Second, the small sample size (n=21) restricts generalizability. Third, the 90-minute session caused fatigue in some participants, suggesting future interventions should incorporate more frequent rest intervals. Finally, while medication use was documented, the exact timing of antihypertensive medication intake relative to the BP measurements was not strictly standardized, which could act as a confounding factor. Future randomized controlled trials with larger samples and extended follow-up periods are recommended.

CONCLUSION

The hypertension exercise education program was associated with significant improvements in the knowledge of the elderly (mean score increased from 59.0 to 80.5) and an acute reduction in systolic and diastolic blood pressure. The integration of health education with structured physical exercise shows promise as a non-pharmacological strategy for managing hypertension in the elderly. Future research should employ a randomized controlled trial design with a larger sample size and long-term follow-up to validate the sustained effectiveness of this intervention.

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