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ORIGINAL ARTICLE

SELF-MANAGEMENT INTEGRATED WITH HEALTH BELIEF-BASED EDUCATION ON BLOOD PRESSURE AND QUALITY OF LIFE IN UNCONTROLLED HYPERTENSION: A QUASI-EXPERIMENTAL STUDY

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ABSTRACT

Self-management and the Health Belief Model (HBM) have been shown to improve blood pressure control and quality of life (QoL). However, the effectiveness of integration self-management with HBM for hypertension requires further clarification. This study examined the effect of integration self-management with HBM on blood pressure and QoL among individuals with uncontrolled hypertension. A total of 138 eligible participants were allocated into two groups: one receiving self-management integrated with HBM-based education (n = 69) and the other receiving regular education (n = 69). Independent t-tests, Chi-squared tests, and generalized estimating equation (GEE) were conducted. The findings showed a significant interaction between groups in systolic blood pressure (SBP) and diastolic blood pressure (DBP) after 12 weeks compared to the control group ($p < 0.001$). Importantly, there was a significant increase in QoL across physical, psychological, social relationships, and environmental domains. Specifically, the intervention group demonstrated significantly higher QoL scores than the control group over time ($\beta = 22.756$, 95% CI [20.623, 24.901], $p < 0.001$). The effectiveness of integration self-management with HBM significantly reduced blood pressure and increased QoL.

Keywords: *Blood pressure; health belief; hypertension; quality of life; self-management*

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BACKGROUND

Hypertension is a chronic condition characterized by persistently elevated blood pressure exceeding 140/90 mmHg (Hias et al., 2024; World Health Organization, 2023). It is a globally recognized prevalent health issue and remains one of the most common asymptomatic disorders, significantly contributing to morbidity and mortality related to cerebrovascular and cardiovascular diseases (Hias et al., 2024). Currently, an estimated 1.28 billion people across the globe are currently dealing with hypertension (World Health Organization, 2023). The Ministry of Health of the Republic of Indonesia reported the 63 million Indonesians have hypertension (Ministry of Health of the Republic of Indonesia, 2018), with a low awareness rate of 87.1% and irregularly blood pressure control status rate of 80.5% (Khoiry et al., 2022). Moreover, in Indonesia, hypertension ranks among the top five causes of death (Kementerian Kesehatan Republik Indonesia, 2018). Notably, a 10-mmHg reduction in systolic blood pressure (SBP) or a 5-mmHg reduction in diastolic blood pressure (DBP) can lead to a 40% decrease in the risk of stroke and a 25% decrease in the risk of chronic cardiac disease (Fekadu et al., 2020).

Individuals with uncontrolled blood pressure are four times more likely to have three or more comorbidities, such as cardiovascular disease and vascular disease, compared to

those with controlled hypertension (Almalki et al., 2020). Uncontrolled blood pressure can escalate the risk of complications and lead to declines in both physical and mental function. Consequently, a vicious cycle of uncontrolled hypertension and poor quality of life (QoL) develops (Lee et al., 2020). Good quality of life encompasses a condition in which the patient experiences emotional, social, and physical satisfaction (Patil et al., 2023). Although, hypertension treatment may persist throughout an individual's lifetime, some patients neglect it and subsequently experience a diminished QoL (Khademian et al., 2020).

Enhancements in blood pressure and QoL in individuals with hypertension can be achieved through the application of health behavior models commonly utilized in healthcare (Zeng et al., 2020; Mohamadian et al., 2019). Importantly, self-management and the health belief model (HBM) are among the most common and accepted conceptual models employed in behavior studies. These two models have been used, each bringing a different perspective on the adoption decision (Chan et al., 2023; Vincenzo et al., 2022; dos Santos Ximenes et al., 2024). Self-management is founded on the concept of skill competence, whereby individuals learn to strategies for planning and adopt diverse methods to control their condition (Qu et al., 2019). However, there is a lack of studies investigating the effectiveness of self-management in improving QoL among individuals with uncontrolled hypertension (Zeng et al., 2020).

Another model used in this study was the HBM, a commonly utilized theoretical framework for health education interventions aimed at increasing health beliefs, declining the blood pressure (Wang et al., 2024), and improving the QoL (Mohamadian et al., 2019). The effectiveness of HBM's theory in enhancing the QoL of individuals with chronic diseases has been extensively examined (Mohamadian et al., 2019; Zhang and Zhao, 2021; Tazangi et al., 2022). The HBM emphasizes the significance of personal beliefs regarding health issues, as these beliefs predict of an individual's health-related behaviors (Khaira et al., 2024). It emphasizes the rationale for behavioral modification by concentrating on the fundamental motivations for initiating improvements in health behaviors (Chan et al., 2023; Vincenzo et al., 2022; dos Santos Ximenes et al., 2024).

Self-management focuses on the processes and methods necessary to sustain or enhance favorable health behaviors, which are influenced not only by beliefs but also by dealing with self-management abilities (Long et al., 2017; dos Santos Ximenes et al., 2024). Furthermore, as a learning process map, the combination of theory and model offer guidance for training, planning, and design, while also facilitating in evaluation (Chaboksavar et al., 2021; Mulyadi et al., 2024; Zhou et al., 2022). Specifically, a previous experimental study demonstrated that health intervention programs incorporating multiple theories and models yield greater improvement in QoL compared to those based on a single theoretical model among individuals with hypertension (Chaboksavar et al., 2021). Consequently, integrating these two theories will result in viable educational program.

To the best of authors' knowledge, there has been a lack of education programs that combine self-management with the HBM to improve the QoL and blood pressure. Hence, this theory-driven study aimed to evaluate the effect of a self-management program integrated with HBM on blood pressure and QoL among Indonesians with hypertension.

METHOD

Research design and setting

A quasi-experimental study with intervention and control groups, a pre-test and post-test design (1:1) and was conducted from February to May 2024 in four health community centers in Surabaya, Indonesia. A single-blind procedure was utilized in this study, in which participants were not informed about their group allocation (intervention or control group). However, the researchers administering the interventions were aware of group assignments to guarantee the accurate implementation of the intervention program.

Participants

Participant allocation was conducted by the research principal using a non-randomized sequential assignment consistent with the quasi-experimental design. Participants were allocated to either the intervention or control group according to the order of recruitment. To reduce potential bias and contamination, intervention and control activities were conducted separately. A total of 138 individuals were selected from four community health centers using convenience sampling, in accordance with the established inclusion criteria. Convenience sampling was selected in this study due to practical and contextual considerations within the clinical setting. Participants were recruited based on their availability and eligibility during the data collection period at the study sites, allowing for efficient and timely enrollment without disrupting routine healthcare services.

The participants were patients with hypertension who met the inclusion criteria: (a) Individuals diagnosed with hypertension (systolic blood pressure ≥ 140 mmHg and/or diastolic blood pressure ≥ 90 mmHg, or currently taking antihypertensive medication); (b) aged 21 to 60 years; and (c) able to communicate in Bahasa Indonesia. The exclusion criteria included individuals who were unwilling to participate, failed to comply with the study protocols, or participated in other health education interventions during the study period.

Sample size

The sample size calculation using a significance level of 5% (α) and a power of 80% (1−β) to detect a minimum difference of 5 points (SD = 10) in high blood pressure scores (Kim et al., 2000). According to the calculation, a sample size of 120 participants (60 per each group) was determined. To account for a 15% attrition rate, the total sample size was increased to 138 participants (69 per group).

Intervention and control groups

The intervention training program was adapted from previous studies (Chaboksavar et al., 2021; Wang et al., 2024) conducted over 12 weeks. The effectiveness of the intervention was assessed at baseline (T0) and after 12 weeks (T1), following the completion of the intervention sessions. Specifically, the program consisted of five sessions, each lasting 60 to 90 minutes, delivered in small groups of 13 or 14 participants. Each session included a short lecture, a booklet, counselling, and group discussion. Importantly, participant adherence to the intervention sessions was closely monitored, resulting in a high attendance rate, with 100% of participants completing all scheduled sessions in accordance with to the research protocol.

We implemented the self-management program and HBM in five stages. (a) The first stage involved an assessment phase. We conducted face-to-face questionnaires explain the study's objectives and to identify the patients' demographics, blood pressure, and QoL. (b) The second stage was the

advising phase, during which participants were informed about the health hazards identified in the previous stage, including perceived barriers, severity, and susceptibility. The benefits of behavior modification, such as improved outcomes and enhanced self-efficacy, were emphasized based on the assessment results. (c) The third stage focus on establishing mutual understanding between the patient and the researcher regarding the goals. Both parties agreed on the patient's performance targets. Additionally, the participants established appropriate behavioral and goal sets, while the researcher developed an action plan for each goal. Patients were instructed to record their daily performance for each behavioral goal. (d) The fourth stage, the assisting stage, we instructed participants on stress management, blood pressure control, cues to action, self-integration, and self-regulation. Participants were asked to practice these skills daily and track of their progress. (e) Lastly, the fifth stage, arrangement stage, we monitored the patients' performance and reminded them to adhere to their medication through telephone follow-ups over the course of one month.

The short lectures were conducted by qualified nurses in a classroom setting at community health centers. These interactive sessions employed various techniques, including demonstrations, role-plays, games, and quizzes, to captivate participants. Each lecture lasted approximately one hour and was held during the first 12 weeks. Additionally, booklets were developed based on self-management principles and HBM elements, containing information and strategies for managing blood pressure and improving QoL. The counselling sessions targeted to provide participants with personalized feedback, guidance, support, and reinforcement regarding their blood pressure levels, medication adherence, lifestyle choices, and health attitudes.

The counselling sessions lasted approximately 20 minutes each and were held biweekly over a 12-week period. Small group discussions focused on the most challenging tasks for participants with poorly controlled blood pressure: dietary management, walking exercises around the house for at least 30 minutes, five times per week (totaling 150 minutes per week), and blood pressure self-monitoring. The sessions also incorporated culturally tailored knowledge and experiential sharing related to hypertension self-management regimens. Individualized counselling empowered patients feel more in control of their lives by teaching essential self-management skills, enhancing motivation, improving communication with healthcare professionals, facilitating problem-solving, and assisting in creating actionable plans. Additionally, it helped participants set SMART (Specific, Measurable, Attainable, Relevant, Time-Based) goals that were personally meaningful. The study motivated participants to increase their engagement in self-management and sustain it with purpose. To reinforce cues to action, participants were instructed to perform walking exercises around the house for at least 30 minutes, five times per week (totaling 150 minutes per week), and to monitor their blood pressure regularly. The control group received usual care, including counselling, prescription medication, blood pressure monitoring, and general health education focused on the prevention and management of hypertension.

Instruments

Sociodemographic Questionnaire. The research assistant collected data using a questionnaire that included questions about participants' demographic characteristics collected at the baseline. The questionnaire covered participants' age, gender, education, employment status, income, and marital status.

The WHOQOL-BREF. The WHOQOL-BREF was utilized in the study to assess the quality of life among patients with hypertension. It includes two items addressing overall Quality of Life and General Health, along with 24 items assessing satisfaction, rated on a 5-point Likert scale (The WHOQOL Group, 1998). The 24 items are categorized into four domains: physical health (7 items), psychological health (6 items), social relationships (3 items), and environmental health (8 items). Additionally, a total quality of life score is calculated based on all 24 items. Each item on the WHOQOL-BREF is rated on a scale from 1 to 5. We calculated the mean score for each domain, the total score, and the average score. The English version of the WHOQOL-BREF was translated into Bahasa Indonesia, with intra-class correlation coefficient for physical health, psychological health, social relationships, and environmental health of 0.79, 0.70, 0.70 and 0.72, respectively (Purba et al., 2018).

Blood Pressure Measurement. Digital Blood Pressure monitoring was conducted using the Omron HBP-1320 (Omron Healthcare Co., Ltd) to measure systolic blood pressure (SBP) and diastolic blood pressure (DBP) on the subject's dominant arm. The Omron HBP-1320 was calibrated monthly. Prior to assessment, participants were instructed to rest in a seated position for at least five minutes. Blood pressure was measured three times, with 1-2minute intervals between readings, following the rest period. Participants were also instructed to avoid physical activity for at least 30 minutes before measurement. The mean of the second and third readings was calculated and used for statistical analysis to improve measurement accuracy and reduce random error. If a substantial discrepancy (>10 mmHg) was observed between readings, an additional measurement was performed and the average of the two closest values was recorded.

Study fidelity

The principal investigator met with nursing educators and trained professional nurses (enumerators) to review protocols, verify proficiency measurements, and equalize perceptions throughout the survey and intervention process. The educators followed research protocol guidelines for self-management and HBM implementation. Adherence to the research protocol was ensured by employing standardized measurement procedures, checklists, and periodic monitoring meetings to maintain consistency.

Statistical analyses

The Statistical Package for the Social Sciences (SPSS) version 25.0 (Chicago, Illinois, USA) was employed to conduct the statistical analysis, with a significance level set at $p = .05$. Means (with standard deviations, SD) and frequencies (percentages) were employed to describe continuous and categorical data, respectively. Independent t-tests and the Chi-squared tests were utilized to compare the baseline characteristics and sociodemographic variables between the two groups. Generalized estimating equation models (GEE) models, with appropriate link functions and distributional assumptions, were applied to examine changes in outcomes over time and between groups. Additionally, these models were adjusted for any potential confounding variables, such as age, gender, education, employment, income, and marital status. Missing data (n = 2; participants in the control group who moved to a different district at follow-up) were assumed to be missing at random. The current investigation applied intention-to-treat (ITT) analysis.

Ethics statement

The study received approval from the Committee Board of Committee Board of Strada Indonesia University, Indonesia (IRB: 000543/EC/KEPK/I/11/2023; 27 November 2023), and was conducted in accordance with the principles outlined in the Declaration of Helsinki. Each participant provided written informed consent, ensuring the confidentiality of their information. The researcher collected the consent forms after explaining the study's objectives and guaranteeing data confidentiality.

RESULT

Table 1. Comparisons of participants' sociodemographic and clinical data by group (n=138)

Characteristic	Control Group (n=69), n (%)	Intervention Group (n=69), n (%)	p-value [a]
Age (years), (mean, SD)	51.67 (6.21)	51.00 (6.39)	0.535 [b]
Gender			0.860
Male	25 (36.2)	26 (37.7)	
Female	44 (63.8)	43 (62.3)	
Education			
ISCED < 3	34 (49.3)	31 (44.9)	0.609
ISCED ≥ 3	35 (50.7)	38 (55.1)	
Employment status			
Unemployed	29 (42.0)	38 (55.1)	0.125
Employed	40 (58.0)	31 (44.9)	
Income (IDR)			
Low income	31 (44.9)	33 (47.8)	0.733
High income	38 (55.1)	36 (52.2)	
Marital status			
No-married/single	18 (26.1)	28 (40.6)	0.071
Married	51 (73.9)	41 (59.4)	

Note: n: number, SD: standard deviation, IDR: Indonesian rupiah rate, ISCED: international standard classification of education. Data are presented as the mean ± standard deviation (SD) or frequency (n) and percentage (%). P values were estimated using: a Chi squared, or b Independent t-test. p<0.05 indicates statistical significance.

Table 1 presents the sociodemographic characteristics of the participants at baseline. There were no significant differences (p > 0.05) between two groups in sociodemographic or clinical characteristics, including age, gender, education, employment status, income, and marital status. Two participants in the control group were lost to follow-up at week 12. No harm or unintended effects were notable in either group, allowing for inclusion in the intention-to-treat analysis (Table 1).

Table 2. Baseline values of participants' blood pressure and QoL among the two groups by group (N=138)

Characteristic	Control Group (n=69), n (%)	Intervention Group (n=69), n (%)	p-value
Blood pressure (mmHg), (mean, SD)			
SBP	210.62 (20.83)	211.46 (20.43)	0.811
DBP	103.54 (5.44)	102.29 (5.01)	0.164
Quality of life (mean, SD)			
Physical health	56.36 (4.95)	56.61 (6.28)	0.797
Psychological health	58.99 (4.69)	59.76 (6.32)	0.416
Social relationships	57.68 (6.45)	57.49 (7.59)	0.872
Environmental health	61.81 (5.69)	61.45 (4.90)	0.689
Total score of QoL	58.28 (3.57)	58.70 (3.85)	0.515

Note: n: number, SD: standard deviation, SBP: systolic blood pressure, DBP: diastolic blood pressure, QoL: quality of life. Data are presented as the mean ± standard deviation (SD) or frequency (n) and percentage (%). P values were estimated using Independent t-test. p<0.05 indicates statistical significance.

Table 2 exhibits no significant differences in baseline blood pressure measurements or QoL domain scores between the two groups (Table 2). Moreover, the univariate analysis of the outcome evaluations is presented in Table 3. Participants in the control group exhibited a decline in systolic blood pressure (SBP) after 12 weeks, with no significant changes in their diastolic blood pressure (DBP), or any QoL domains. In contrast, the intervention group demonstrated significant reductions in both SBP and DBP, along with improvements across all QoL dimensions after 12-week intervention (Table 3).

Table 3. Blood pressure and QoL before and after the intervention (N = 138)

Variables	Control Group (n=69), mean (SD)			Intervention Group (n=69), mean (SD)		
	Baseline	12-week	Diff (95% CI), p value	Baseline	12-week	Diff (95% CI), p value
Blood pressure (mmHg)						
SBP	210.62 (20.83)	207.83 (20.84)	-2.797 (-3.553 to -2.041), < 0.001	211.46 (20.43)	190.84 (21.48)	-20.623 (-22.235 to -19.012), < 0.001
DBP	103.54 (5.44)	104.49 (6.28)	0.957 (-0.197 to 2.110), 0.103	102.29 (5.01)	95.70 (4.95)	-6.594 (-6.856 to -6.333), < 0.001

Variables	Control Group (n=69), mean (SD) Baseline	12-week	Diff (95% CI), p value	Intervention Group (n=69), mean (SD) Baseline	12-week	Diff (95% CI), p value
Quality of life						
Physical health	56.36 (4.95)	57.27 (4.84)	0.911 (-0.776 to 2.598), 0.286	56.61 (6.28)	79.50 (5.78)	22.899 (20.948 to 24.849), < 0.001
Psychological health	58.99 (4.69)	60.19 (4.39)	1.208 (-0.073 to 2.488), 0.064	59.76 (6.32)	83.77 (8.44)	24.010 (21.586 to 26.434), < 0.001
Social relationships	57.68 (6.45)	57.48 (6.68)	-0.193 (-2.096 to 1.709), 0.840	57.49 (7.59)	80.77 (10.82)	23.285 (19.859 to 26.711), < 0.001
Environmental health	61.81 (5.69)	62.07 (5.57)	0.254 (-1.240 to 1.747), 0.736	61.45 (4.90)	82.43 (8.30)	20.978 (18.707 to 23.249), < 0.001
Total score of QoL	58.28 (3.57)	58.90 (3.49)	0.613 (-0.285 to 1.512), 0.178	58.70 (3.85)	82.07 (7.46)	23.378 (21.379 to 25.377), < 0.001

Note: n: number, SD: standard deviation, Diff: difference between after and before, CI: confidence interval, SBP: systolic blood pressure, DBP: diastolic blood pressure, QoL: quality of life.

Table 4. Effect of the combination of Self-Management with Health Belief-Based Education Program on Blood Pressure and Quality of Life (N=138)

Outcome measure	Model estimates Regression coefficient	Standard error	ß (95% CI)	p value
Blood pressure (mmHg)				
SBP				
Difference between groups at baseline	0.841	3.486	-5.992 to 7.674	0.809
Time effect on control group	-2.797	0.376	-3.534 to -2.060	<0.001
Group x time interaction	-17.826	0.886	-19.562 to -16.090	<0.001
DBP				
Difference between groups at baseline	-1.246	0.883	-2.978 to 0.485	0.158
Time effect on control group	0.957	0.574	-0.169 to 2.082	0.096
Group x time interaction	-7.551	0.589	-8.704 to -6.397	< 0.001
Quality of life (QoL)				
Physical health				
Difference between groups at baseline	0.248	0.955	-1.624 to 2.121	0.795
Time effect on control group	0.911	0.840	-0.734 to 2.556	0.278
Group x time interaction	21.988	1.283	19.473 to 24.502	< 0.001
Psychological health				
Difference between groups at baseline	0.773	0.941	-1.071 to 2.617	0.411
Time effect on control group	1.208	0.637	-0.041 to 2.456	0.058
Group x time interaction	22.802	1.364	20.129 to 25.475	< 0.001
Social relationships				
Difference between groups at baseline	-0.193	1.191	-2.527 to 2.140	0.871
Time effect on control group	-0.194	0.946	-2.048 to 1.662	0.838
Group x time interaction	23.478	1.950	19.657 to 27.300	< 0.001
Environmental health				
Difference between groups at baseline	-0.362	0.897	-2.120 to 1.395	0.686
Time effect on control group	0.254	0.743	-1.202 to 1.709	0.733
Group x time interaction	20.725	1.352	18.074 to 23.375	< 0.001
Total score of QoL				
Difference between groups at baseline	0.412	0.628	-0.818 to 1.642	0.511
Time effect on control group	0.613	0.447	-0.263 to 1.489	0.170
Group x time interaction	22.756	1.091	20.623 to 24.901	< 0.001

Note: Time effects and differences between groups were compared with baseline. n: number of participants, ß: regression coefficient, CI: confidence interval, SBP: systolic blood pressure, DBP: diastolic blood pressure, QoL: quality of life.. ß values and 95% CIs were estimated using generalized estimating equations.

Finally, Table 4 represented that the self-management theory integrated with the HBM-based education program had a significant impact on blood pressure (SBP and DBP) and QoL among individuals with uncontrolled hypertension at post-intervention. The QoL assessed using five variables: physical health, psychological health, social relationships, environmental health, and total QoL. Significant within-group differences in SBP were observed only before and after the 12-week intervention. Moreover, there were no differences in blood pressure or QoL parameters between the intervention group and the control group at baseline. Overall, the significant group-by-time interaction analysis for blood pressure and all QoL domains revealed that participants in the intervention group exhibited significant reductions in SBP and DBP, as well as significant improvement in physical health, psychological health, social relationships, and environmental health after the 12-week intervention (Table 4).

Specifically, the group receiving the self-management theory integrated with the HBM-based education program reported statistically significantly higher total QoL score compared to than their counterparts across both time and group (β = 22.756, 95%CI [20.623, 24.901], p < 0.001). In addition, compared to the control group, participants in the combined self-management theory and HBM-based education program

group also showed significant escalate in physical health (β = 21.988, 95% CI [19.473, 24.502], p < 0.001), psychological health (β = 22.802, 95% CI [20.129, 25.475], p < 0.001), social relationships (β = 23.478, 95% CI [19.657, 27.300], p < 0.001), and environmental health (β = 20.725, 95% CI [18.074, 23.375], p < 0.001) after the 12-week intervention (Table 4).

DISCUSSION

As no research evidence integrating self-management theory with the HBM model to enhance the blood pressure control and QoL in individuals with uncontrolled hypertension was found by investigators in the databases, it was not possible to compare the findings of this investigation with those of closely related studies. The integration of the HBM and self-management constitutes a vital strategy for enhancing the quality of life in individuals with hypertension. The HBM serves as a conceptual framework that affects an individual's cognitive and motivational processes, especially in shaping perceptions of illness, the risk of complications, and the advantages and obstacles of health management behaviors (Wang et al., 2024). Enhancing perceived vulnerability and perceived severity enables patients to comprehend the ramifications of uncontrolled hypertension, thereby cultivating awareness and psychological preparedness for active involvement in disease management through effective self-management (Chan et al., 2023; Vincenzo et al., 2022; dos Santos Ximenes et al., 2024).

Increasing patient confidence in self-managing blood pressure enables the consistent adoption of healthy behaviors, ultimately leading to improved blood pressure control. This physiological improvement directly reduces hypertension-related symptoms, such as headaches, fatigue, and disruptions of daily activities, thereby improving physical function (Foroumandi et al., 2020). It is essential to integrate self-management strategies with the HBM because the HBM considers cognitive and perceptual factors including perceived severity, benefits, barriers, and self-efficacy, that influence health behavior change (Aminuddin et al., 2021; Van Truong et al., 2021). This self-efficacy that integrated approach has the potential to improve the quality of life for patients with uncontrolled hypertension by enhancing adherence, optimizing blood pressure control, and combining behavioral skill development with belief-based education (Van Truong et al., 2021).

A study conducted in China indicated that self-management strategies decreased the likelihood of uncontrolled blood pressure by 0.98 times (Qu et al., 2019). Both SBP and DBP scores decreased after the HBM education in the intervention group, while the control group, which received usual, showed no significant differences. Despite a slight increase in score in the control group, this was likely because they continued to receive the usual care from the community health services providers (Shao et al., 2018). Van Truong et al. (2021) report that trials with interventions lasting less than six months demonstrated a greater effect size for SBP than studies with interventions lasting six months or more. Similarly, interventions shorter than six months showed larger effect sizes compared to longer interventions, as supported by Aminuddin et al. (2021). This may be because shorter-duration interventions make it more likely that individuals will retain and implement the knowledge gained, thereby boosting their self-esteem and motivation to manage their condition (Van Truong et al., 2021). The mechanism by which self-management effectively improves blood pressure regulation primarily involves behavioral modifications and sustained treatment adherence. Patients who comprehend their disease process and possess practical strategies are more likely to adhere to prescribed antihypertensive medications, implement healthier dietary practices (such as sodium restriction), participate in regular physical activity, manage weight effectively, and attend routine follow-up appointments (Van Truong et al., 2021).

Enhanced medication adherence immediately increases pharmacological efficacy by sustaining steady therapeutic drug concentrations, thereby lowering systemic vascular resistance and regulating fluid balance (Qu et al., 2019). Lifestyle modifications attained through self-management such as enhanced diet, augmented physical activity, smoking cessation, and stress management induce physiological changes including improved endothelial function, diminished sympathetic nervous system activation, reduced arterial stiffness, and better metabolic regulation. These mechanisms collectively contribute to reductions in both systolic and diastolic blood pressure (dos Santos Ximenes et al., 2024). Furthermore, self-management supports regular self-monitoring of blood pressure, boosting patients' knowledge of their condition and reinforcing accountability (Long et al., 2017; dos Santos Ximenes et al., 2024). This feedback loop promotes consistent behavior and enables early detection of uncontrolled blood pressure levels, encouraging timely corrective actions (Long et al., 2017). Therefore, integrating the HBM as a theoretical framework with practical self-management support offers a cohesive and scientifically validated approach to hypertension management and blood pressure regulation (Aminuddin et al., 2021; Van Truong et al., 2021).

Our intervention improved participants' QoL at the 12-weeks follow-up in the intervention group. A recent systematic review of 33 studies demonstrated that patients with hypertension exhibited poorer QoL compared to normotensive individuals (Ye et al., 2018). Importantly, QoL is a key therapeutic outcome metric for assessing the success of hypertension treatment (Zhu et al., 2021). A previous study outlined numerous interventions; specifically, it advised patients to limit their daily salt intake to no more than 6 grams, roughly equivalent to the size of a mineral water bottle cap (Chaboksavar et al., 2021). We informed the patients that they could easily achieve enhanced self-management through brief discussions aimed at improving perceived barriers, severity, benefits, and susceptibility, and ultimately improving their QoL. In this context, the QoL of individuals with controlled blood pressure was significantly better than that of patients with uncontrolled blood pressure (Lee et al., 2020; Zhu et al., 2021). The HBM constructs elucidate how patients with hypertension assess the risks and severity of their condition and its complications, evaluate the advantages and obstacles of adhering to antihypertensive medication and lifestyle modifications, cultivate confidence and motivation for self-management, and obtain cues and support from healthcare providers and other resources (Wang et al., 2024). Educational interventions grounded in HBM are essential for promoting health behavior modification in individuals with uncontrolled hypertension. Heightening perceived susceptibility and severity of the disease helps participants better understand the hazards associated with long-term hypertension sequelae, such as stroke and cardiovascular disease, hence enhancing their motivation to actively manage their blood pressure.

The results indicating reduced systolic and diastolic blood pressure in the intervention group imply that increased risk awareness enhances compliance with hypertension management practices (Azadi et al., 2021). Moreover,

elevated blood pressure potentially resulting in symptoms like headaches, fatigue, dizziness, sleep disturbances, and impaired physical endurance. These symptoms directly undermine the physical health dimension of QoL (Ye et al., 2018). Effective blood pressure control through persistent self-management and adherence reduces cardiovascular strain, improves circulation, and alleviates symptom burden, consequently boosting physical functioning and daily activity performance (Lee et al., 2020; Zhu et al., 2021).

Controlling blood pressure effects on more than just the body; it also impacts mental health. Individuals with uncontrolled hypertension often experience anxiety and fear of consequences such as stroke or heart disease, and they may feel more susceptible to illness (Ye et al., 2018; Zhu et al., 2021). Conversely, those with more stable blood pressure tend to feel a greater sense of control over their condition, worry less about their health, and exhibit greater emotional stability. This has indicated that a good effect on the psychological aspect of QoL (Zhu et al., 2021). Effective blood pressure management also reduces the risk of long-term complications, thereby protecting cognitive function and social involvement (Vakulenko et al., 2024). Thus, lowering blood pressure through organized self-management not only improves clinical outcomes but also improves QoL of individuals with hypertension.

This finding revealed that a novel treatment combining self-management theory with HBM can enhance the QoL. However, several limitations should be noted. The short-term assessment of the 12-week educational program necessitates longer-term evaluation. The quasi-experimental design limits the ability to formulate causal conclusions and may introduce selection bias. Furthermore, data could have led to reporting bias. Additionally, the convenience sampling may reduce external validity and generalizability of the findings. We also did not investigate the potential influence of other variables, such as family support and treatment adherence, on QoL. Future randomized controlled trials should explore the impact of these factors more thoroughly.

CONCLUSION AND RECOMMENDATION

A self-management theory integrated with the HBM can result in significant improvements in blood pressure and QoL among Indonesians with uncontrolled hypertension. To some extent, the 12-week health education program delivered by community or public health nurses improves blood pressure control and QoL outcomes. Future studies could incorporate patient and the healthcare team commitment, multi-center programs, and longer durations to evaluate the long-term effects of health coaching on blood pressure control and QoL in individuals with uncontrolled hypertension.

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CONFLICT OF INTEREST

The authors have no conflicts of interest associated with the material presented in this paper.

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