

Association Between Self-Care Management and Blood Pressure Control Among Patients with Hypertension in Primary Care: A Cross-Sectional Study

Putra Agina Widyaswara Suwaryo^{1*}, Barkah Waladani¹, Arif Setyo Upoyo², Fairrul Kadir³

¹Department of Nursing, Universitas Muhammadiyah Gombong, Kebumen, 54412, Central Java, Indonesia

²Department of Nursing, Universitas Jenderal Soedirman, Purwokerto, 53122, Central Java, Indonesia

³Department of Medicine, Universiti Malaysia Sabah, 88400, Kinabalu, Malaysia

*Corresponding Author: ners.putra@gmail.com

Abstract: Hypertension remains a major public health problem, and blood pressure control is frequently suboptimal in primary care. Although self-care management is considered essential for hypertension control, evidence regarding its association with objective blood pressure outcomes remains limited in Indonesian primary care settings. This study aimed to examine the association between self-care management and blood pressure control among patients with hypertension in primary care. A cross-sectional study was conducted among adult patients with hypertension attending a primary healthcare center in Indonesia between October and December 2025. A total of 272 eligible participants were recruited using total sampling. Self-care management was assessed using the Hypertension Self-Management Behavior Questionnaire (HSMBQ), while blood pressure was measured using standardized clinical procedures. The association between self-care management and uncontrolled blood pressure was examined using multivariable logistic regression. Among 272 patients with hypertension, suboptimal self-care management was independently associated with uncontrolled blood pressure after adjustment for demographic and clinical characteristics (AOR = 7.92, 95% CI = 4.32–14.50; $p < 0.001$). The final logistic regression model demonstrated good calibration (Hosmer–Lemeshow $p = 0.72$) and acceptable discrimination (AUC = 0.81). These findings highlight the importance of strengthening nursing interventions focused on self-care education, behavioral monitoring, and patient empowerment to improve blood pressure control in primary care. Integrating structured self-care assessment into routine nursing practice may enhance evidence-based management of hypertension.

Keywords: blood pressure; Hypertension; nursing care; Primary Health Care; self care

Submitted: 27 February 2026

Revision: 10 July 2026

Accepted: 13 July 2026

INTRODUCTION

Hypertension remains one of the leading contributors to cardiovascular morbidity and mortality worldwide ([Mills et al., 2020](#); [Poznyak et al., 2022](#); [Yusuf et al., 2020](#)). Globally, the prevalence of hypertension continues to rise, and a substantial proportion of patients fail to achieve optimal blood pressure control despite the availability of effective pharmacological therapies ([Farrar & Frieden, 2025](#)). Uncontrolled hypertension significantly increases the risk of stroke, myocardial infarction, heart failure, and chronic kidney disease, thereby imposing a considerable burden on healthcare systems and communities ([Cheraghi et al., 2025](#); [Lin et al., 2022](#)). Although clinical guidelines emphasize both pharmacological and non-pharmacological management, blood pressure control rates remain suboptimal in many primary care settings.

In Indonesia, hypertension is one of the most common chronic diseases managed in primary health services ([Upoyo et al., 2021](#)). National estimates indicate that more than 50 million Indonesian adults are living with hypertension, yet only a small proportion achieve adequate blood pressure control despite the availability of treatment. This persistent gap between diagnosis, treatment, and blood pressure control highlights hypertension as one of the major chronic disease challenges facing Indonesian primary healthcare services. Previous studies have shown that medication adherence, dietary modification, physical activity, and regular blood pressure monitoring are essential components of effective hypertension management ([Lu et al., 2025](#); [Ojangba et al., 2023](#)). These components are often conceptualized within the framework of self-care management, which refers to patients' active participation in maintaining health, monitoring symptoms, and adhering to therapeutic recommendations.

Self-care management is a core element of evidence-based nursing practice, particularly in chronic disease management ([Jin et al., 2023](#); [Napolitano et al., 2025](#); [Nguyen et al., 2022](#)). Primary care represents the cornerstone of long-term hypertension management because patients receive continuous follow-up, medication monitoring, lifestyle counseling, and behavioral support in this setting. Nurses are the healthcare professionals who interact most frequently with patients during routine visits and play a pivotal role in strengthening self-care behaviors through education, counseling, motivation, and regular assessment. However, several recent studies have reported that inadequate self-care behaviors remain prevalent among patients with hypertension and are associated with poor treatment outcomes ([Konlan & Shin, 2023](#); [Niriayo et al., 2024](#); [Pahria et al., 2022](#)). Despite growing recognition of the importance of self-care, there remains limited evidence from primary care settings in Indonesia examining the direct relationship between self-care management and blood pressure control using multivariable analytical approaches.

Although previous studies have consistently reported the importance of self-care in hypertension management, several important limitations remain. Many studies have focused primarily on medication adherence or individual lifestyle behaviors rather than evaluating self-care management as a comprehensive multidimensional construct. Other studies have described self-care levels without examining their relationship with objective blood pressure outcomes. Furthermore, evidence from Indonesian primary care settings remains scarce, particularly studies employing multivariable analysis to determine whether self-care management independently contributes to blood pressure control after adjustment for potential confounding factors ([Chen et al., 2023](#); [H.-J. Kim et al., 2025](#)). This gap limits the ability to design targeted nursing interventions based on empirical evidence. Therefore, examining the relationship between self-care management and blood pressure control in primary care is important to strengthen evidence-based nursing strategies aimed at improving hypertension outcomes.

The present study addresses these gaps by examining the relationship between multidimensional self-care management and objective blood pressure control among patients with hypertension in an Indonesian primary care setting using multivariable logistic regression. Unlike previous descriptive studies, this study evaluates whether self-care management remains independently associated with blood pressure control after adjustment for demographic and clinical characteristics. The findings provide evidence to support structured nurse-led self-care assessment and intervention strategies in primary care practice.

The general objective of this study was to analyze the relationship between self-care management and blood pressure control among patients with hypertension in primary care. Specifically, this study aimed to (1) describe the level of self-care management among patients with hypertension, (2) determine the proportion of patients with controlled and uncontrolled blood pressure, and (3) examine the association between self-care management and uncontrolled hypertension after adjusting for demographic and clinical factors. It was hypothesized that patients with suboptimal self-care management would have a higher likelihood of uncontrolled blood pressure compared to those with optimal self-care management.

METHODS

Study Design and Setting

The study was conducted at Health Center, a government-operated primary healthcare facility located in Kebumen Regency, Central Java, Indonesia, serving both urban and surrounding semi-rural communities. The clinic provides comprehensive chronic disease management services, including routine hypertension screening, blood pressure monitoring, medication dispensing, lifestyle counseling, and regular follow-up through integrated non-communicable disease programs. On average, approximately 120–150 adult patients with hypertension attend the clinic each month for routine evaluation and treatment.

During the study period, all adult patients with hypertension attending the primary healthcare center were screened for eligibility. A total of 295 patients were assessed for eligibility. Of these, 15 did not meet the inclusion criteria, and eight declined to participate. Consequently, 272 participants were enrolled and included in the final analysis. No enrolled participants were excluded because of incomplete questionnaire data or missing blood pressure measurements, shown in [Figure 1](#).

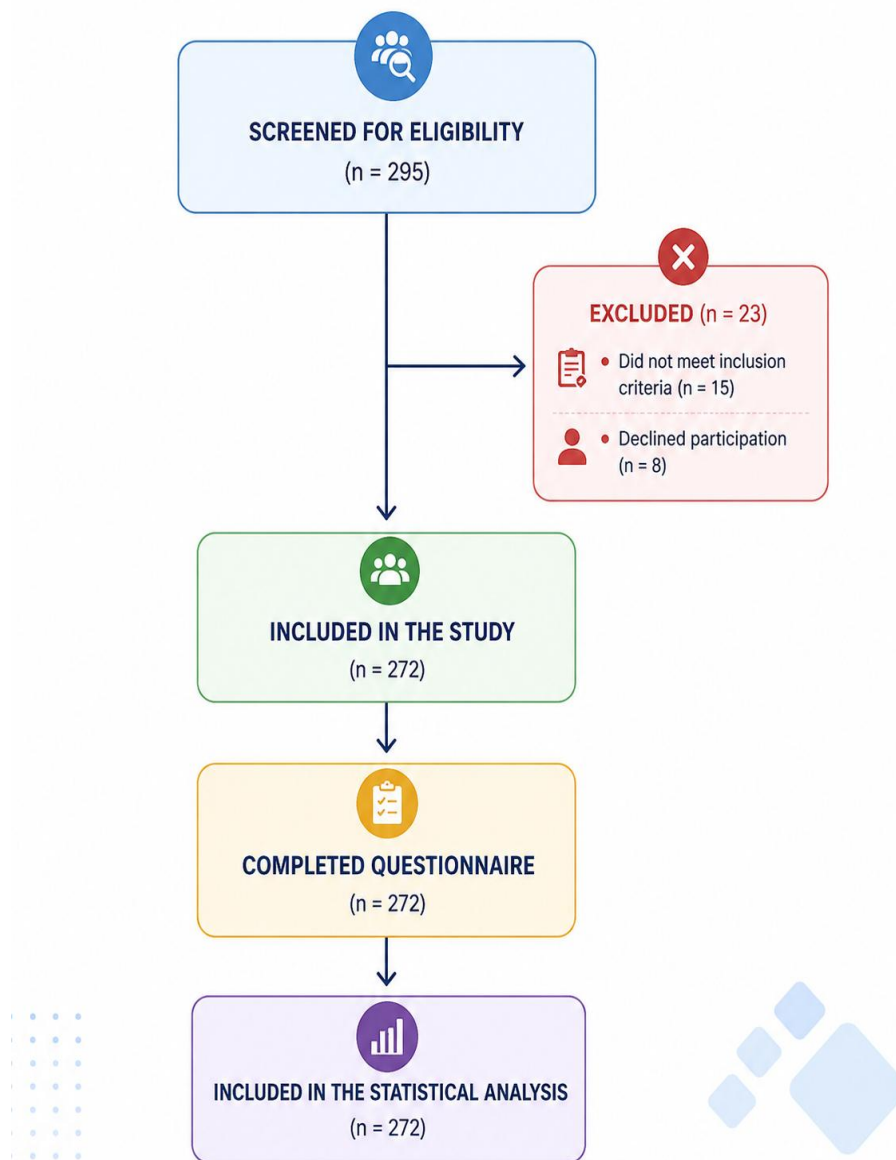


Figure 1. STROBE flow diagram of participant recruitment and inclusion in the study

Participants

The study population consisted of adult patients diagnosed with hypertension who attended the primary care clinic during the study period. The inclusion criteria were: (1) age ≥ 18 years; (2) a documented physician diagnosis of hypertension; and (3) currently receiving antihypertensive treatment, defined as having been prescribed and taking at least one antihypertensive medication continuously for a minimum of one month before enrollment. A total sampling technique was applied, and 272 eligible patients were included in the study. All participants provided informed consent prior to enrollment. Hypertension was confirmed based on a documented physician diagnosis recorded in the patient's medical record before study enrollment. Diagnoses were established according to the clinical criteria adopted by the primary healthcare center, which are consistent with the recommendations of the Indonesian Society of Hypertension and international hypertension management guidelines. Blood pressure was remeasured during the study using standardized clinical procedures to classify participants according to their current blood pressure control status.

A total sampling approach was adopted because the number of eligible patients attending the primary healthcare center during the study period was manageable, and all eligible individuals were invited to participate. Although no formal a priori sample size calculation was performed, the final sample of 272 participants exceeded the minimum sample size recommended for multivariable logistic regression based on the events-per-variable (EPV) principle, thereby providing adequate statistical power and stable parameter estimates. Eligible patients were recruited consecutively during routine hypertension clinic visits throughout the study period. Selection bias was minimized by inviting all patients who met the predefined eligibility criteria to participate using identical recruitment procedures.

Measures

Self-care management was assessed using the Hypertension Self-Management Behavior Questionnaire (HSMBQ), a validated instrument designed to evaluate self-care behaviors among patients with hypertension. The questionnaire consists of four domains: medication adherence, dietary management, physical activity, and blood pressure monitoring. Each item is rated using a Likert-type scale, with higher scores indicating better self-care management. The total score is calculated by summing the responses across all items, yielding an overall measure of self-care behavior. The Indonesian version of the HSMBQ has demonstrated satisfactory validity and internal consistency and has been used in previous studies involving patients with hypertension. Content validity was established through expert review, yielding an Item Content Validity Index (I-CVI) ranging from 0.83 to 1.00 and a Scale Content Validity Index/Average (S-CVI/Ave) of 0.94. Internal consistency reliability was high, with a Cronbach's alpha coefficient of 0.89 for the overall instrument. These findings support the validity and reliability of the HSMBQ for assessing self-care management among Indonesian patients with hypertension. For analytical purposes, total HSMBQ scores were categorized into optimal and suboptimal self-care management according to the recommended scoring criteria of the HSMBQ. Participants whose total scores met or exceeded the predefined cut-off value were classified as having optimal self-care management, whereas those scoring below the cut-off were categorized as having suboptimal self-care management. This classification was adopted from the original instrument and previous validation studies to facilitate clinical interpretation and comparison across studies.

Blood pressure was measured using a calibrated sphygmomanometer according to standard clinical procedures. Two measurements were obtained during the same visit after the participant had rested in a seated position for at least five minutes. The average of the two readings was used for analysis. Blood pressure control was defined based on established clinical thresholds, with systolic blood pressure < 140 mmHg and diastolic blood pressure < 80 mmHg classified as controlled, and values above these thresholds classified as uncontrolled. Demographic and clinical characteristics collected included age, sex, educational level, occupation, and hypertension grade. These variables were considered potential confounders in the association between self-care management and blood pressure control. The primary outcome variable was blood pressure control status. Participants were classified

as having controlled hypertension if their measured blood pressure was below 140/90 mmHg, whereas those with a systolic blood pressure ≥ 140 mmHg and/or diastolic blood pressure ≥ 90 mmHg were classified as having uncontrolled hypertension, in accordance with the hypertension management guidelines adopted by the primary healthcare center.

Statistical Analysis

Logistic regression analysis was performed to examine the association between self-care management and uncontrolled hypertension. Covariates were selected a priori based on previous literature, clinical relevance, and their potential role as confounding variables. The selected covariates included age, sex, educational level, occupation, and hypertension grade.

Three sequential logistic regression models were constructed. Model 1 presented the crude or unadjusted association between each independent variable and uncontrolled hypertension. Model 2 examined the association between self-care management and uncontrolled hypertension after adjustment for age and sex, which were considered basic demographic confounders. Model 3 was the fully adjusted model and additionally included educational level, occupation, and hypertension grade. All covariates in the final model were entered simultaneously using the Enter method. Variables not presented in Model 2 were introduced only in Model 3 as part of the fully adjusted analysis.

Crude odds ratios and adjusted odds ratios with corresponding 95% confidence intervals were reported. Multicollinearity among independent variables was assessed using the variance inflation factor, with values below 5 indicating the absence of problematic multicollinearity. Model calibration was evaluated using the Hosmer–Lemeshow goodness-of-fit test, with a non-significant result indicating an acceptable fit. Model discrimination was assessed using the area under the receiver operating characteristic curve. Statistical significance was defined as $p < 0.05$.

Ethical Considerations

This study was approved by the Health Research Ethics Committee of Universitas Muhammadiyah Gombong (Approval No. 203.6/II.3.AU/F/KEPK/X/2025). All participants received information regarding the study objectives and procedures and provided written informed consent prior to participation. Confidentiality of participant data was maintained throughout the study, and data were analyzed anonymously.

RESULTS

A total of 272 patients with hypertension participated in this study ([Table 1](#)). Of these, 190 (69.8%) had uncontrolled hypertension, while 82 (30.2%) achieved controlled blood pressure. The mean age of participants was 58.3 years (SD = 9.6). Most participants were female (53.3%), had secondary education or lower (62.8%), and were classified as having hypertension grade II–III (41.9%). Comparisons between patients with controlled and uncontrolled hypertension were performed using the independent t-test for continuous variables and the Chi-square test for categorical variables.

Table 1. Characteristics of Patients with Controlled and Uncontrolled Hypertension (n = 272)

Characteristic	Total (n=272)	Controlled (n=82)	Uncontrolled (n=190)	p-value
Age, mean (SD)	58.3 (9.6)	55.1 (8.7)	59.7 (9.8)	0.08
Female, n (%)	145 (53.3%)	42 (51.2%)	103 (54.2%)	0.72
Secondary education or less, n (%)	171 (62.8%)	36 (43.9%)	135 (71.1%)	0.04
Farmer occupation, n (%)	73 (26.8%)	14 (17.1%)	59 (31.1%)	0.21
Hypertension grade II–III, n (%)	114 (41.9%)	19 (23.1%)	95 (50%)	0.03
Suboptimal self-care, n (%)	184 (67.6%)	28 (34.1%)	156 (82.1%)	<0.001

Continuous variables are presented as mean $\pm$ standard deviation (SD) and were compared using the independent t-test. Categorical variables are presented as frequency (percentage) and were compared using the Chi-square test. Statistical significance was defined as $p < 0.05$.

Table 2. Self-Care Management Domains (n = 272)

Self-Care Domain	Mean (SD)	Optimal n (%)	Suboptimal n (%)
Medication adherence	14.8 (2.6)	184 (67.6)	88 (32.4)
Blood pressure monitoring	11.2 (3.1)	102 (37.5)	170 (62.5)
Physical activity	10.5 (2.9)	85 (31.2)	187 (68.8)
Dietary management	12.3 (2.7)	114 (41.9)	158 (58.1)
Total self-care score	48.8 (8.1)	82 (30.1)	190 (69.9)

[Table 2](#) summarizes the distribution of self-care management across the four assessed domains. The highest proportion of optimal behavior was observed in medication adherence (67.6%), whereas physical activity (31.2%) and blood pressure monitoring (37.5%) demonstrated lower proportions of optimal behavior. Overall, 190 participants (69.9%) were classified as having suboptimal self-care management, while 82 (30.1%) demonstrated optimal self-care management. Three logistic regression models were constructed to examine the association between self-care management and uncontrolled hypertension. Model 1 presents the crude association, Model 2 adjusts for age and sex, and Model 3 additionally adjusts for educational level, occupation, and hypertension grade.

Table 3. Logistic Regression Analysis of Factors Associated with Uncontrolled Hypertension (n = 272)

Variable	Crude OR (95% CI)	Model 2 aOR (95% CI)	Model 3 aOR (95% CI)	p-value
Suboptimal self-care	8.85 (4.91–15.93)	8.54 (4.70–15.52)	7.92 (4.32–14.50)	<0.001
Age (per year increase)	1.05 (0.99–1.12)	1.04 (0.98–1.11)	1.03 (0.97–1.10)	0.28
Female	1.21 (0.42–3.45)	1.18 (0.38–3.66)	1.12 (0.35–3.60)	0.85
Secondary education or less	3.07 (1.02–9.20)	—	2.41 (0.74–7.88)	0.14
Farmer occupation	2.18 (1.12–4.25)	—	1.56 (0.78–3.10)	0.20
Hypertension grade II–III	3.45 (1.04–11.40)	—	2.88 (0.81–10.10)	0.10

Notes: OR = odds ratio; aOR = adjusted odds ratio; CI = confidence interval. Model 1 presents crude, unadjusted estimates. Model 2 includes self-care management, age, and sex. Model 3 includes self-care management, age, sex, educational level, occupation, and hypertension grade. A dash (—) indicates that the variable was not included in Model 2 and was introduced only in the fully adjusted Model 3. All variables in Model 3 were entered simultaneously using the Enter method.

Multivariate logistic regression analysis ([Table 3](#)) demonstrated that suboptimal self-care management was significantly associated with uncontrolled hypertension after adjustment for age, sex, educational level, occupation, and hypertension grade (aOR = 7.92; 95% CI: 4.32–14.50; $p < 0.001$). Other variables were not independently associated with uncontrolled hypertension in the adjusted model. The fully adjusted logistic regression model demonstrated satisfactory performance. The Hosmer–Lemeshow goodness-of-fit test was non-significant ($p = 0.72$), indicating acceptable model calibration. The area under the receiver operating characteristic curve was 0.81, indicating good discrimination between participants with controlled and uncontrolled hypertension. Variance inflation factor values ranged from 1.1 to 1.8, indicating no evidence of problematic multicollinearity among the covariates included in the final model.

DISCUSSION

This study found that self-care management was significantly associated with blood pressure control among patients with hypertension in primary care. Patients who demonstrated suboptimal self-care were substantially more likely to experience uncontrolled hypertension, even after adjusting for demographic and clinical characteristics. These findings reinforce the important role of behavioral factors in the management of chronic diseases, particularly in conditions such as hypertension where

long-term adherence and lifestyle modification are essential ([Alkhatib, 2023](#); [Burnier, 2024](#); [S. Kim et al., 2021](#); [Laddu et al., 2021](#)).

Effective hypertension management requires sustained engagement in self-care behaviors in addition to pharmacological therapy ([Al-Makki et al., 2022](#)). Consistent with Orem's Self-Care Deficit Nursing Theory, inadequate self-care capacity may compromise long-term disease control by limiting patients' ability to adhere to recommended treatment and lifestyle modifications ([Hong & Shan, 2021](#); [Ojha et al., 2022](#); [Verma et al., 2021](#)). From a theoretical perspective, self-care can be understood within Orem's Self-Care Deficit Nursing Theory, which emphasizes patients' capacity to perform activities necessary to maintain health and well-being ([Khademian et al., 2020](#); [Nasresabetghadam et al., 2021](#); [Xie et al., 2025](#); [Yip, 2021](#)). The high prevalence of suboptimal self-care observed in this study suggests that many patients may require additional educational and behavioral support within primary care settings.

The finding that nearly seventy percent of participants had uncontrolled hypertension reflects the broader reality observed in many primary care settings, both nationally and globally. Despite clear clinical guidelines, blood pressure control rates remain unsatisfactory. Previous studies have reported that poor adherence to lifestyle recommendations and medication regimens is one of the primary contributors to uncontrolled hypertension ([Egan et al., 2024](#); [Pobrotyn et al., 2021](#)). Our findings are consistent with these studies, demonstrating that patients with lower levels of self-care management were significantly more likely to have uncontrolled blood pressure ([Hazrati Gonbad et al., 2022](#); [Jariyasakulwong et al., 2024](#); [Upoyo et al., 2024](#)). This consistency strengthens the evidence that behavioral management is a critical determinant of hypertension outcomes.

Interestingly, medication adherence in this study showed relatively better performance compared to lifestyle-related domains such as physical activity and blood pressure monitoring. This pattern may reflect a common clinical reality in which patients perceive medication as the primary treatment, while lifestyle modification is considered secondary or optional. Cultural factors, occupational demands, and limited access to safe spaces for exercise may further contribute to low physical activity levels ([Badr et al., 2021](#); [Bantham et al., 2021](#); [Bytyci Katanolli et al., 2022](#); [Gagliardi et al., 2022](#)). In rural or semi-urban contexts, occupational routines such as farming may not necessarily translate into structured physical activity aligned with cardiovascular health recommendations. This highlights the complexity of translating theoretical lifestyle guidance into daily practice.

Although educational level and hypertension grade showed associations in bivariate analysis, these variables were no longer statistically significant after multivariable adjustment. This suggests that while socio-demographic and clinical severity factors play a role, self-care behaviors may represent a more proximal determinant of blood pressure control ([Jariyasakulwong et al., 2024](#); [Konlan & Shin, 2023](#)). The attenuation of these associations in the adjusted model also indicates that behavioral factors may mediate part of the relationship between socio-demographic characteristics and clinical outcomes.

Although the observed association between suboptimal self-care management and uncontrolled hypertension was substantial, the cross-sectional design does not permit conclusions regarding causal or temporal relationships. It is therefore possible that inadequate self-care contributes to poor blood pressure control, that uncontrolled hypertension influences patients' self-care behaviors, or that both are affected by other unmeasured factors. Longitudinal studies are needed to clarify these temporal relationships ([Tan et al., 2021](#)). At the same time, it is also possible that patients with long-standing uncontrolled hypertension may feel discouraged or fatigued, which in turn reduces motivation to maintain self-care routines. This bidirectional possibility highlights the need for longitudinal studies to better understand temporal relationships.

From a nursing perspective, these findings emphasize the strategic role of nurses in chronic disease management. Nurses are often the primary health professionals who provide ongoing education, counseling, and behavioral reinforcement in primary care settings. Structured self-care assessment tools can help identify patients at higher risk of poor blood pressure control ([Avegno et al., 2023](#)). Interventions such as individualized education, motivational interviewing, and family involvement may strengthen patients' confidence and ability to manage their condition effectively

([Huang et al., 2023](#); [Komaç & Duru, 2024](#); [Wu et al., 2025](#)). Evidence from previous interventional studies has shown that nurse-led programs can improve medication adherence and lifestyle behaviors among patients with hypertension ([Kolcu & Ergun, 2020](#); [Nanyonga et al., 2022](#); [Ruswati, 2024](#)). Therefore, integrating systematic self-care assessment into routine nursing practice may represent a practical and evidence-based approach to improving hypertension outcomes.

This study extends the existing evidence in several important ways. First, it provides empirical data from an Indonesian primary care setting, where evidence regarding the relationship between multidimensional self-care management and objective blood pressure control remains limited. Second, unlike many previous studies that focused primarily on medication adherence or descriptive assessments of self-care behaviors, this study evaluated comprehensive self-care management using multivariable logistic regression to account for potential demographic and clinical confounders. These findings provide stronger evidence to support the integration of structured self-care assessment into routine nursing practice for hypertension management ([Warren-Findlow et al., 2020](#)). In contrast to descriptive studies that focus only on self-care levels, this study demonstrates its measurable association with clinical outcomes. The findings support the development of nursing interventions that prioritize behavioral assessment and patient empowerment as core components of hypertension management.

Strengths and Limitations of the study

This study has several strengths. First, it involved a relatively large sample of patients in a real-world primary care setting, enhancing the practical relevance of the findings for nursing services. Second, blood pressure was measured using standardized clinical procedures, ensuring objective outcome assessment. Third, the application of multivariable logistic regression allowed adjustment for clinically relevant demographic and clinical covariates, thereby providing a more robust estimate of the association between self-care management and blood pressure control than descriptive analyses alone. This analytical approach strengthens the internal validity of the findings by reducing the potential influence of measured confounding factors.

However, several limitations should be acknowledged. The cross-sectional design does not allow causal conclusions to be drawn. Self-care behaviors were assessed using self-reported measures, which may introduce recall or social desirability bias. Additionally, the study was conducted in a single primary care setting, which may limit generalizability to other populations or healthcare contexts. Overall, the results underline that improving blood pressure control requires more than medication adjustment. Strengthening patients' capacity for self-care through structured nursing interventions may play a critical role in achieving sustainable hypertension management in primary care.

Implications for nursing practice

For nursing practice, this study underscores the critical role of nurses in strengthening patient self-care behaviors through structured education, behavioral counseling, and continuous monitoring. Integrating routine self-care assessment into primary care services may help identify patients at higher risk of uncontrolled hypertension and enable timely, individualized interventions. Nurse-led strategies such as motivational interviewing, family involvement, and culturally sensitive education programs may enhance patient empowerment and long-term adherence.

CONCLUSION

This study demonstrated a significant association between self-care management and blood pressure control among patients with hypertension in primary care. Patients with suboptimal self-care management were more likely to have uncontrolled blood pressure after adjustment for relevant demographic and clinical characteristics. Because this study employed a cross-sectional design, the findings should be interpreted as statistical associations rather than causal relationships.

The present study contributes new evidence from an Indonesian primary care setting by demonstrating that comprehensive self-care management, assessed using a multidimensional approach and analyzed through multivariable logistic regression, is independently associated with blood pressure

control. These findings extend previous evidence that has primarily focused on medication adherence or descriptive assessments of self-care behaviors.

From a nursing perspective, the findings support the integration of structured self-care assessment into routine primary care services to identify patients at higher risk of uncontrolled hypertension. Nurse-led interventions, including individualized education, behavioral counseling, motivational support, and regular self-care monitoring, may strengthen patient self-management and contribute to improved hypertension care. Future longitudinal and interventional studies are warranted to confirm these associations and evaluate the effectiveness of nurse-led self-care programs in improving long-term blood pressure outcomes.

DATA AVAILABILITY STATEMENT

The datasets generated and analyzed during the current study are not publicly available because they contain de-identified patient information collected under institutional ethical approval. However, the data are available from the corresponding author upon reasonable request and with permission from the relevant institutional authority.

ETHICAL STATEMENT

This study was approved by the Health Research Ethics Committee of Universitas Muhammadiyah Gombong (Approval No. 203.6/II.3.AU/F/KEPK/X/2025). All participants received a complete explanation regarding the study objectives and procedures and provided written informed consent prior to participation. Participant confidentiality and anonymity were strictly maintained throughout the study. Data were analyzed and reported without revealing personal identifiers.

AUTHOR CONTRIBUTION

PAWS: Conceptualization, methodology, data collection, formal analysis, writing – original draft, and supervision.

BW: Methodology, validation, data curation, writing – review and editing.

AS: Data analysis support, validation, writing – review and editing.

FK: Data analysis support, validation, writing – review and editing.

All authors have read and approved the final manuscript.

DECLARATION OF CONFLICT OF INTEREST

The authors declare that there is no conflict of interest related to this study.

FUNDING

This research received no external funding.

ACKNOWLEDGMENT

The authors would like to thank all patients who participated in this study and the healthcare staff at the primary care clinic for their cooperation and support during data collection.

REFERENCES

- Alkhatib, A. (2023). Optimizing Lifestyle Behaviors in Preventing Multiple Long-Term Conditions. *Encyclopedia*, 3(2), 468–477. <https://doi.org/10.3390/encyclopedia3020032>
- Al-Makki, A., DiPette, D., Whelton, P. K., Murad, M. H., Mustafa, R. A., Acharya, S., Beheiry, H. M., Champagne, B., Connell, K., Cooney, M. T., Ezeigwe, N., Gaziano, T. A., Gidio, A., Lopez-Jaramillo, P., Khan, U. I., Kumarapeli, V., Moran, A. E., Silwimba, M. M., Rayner, B., ... Khan, T. (2022). Hypertension Pharmacological Treatment in Adults: A World Health Organization Guideline Executive Summary. *Hypertension*, 79(1), 293–301. <https://doi.org/10.1161/HYPERTENSIONAHA.121.18192>

- Avegno, K. S., Roberson, K. B., Onsomu, E. O., Edwards, M. F., Dean, E. L., & Bertoni, A. G. (2023). Evaluating a Telephone and Home Blood Pressure Monitoring Intervention to Improve Blood Pressure Control and Self-Care Behaviors in Adults with Low-Socioeconomic Status. *International Journal of Environmental Research and Public Health*, 20(7). <https://doi.org/10.3390/ijerph20075287>
- Badr, H. E., Rao, S., & Manee, F. (2021). Gender differences in quality of life, physical activity, and risk of hypertension among sedentary occupation workers. *Quality of Life Research*, 30(5), 1365–1377. <https://doi.org/10.1007/s11136-020-02741-w>
- Bantham, A., Taverno Ross, S. E., Sebastião, E., & Hall, G. (2021). Overcoming barriers to physical activity in underserved populations. *Progress in Cardiovascular Diseases*, 64, 64–71. <https://doi.org/10.1016/j.pcad.2020.11.002>
- Burnier, M. (2024). The role of adherence in patients with chronic diseases. *European Journal of Internal Medicine*, 119, 1–5. <https://doi.org/10.1016/j.ejim.2023.07.008>
- Bytyci Katanolli, A., Probst-Hensch, N., Ann Obas, K., Gerold, J., Zahorka, M., Jerliu, N., Ramadani, Q., Fota, N., & Merten, S. (2022). Perceived barriers to physical activity behaviour among patients with diabetes and hypertension in Kosovo: A qualitative study. *BMC Primary Care*, 23(1), 257. <https://doi.org/10.1186/s12875-022-01866-w>
- Chen, T.-Y., Kao, C.-W., Cheng, S.-M., & Liu, C.-Y. (2023). Factors influencing self-care among patients with primary hypertension: Path analysis of mediating roles of self-efficacy and depressive symptoms. *European Journal of Cardiovascular Nursing*, 22(6), 620–627. <https://doi.org/10.1093/eurjcn/zvad011>
- Cheraghi, Z., Azmi-Naei, B., Cheraghi, P., & Doosti-Irani, A. (2025). The global prevalence of uncontrolled hypertension: A systematic review and meta-analysis. *BMC Public Health*, 25(1), 4259. <https://doi.org/10.1186/s12889-025-25553-4>
- Egan, B. M., Mattix-Kramer, H. J., Basile, J. N., & Sutherland, S. E. (2024). Managing Hypertension in Older Adults. *Current Hypertension Reports*, 26(4), 157–167. <https://doi.org/10.1007/s11906-023-01289-7>
- Farrar, J., & Frieden, T. (2025). WHO global report on hypertension 2025. *The Lancet*, 406(10517), 2318–2319. [https://doi.org/10.1016/S0140-6736\(25\)02208-1](https://doi.org/10.1016/S0140-6736(25)02208-1)
- Gagliardi, A. R., Morrison, C., & Anderson, N. N. (2022). The design and impact of culturally-safe community-based physical activity promotion for immigrant women: Descriptive review. *BMC Public Health*, 22(1), 430. <https://doi.org/10.1186/s12889-022-12828-3>
- Hazrati Gonbad, S., Zakerimoghadam, M., Pashaepoor, S., & Haghani, S. (2022). The Effects of Home-Based Self-Care Education on Blood Pressure and Self-Care Behaviors among Middle-Aged Patients with Primary Hypertension in Iran: A Randomized Clinical Controlled Trial. *Home Health Care Management & Practice*, 34(1), 9–16. <https://doi.org/10.1177/10848223211012727>
- Hong, D., & Shan, W. (2021). Improvement in Hypertension Management with Pharmacological and Non- Pharmacological Approaches: Current Perspectives. *Current Pharmaceutical Design*, 27(4), 548–555. <https://doi.org/10.2174/138161282666200922153045>
- Huang, X., Xu, N., Wang, Y., Sun, Y., & Guo, A. (2023). The effects of motivational interviewing on hypertension management: A systematic review and meta-analysis. *Patient Education and Counseling*, 112, 107760. <https://doi.org/10.1016/j.pec.2023.107760>
- Jariyasakulwong, P., Wattanakitkrileart, D., Pongthavornkamol, K., Piaseu, N., & Roubsanthisuk, W. (2024). Factors Influencing Self-Care Practices and Blood Pressure Among Individuals with Uncontrolled Hypertension: A Cross-Sectional Study. *Patient Preference and Adherence*, 19, 1–17. <https://doi.org/10.2147/PPA.S497555>
- Jin, Y., Bhattarai, M., Kuo, W., & Bratzke, L. C. (2023). Relationship between resilience and self-care in people with chronic conditions: A systematic review and meta-analysis. *Journal of Clinical Nursing*, 32(9–10), 2041–2055. <https://doi.org/10.1111/jocn.16258>
- Khademian, Z., Kazemi Ara, F., & Gholamzadeh, S. (2020). The Effect of Self Care Education Based on Orem's Nursing Theory on Quality of Life and Self-Efficacy in Patients with Hypertension: A

- Quasi-Experimental Study. *International Journal of Community Based Nursing and Midwifery*, 8(2), 140–149. <https://doi.org/10.30476/IJCBNM.2020.81690.0>
- Kim, H.-J., Kim, B. S., Kim, H., Lee, J., Shin, J.-H., & Sung, K.-C. (2025). Impact of blood pressure and medication adherence on clinical outcomes in patients with hypertension. *Frontiers in Medicine*, 12. <https://doi.org/10.3389/fmed.2025.1564791>
- Kim, S., Park, M., & Song, R. (2021). Effects of self-management programs on behavioral modification among individuals with chronic disease: A systematic review and meta-analysis of randomized trials. *PLOS ONE*, 16(7), e0254995. <https://doi.org/10.1371/journal.pone.0254995>
- Kolcu, M., & Ergun, A. (2020). Effect of a nurse-led hypertension management program on quality of life, medication adherence and hypertension management in older adults: A randomized controlled trial. *Geriatrics & Gerontology International*, 20(12), 1182–1189. <https://doi.org/10.1111/ggi.14068>
- Komaç, F., & Duru, P. (2024). The effect of education based on a health belief model and motivational interviews on cardiovascular disease risk factors and healthy lifestyle behaviour changes in patients with essential hypertension: A randomized controlled trial. *Patient Education and Counseling*, 120, 108126. <https://doi.org/10.1016/j.pec.2023.108126>
- Konlan, K. D., & Shin, J. (2023). Determinants of Self-Care and Home-Based Management of Hypertension: An Integrative Review. *Global Heart*, 18(1), 16. <https://doi.org/10.5334/gh.1190>
- Laddu, D., Ma, J., Kaar, J., Ozemek, C., Durant, R. W., Campbell, T., Welsh, J., Turrise, S., & on behalf of the American Heart Association Behavioral Change for Improving Health Factors Committee of the Council on Epidemiology and Prevention and the Council on Lifestyle and Cardiometabolic Health; Council on Arteriosclerosis, Thrombosis and Vascular Biology; Council on Hypertension; and Stroke Council. (2021). Health Behavior Change Programs in Primary Care and Community Practices for Cardiovascular Disease Prevention and Risk Factor Management Among Midlife and Older Adults: A Scientific Statement From the American Heart Association. *Circulation*, 144(24), e533–e549. <https://doi.org/10.1161/CIR.0000000000001026>
- Lin, Q., Ye, T., Ye, P., Borghi, C., Cro, S., Damasceno, A., Khan, N., Nilsson, P. M., Prabhakaran, D., Ramirez, A., Schlaich, M. P., Schutte, A. E., Stergiou, G., Weber, M. A., Beaney, T., & Poulter, N. R. (2022). Hypertension in stroke survivors and associations with national premature stroke mortality: Data for 2.5 million participants from multinational screening campaigns. *The Lancet Global Health*, 10(8), e1141–e1149. [https://doi.org/10.1016/S2214-109X\(22\)00238-8](https://doi.org/10.1016/S2214-109X(22)00238-8)
- Lu, X., Wang, J., Chen, S., Lv, L., & Yu, J. (2025). Effect of Comprehensive Health Management on Medication Adherence and Healthy Lifestyle Behavior of Patients With Hypertension. *International Journal of Hypertension*, 2025(1), 1165809. <https://doi.org/10.1155/ijhy/1165809>
- Mills, K. T., Stefanescu, A., & He, J. (2020). The global epidemiology of hypertension. *Nature Reviews Nephrology*, 16(4), 223–237. <https://doi.org/10.1038/s41581-019-0244-2>
- Nanyonga, R. C., Spies, L. A., & Nakaggwa, F. (2022). The effectiveness of nurse-led group interventions on hypertension lifestyle management: A mixed method study. *Journal of Nursing Scholarship*, 54(3), 286–295. <https://doi.org/10.1111/jnu.12732>
- Napolitano, D., Bozzetti, M., Cascio, A. L., Stefano, G. D., Orgiana, N., Lopetuso, L. R., D’Onofrio, A. M., Camardese, G., Papa, A., Scaldaferri, F., Cocchieri, A., & Bartoli, D. (2025). Resilience and Self-Care in Patients with Inflammatory Bowel Disease: A Multicentre Cross-Sectional Study in Outpatient Settings. *Journal of Clinical Medicine*, 14(11). <https://doi.org/10.3390/jcm14113868>
- Nasresabetghadam, S., Jahanshahi, M., Fotokian, Z., Nasiri, M., & Hajiahmadi, M. (2021). The Effects of Orem’s Self-care Theory on Self-care Behaviors among Older Women with Hypertension: A Randomized Controlled Trial. *Nursing and Midwifery Studies*, 10(2), 99. https://doi.org/10.4103/nms.nms_9_20
- Nguyen, T. N. M., Whitehead, L., Saunders, R., & Dermody, G. (2022). Systematic review of perception of barriers and facilitators to chronic disease self-management among older adults:

- Implications for evidence-based practice. *Worldviews on Evidence-Based Nursing*, 19(3), 191–200. <https://doi.org/10.1111/wvn.12563>
- Niriayo, Y. L., Yemane, B., Asgedom, S. W., Teklay, G., & Gidey, K. (2024). Prevalence and predictors of poor self-care behaviors in patients with chronic heart failure. *Scientific Reports*, 14(1), 1984. <https://doi.org/10.1038/s41598-024-52611-5>
- Ojangba, T., Boamah, S., Miao, Y., Guo, X., Fen, Y., Agboyibor, C., Yuan, J., & Dong, W. (2023). Comprehensive effects of lifestyle reform, adherence, and related factors on hypertension control: A review. *The Journal of Clinical Hypertension*, 25(6), 509–520. <https://doi.org/10.1111/jch.14653>
- Ojha, U., Ruddaraju, S., Sabapathy, N., Ravindran, V., Worapongsatitaya, P., Haq, J., Mohammed, R., & Patel, V. (2022). Current and Emerging Classes of Pharmacological Agents for the Management of Hypertension. *American Journal of Cardiovascular Drugs*, 22(3), 271–285. <https://doi.org/10.1007/s40256-021-00510-9>
- Pahria, T., Nugroho, C., & Yani, D. I. (2022). Factors Influencing Self-Care Behaviors in Hypertension Patients With Complications. *Vascular Health and Risk Management*, 18, 463–471. <https://doi.org/10.2147/VHRM.S366811>
- Pobrotyn, P., Pasieczna, A., Diakowska, D., Uchmanowicz, B., Mazur, G., Banasik, M., & Koltuniuk, A. (2021). Evaluation of Frailty Syndrome and Adherence to Recommendations in Elderly Patients with Hypertension. *Journal of Clinical Medicine*, 10(17). <https://doi.org/10.3390/jcm10173771>
- Poznyak, A. V., Sadykhov, N. K., Kartuesov, A. G., Borisov, E. E., Melnichenko, A. A., Grechko, A. V., & Orekhov, A. N. (2022). Hypertension as a risk factor for atherosclerosis: Cardiovascular risk assessment. *Frontiers in Cardiovascular Medicine*, 9. <https://doi.org/10.3389/fcvm.2022.959285>
- Ruswati, R. (2024). The Role of Nurses in Enhancing Medication Adherence and Patient Outcomes in Hypertension Management. *International Journal of Nursing and Midwifery Research*, 2(3), 78–87. <https://doi.org/10.35335/ners.v2i3.286>
- Tan, F. C. J. H., Oka, P., Dambha-Miller, H., & Tan, N. C. (2021). The association between self-efficacy and self-care in essential hypertension: A systematic review. *BMC Family Practice*, 22(1), 44. <https://doi.org/10.1186/s12875-021-01391-2>
- Upoyo, A. S., Sari, Y., Taufik, A., Anam, A., & Kuswati, A. (2024). The Effect of Online Group Education on Promoting Knowledge, Motivation, Self-Efficacy, Self-Care Behaviors and Preventing Uncontrolled Blood Pressure in Hypertensive Patients: A Quasi-Experiment Study. *Sage Open Nursing*, 10, 23779608241299288. <https://doi.org/10.1177/23779608241299288>
- Upoyo, A. S., Setyopranoto, I., & Pangastuti, H. S. (2021). The Modifiable Risk Factors of Uncontrolled Hypertension in Stroke: A Systematic Review and Meta-Analysis. *Stroke Research and Treatment*, 2021(1), 6683256. <https://doi.org/10.1155/2021/6683256>
- Verma, N., Rastogi, S., Chia, Y.-C., Siddique, S., Turana, Y., Cheng, H., Sogunuru, G. P., Tay, J. C., Teo, B. W., Wang, T.-D., Tsoi, K. K. F., & Kario, K. (2021). Non-pharmacological management of hypertension. *The Journal of Clinical Hypertension*, 23(7), 1275–1283. <https://doi.org/10.1111/jch.14236>
- Warren-Findlow, J., Krinner, L. M., Vinoski Thomas, E., Coffman, M. J., Gordon, B., & Howden, R. (2020). Relative and Cumulative Effects of Hypertension Self-Care Behaviors on Blood Pressure. *Western Journal of Nursing Research*, 42(3), 157–164. <https://doi.org/10.1177/0193945919851111>
- Wu, J., Zhu, X., Wu, Q., & Xiao, F. (2025). Interdisciplinary collaborative care model combined with family empowerment in patients with comorbid hypertension and diabetes: A study on blood pressure/glucose control and psychosocial adaptation based on the COM-B model. *Clinical and Experimental Hypertension*, 47(1), 2570212. <https://doi.org/10.1080/10641963.2025.2570212>
- Xie, Y., Wang, D., Zhou, J., Zhou, T., Huang, Y., Zhang, K., & Li, H. (2025). Impact of nursing based on Orem's self-care theory on self-care behaviours in older patients with heart failure: A randomised controlled trial. *Australasian Journal on Ageing*, 44(3), e70059. <https://doi.org/10.1111/ajag.70059>

- Yip, J. Y. C. (2021). Theory-Based Advanced Nursing Practice: A Practice Update on the Application of Orem's Self-Care Deficit Nursing Theory. *Sage Open Nursing*, 7, 23779608211011993. <https://doi.org/10.1177/23779608211011993>
- Yusuf, S., Joseph, P., Rangarajan, S., Islam, S., Mente, A., Hystad, P., Brauer, M., Kuttly, V. R., Gupta, R., Wielgosz, A., AlHabib, K. F., Dans, A., Lopez-Jaramillo, P., Avezum, A., Lanas, F., Oguz, A., Kruger, I. M., Diaz, R., Yusoff, K., ... Dagenais, G. (2020). Modifiable risk factors, cardiovascular disease, and mortality in 155 722 individuals from 21 high-income, middle-income, and low-income countries (PURE): A prospective cohort study. *The Lancet*, 395(10226), 795–808. [https://doi.org/10.1016/S0140-6736\(19\)32008-2](https://doi.org/10.1016/S0140-6736(19)32008-2)



Copyright:© 2026 by the authors. Submitted for possible open access publication under the terms and conditions of the Creative Commons Attribution (CC BY) license (<https://creativecommons.org/licenses/by/4.0/>).