Original Article

Minahasa Culture, Family Support, Health Worker Support, Self-Efficacy, and Knowledge Associated with Self-Care Behavior among Hypertensive Patients: A Cross-Sectional Study

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ABSTRACT

Background: Hypertension is a leading cause of stroke and cardiovascular disease, and its high prevalence in Indonesia remains difficult to control. Evidence on how psychosocial and cultural factors, including Minahasa local culture, influence self-care is still limited. This study examined the effects of knowledge, self-efficacy, family support, health worker support, and Minahasa culture on self-care behavior among hypertensive patients in Southeast Minahasa Regency.

Methods: A quantitative correlational cross-sectional study was conducted among 165 hypertensive patients recruited by consecutive purposive sampling from the outpatient clinic of a general hospital in Southeast Minahasa. Data were collected using validated questionnaires, and associations between predictors and self-care behavior were analyzed using multiple linear regression ($p < 0.05$).

Results: Self-efficacy ($\beta = 0.381$; $p < 0.001$) and family support ($\beta = 0.329$; $p < 0.001$) had significant positive effects on self-care behavior. Knowledge ($\beta = -0.009$; $p = 0.895$), health worker support ($\beta = -0.065$; $p = 0.643$), and Minahasa culture ($\beta = 0.127$; $p = 0.405$) showed no significant direct effects. The model explained 34.7% of variance in self-care behavior ($R^2 = 0.347$).

Conclusion: Self-efficacy and family support are the main determinants of self-care behavior, whereas knowledge, health worker support, and Minahasa culture do not exert significant direct effects. These findings indicate that local cultural values alone do not automatically improve self-care and may act indirectly through family and psychosocial pathways. Hypertension programs should prioritize strengthening self-efficacy and mobilizing family support, and future longitudinal studies should test culturally grounded, family-centered interventions

Keywords: Self-Care Behaviour; Hypertensive Patients; Minahasa Culture.

Implications for Practice:

- Enhancing self-efficacy in hypertensive patients by providing targeted health education and emotional support can significantly improve their adherence to self-care behaviors and hypertension management.
- Family support plays a key role in managing hypertension, emphasizing the need for healthcare providers to actively engage family members in patient care and decision-making processes.
- Training healthcare providers to improve communication and offer clear, actionable advice could help overcome barriers to effective hypertension management and improve self-care practices among patients

Introduction

Hypertension, or high blood pressure, is a major global health problem that significantly affects individuals, families, and society (Chaturvedi et al., 2024). It increases the risk of cardiovascular disease, stroke, and kidney failure, thereby reducing quality of life, productivity, and national competitiveness (World Health Organization, 2025). The long-term treatment costs and productivity losses associated with hypertension place a substantial economic burden on health systems and families, while the threat of complications creates ongoing psychological distress and stress for patients and their caregivers. Often referred to as the "silent killer," hypertension frequently presents without symptoms but can lead to severe and life-threatening complications. In Indonesia, an estimated 63 million people live with hypertension, making it a critical public health concern (Feigin et al., 2021). Although the prevalence of hypertension among Indonesians aged over 18 years decreased slightly from 34.1% in 2018 to 30.8% in 2023 (Kementerian Kesehatan Republik Indonesia, 2018, 2024), it remains a leading cause of stroke, heart disease, kidney failure, blindness, and substantial psychosocial and economic burden for patients and their families (Darma Perbasya, 2022).

In North Sulawesi, particularly in Minahasa Tenggara Regency, hypertension cases have continued to rise, reflecting not only a growing clinical caseload but also a mounting burden on local health services and families who must manage the long-term consequences of hypertension. From January to August 2024, there were 68,221 hypertension cases recorded in North Sulawesi, while in Southeast Minahasa Regency, cases increased from 13,580 in 2022 to 15,070 in 2023, with 8,658 cases already documented by August 2024. At Mitra Sehat Minahasa Tenggara Hospital, the number of hypertensive patients grew from 735 in 2021 to 1,088 in 2023, with 732 patients recorded by August 2024. Self-care behavior is a key component in preventing complications and controlling blood pressure among people with hypertension. Self-care includes adopting a healthy diet, managing stress, engaging in regular physical activity, reducing salt intake, avoiding tobacco and excessive alcohol, and adhering to prescribed medication (Pahria et al., 2022). Poor self-care behavior contributes to uncontrolled hypertension and increases the risk of cardiovascular events and other complications (Afik & Fikriana, 2021; de Santana Silva et al., 2024). Evidence from Indonesia shows that many hypertensive patients have low levels of self-care behavior, which is associated with poorly controlled blood pressure and a higher incidence of complications (Khotibul Umam et al., 2023; Sarfika et al., 2023).

Theoretically, self-care behavior in hypertension can be understood through the Health Belief Model (HBM), Social Cognitive Theory (SCT), and stress-coping perspectives. The HBM posits that perceived susceptibility and severity of disease, perceived benefits and barriers to action, and cues to action influence health behaviors. In the context of hypertension, patients' decisions to adhere to medication, modify diet, and maintain physical activity are shaped by how they perceive their risk of complications and the benefits of self-care. SCT emphasizes the role of self-efficacy, observational learning, and reciprocal interactions between individual, behavior, and environment; within this framework, individuals who believe in their ability to perform self-care (high self-efficacy) are more likely to engage in and maintain these behaviors consistently (Susanti et al., 2024; Tan et al., 2021). Complementing these models, Lazarus and Folkman's stress-coping theory

conceptualizes hypertension as a chronic stressor that requires ongoing cognitive appraisal and coping efforts, where individuals' coping responses (e.g., active problem-focused strategies such as self-care or avoidant strategies such as denial) are shaped by their resources, including knowledge, social support, and cultural context.

Self-efficacy is therefore a central determinant of self-care in hypertensive patients, and high self-efficacy is associated with better adherence to treatment, more consistent lifestyle modifications, and improved blood pressure control (Susanti et al., 2024; Tan et al., 2021). Social support from family and health workers further strengthens self-care through emotional encouragement, practical assistance, and continuous reminders, which function as cues to action, coping resources, and sources of vicarious learning (Lindblom et al., 2024; Sistikawati et al., 2021; Tiwi et al., 2022). In Indonesia, existing studies have highlighted the importance of knowledge, self-efficacy, and social support for hypertension management (Afik & Fikriana, 2021; de Santana Silva et al., 2024; Khotibul Umam et al., 2023; Lindblom et al., 2024; Pahria et al., 2022; Sarfika et al., 2023; Sistikawati et al., 2021; Susanti et al., 2024; Tiwi et al., 2022). However, these factors are often examined separately, and prior studies have yielded varying conclusions about which factor, knowledge, self-efficacy, or social support, is most strongly associated with self-care behavior, suggesting that additional contextual factors, such as local culture and stress-coping resources, may shape how these determinants operate in specific communities. In the Minahasa community, the cultural system of Mapalus, characterized by cooperation, collective leadership, and strong solidarity, plays an important role in daily life and may serve as a key coping resource that helps individuals and families appraise hypertension as a manageable condition and mobilize collective strategies to deal with its demands.

Beyond individual beliefs and general social support, local culture can shape health behavior by influencing norms, shared values, and collective expectations. From an HBM perspective, Minahasa cultural values such as Mapalus may function as cues to action and shape perceived benefits and social norms around maintaining health; from an SCT perspective, they can strengthen collective and individual self-efficacy through cooperative activities, role modelling, and mutual reinforcement of positive behaviors; and from a stress-coping perspective, they may help reduce the psychosocial burden of hypertension through shared coping and mutual support (Afik & Fikriana, 2021; de Santana Silva et al., 2024; Khotibul Umam et al., 2023; Lindblom et al., 2024; Pahria et al., 2022; Sarfika et al., 2023; Sistikawati et al., 2021; Susanti et al., 2024; Tiwi et al., 2022). However, there is still limited empirical evidence on how these Minahasa cultural values are linked to self-care behavior in hypertensive patients, especially in Southeast Minahasa Regency, and previous studies in Indonesia have not specifically examined (1) how local Minahasa cultural values, particularly Mapalus, influence self-care behavior in hypertension; (2) the mechanisms by which culture interacts with knowledge, self-efficacy, family support, and health worker support within the frameworks of the HBM, SCT, and stress-coping theory; and (3) context-specific evidence from Southeast Minahasa Regency, where hypertension prevalence and case numbers are high. Guided by the Health Belief Model, Social Cognitive Theory, and Lazarus and Folkman's stress-coping theory, this study aims to fill these gaps by analyzing the influence of knowledge, self-efficacy, family support,

health worker support, and Minahasa culture on self-care behavior among hypertensive patients in Southeast Minahasa Regency. The study hypothesizes that higher levels of knowledge, self-efficacy, family support, health worker support, and stronger adherence to Minahasa cultural values are each positively associated with better self-care behavior in hypertensive patients, and that integrating local cultural wisdom and stress-coping resources into established behavioral theories can inform more culturally sensitive and sustainable hypertension management strategies in the Minahasa community.

Methods

Study Design

This study used a quantitative analytic observational design with a correlational descriptive, cross-sectional approach. The aim was to analyze the relationships between the independent variables (knowledge, self-efficacy, family support, health worker support, and Minahasa culture) and the dependent variable (self-care behavior) in hypertensive patients at a single point in time (Agnesia et al., 2023; Liberty, 2024). The design included both a descriptive component (describing sociodemographic characteristics and distributions of all study variables) and an analytic component (testing associations between variables using correlation, multiple linear regression, and SEM-PLS). This cross-sectional quantitative study followed STROBE (Strengthening the Reporting of Observational Studies in Epidemiology) reporting standards for cross-sectional studies (von Elm et al., 2007)

Participants

The study was conducted at Mitra Sehat Type D Regional General Hospital in Southeast Minahasa Regency, North Sulawesi, Indonesia. Data were collected in the outpatient clinic, which provides follow-up care, medication refills, and blood pressure monitoring for hypertensive patients.

The accessible population comprised 281 hypertensive patients registered at the outpatient clinic. A consecutive purposive sampling strategy was used: all patients attending the clinic during the data collection period who met the eligibility criteria were invited to participate. On each clinic day, trained research assistants screened patients for eligibility based on medical records and brief interviews, explained the study, and obtained written informed consent from those willing to participate.

Inclusion criteria were: (1) aged 18–69 years; (2) diagnosed with hypertension by a physician; (3) undergoing treatment for hypertension for at least six months; (4) able to communicate in Indonesian; (5) physically and cognitively able to complete the questionnaire (with assistance if required); and (6) provided written informed consent. Exclusion criteria were: (1) documented severe cognitive impairment or acute psychiatric conditions that interfered with communication or comprehension; (2) critically ill or hemodynamically unstable at the time of data collection; and (3) refusal to participate or withdrawal of consent.

From the total clinic population of 281 patients, a final sample of 165 hypertensive patients was obtained. The initial estimation referred to Slovin's formula for a finite population (Amirin, 2011; Slovin, L.A., 1960). In addition, an a priori power consideration was applied for multiple linear regression and SEM-PLS with five main predictors. Using a conventional assumption of a medium effect size (f^2 = 0.15), α = 0.05, and 80% power, the minimum required sample for multiple regression is approximately 90–100

participants; recommendations for SEM-PLS also suggest a minimum of at least 10 times the number of predictors (≥ 50 participants). Thus, the achieved sample of 165 participants exceeded these minimum requirements and was considered adequate to detect meaningful associations between predictors and self-care behavior.

Participants were recruited consecutively on routine clinic days during the data collection period. All attending hypertensive patients were screened for eligibility; those who met the inclusion criteria and did not meet any exclusion criteria were invited to participate. Of the eligible patients approached, 165 provided written informed consent and completed the questionnaire. No participants who consented withdrew during data collection, and no questionnaires were excluded due to substantial missing data; therefore, all 165 participants were included in the final analysis.

Instruments

Data were collected using a structured questionnaire consisting of seven parts: sociodemographic data, hypertension knowledge, self-efficacy, self-care behavior, family support, health worker support, and Minahasa culture. All multi-item scales were based on previously validated instruments (Hypertension Knowledge Questionnaire, High Blood Pressure Self-Care Profile, Perceived Social Support–Family Scale, and Patient Assessment of Chronic Illness Care) and one culture-specific scale developed for this study. Sociodemographic data included age, sex, marital status, education, occupation, monthly income, duration of hypertension, comorbidities, and type of antihypertensive treatment.

Hypertension knowledge

Hypertension knowledge was assessed using the Hypertension Knowledge Questionnaire (HKQ), based on the Hypertension Knowledge-Level Scale, using the validated Indonesian version translated and tested by. The instrument consists of 22 items grouped into domains (definition, medical treatment, drug compliance, lifestyle, diet, and complications), with response options true or false. Each correct response is scored 1, and incorrect/"don't know" responses are scored 0; total scores are obtained by summing all items (possible range 0–22), with higher scores indicating better hypertension knowledge. For descriptive purposes, knowledge can be reported as a continuous score and/or categorized (e.g., low, moderate, high) using predefined cut points. The Indonesian version has demonstrated good validity and internal consistency in previous research, and in the present study, Cronbach's alpha was calculated to confirm reliability.

Self-efficacy

Self-efficacy related to hypertension management was measured using Part A (Self-efficacy) of the High Blood Pressure Self-Care Profile (HBP-SCP) developed by. The Indonesian version used in this study consists of 15 items that assess confidence in performing key self-care activities (physical activity, diet, salt restriction, fat restriction, stress management, medication adherence, blood pressure monitoring, and follow-up visits). Each item is rated on a 4-point Likert scale: not confident, somewhat confident, confident, and very confident, scored from 1 to 4, respectively. A total or mean score is calculated, with higher scores reflecting higher self-efficacy. The original HBP-SCP has shown good psychometric properties. In this study, the scale was translated into Indonesian using forward–backward translation, reviewed by an expert panel (nursing and public health), pilot-tested for clarity, and its internal consistency (Cronbach's alpha) was assessed.

Self-care behavior

Self-care behavior was measured using Part B (Behavior) of the High Blood Pressure Self-Care Profile (HBP-SCP) (Han et al., 2014). The Indonesian version contains 17 items that evaluate the frequency of self-care practices related to hypertension (physical activity, salt reduction, fat reduction, healthy eating, label reading, smoking behavior, blood pressure monitoring, medication adherence, weight control, stress management, and regular follow-up). Responses are rated on a 4-point frequency scale: Tidak pernah (never), Kadang-kadang (1–2 times per week), Sering (about 3 times per week), and Selalu dilakukan (4–5 times per week), scored from 1 to 4. Higher total or mean scores indicate better self-care behavior. Similar to Part A, translation followed a forward–backward procedure, expert review, and pilot testing, and Cronbach's alpha was computed in the current sample to determine internal consistency.

Family support

Family support was measured using the Perceived Social Support–Family Scale (PSS-Fa) (20-item Indonesian version). The scale assesses perceived informational, appraisal, instrumental, and emotional support from family members. Each item is rated on a 5-point Likert scale: strongly disagree, disagree, neutral, agree, and strongly agree, typically scored from 1 to 5. Negatively worded items are reverse-coded so that higher scores consistently reflect higher perceived family support. Total or mean scores are used in the analysis. Content experts reviewed the Indonesian version for cultural appropriateness, and internal consistency (Cronbach's alpha) was assessed in this study.

Health worker support

Perceived support from health workers was measured using an instrument based on the Patient Assessment of Chronic Illness Care (PACIC) (Simonsen et al., 2018), adapted for hypertensive patients in this setting. The questionnaire includes 19 items that assess patient perceptions of key components of chronic illness care (e.g., shared decision-making, goal setting, follow-up, coordination of care, and linkage with community resources). Each item is rated on a 5-point Likert scale: never, rarely, sometimes, often, and always, scored 1 to 5. Mean scores are calculated across items, with higher scores indicating greater perceived support and higher-quality chronic illness care from health workers. The instrument was translated into Indonesian through forward–backward translation, expert panel review, and pilot testing; internal consistency reliability (Cronbach's alpha) was examined in the present study.

Minahasa culture

Minahasa cultural values related to health were assessed using the Minahasa Culture–Health Questionnaire, a culture-specific scale developed by the research team based on the Mapalus concept and local cultural principles. The instrument includes 19 items covering domains such as participation in community health activities, reciprocity in food-sharing (Mapalus makanan), discipline in health check-ups and medication adherence, leadership and assertiveness in rejecting unhealthy behaviors, social harmony, social responsibility, trust in health workers, hard work in following treatment, cooperation, transparency, equality, social compassion, respect for diversity, social justice, faith, and deliberation in health-related decision-making. Items are rated on a 4-point Likert scale: never, sometimes, often, and always, scored from 1 to 4, with higher scores

indicating stronger adherence to Minahasa cultural values in daily and health-related practices. Item generation was informed by literature, informal interviews with community members, and consultation with Minahasa cultural figures and health professionals. An expert panel evaluated content validity, a pilot test was conducted to assess clarity and feasibility, and Cronbach's alpha was calculated to assess internal consistency in this study.

Content validity for all instruments (including the Minahasa culture scale) was evaluated by an expert panel (nursing, public health, and local cultural experts). Construct validity for multi-item scales was examined using item–total correlations and factor analysis during pilot testing. Reliability was assessed using Cronbach's alpha separately for each scale (knowledge, self-efficacy, self-care behavior, family support, health worker support, and Minahasa culture). Detailed α values for each variable are reported in the instrument reliability table of the full manuscript/thesis.

Data Collection

Data collection was conducted between August and September 2025 at Mitra Sehat Type D Regional General Hospital in Southeast Minahasa Regency.

Data were collected by trained research assistants, consisting of nurses and final-year health sciences students. Before data collection, all enumerators participated in standardized training led by the principal investigator. The training covered: (1) eligibility screening and recruitment procedures based on clinic records and brief interviews; (2) informed consent procedures and ethical principles, including confidentiality and the right to refuse or withdraw; (3) standardized explanation of questionnaire items without leading or influencing participants' responses; (4) procedures for assisting participants with limited literacy, including reading items verbatim and recording responses exactly as stated; (5) data checking, identification and handling of missing items, and secure storage of completed questionnaires; and (6) documentation of recruitment logs and daily progress. Role-play, mock interviews, and supervised practice sessions were used to ensure inter-enumerator consistency. During the first week of data collection, the principal investigator directly observed a sample of interviews and provided feedback to maintain quality control.

During the data collection period, clinic appointment lists were reviewed each day to identify potentially eligible hypertensive patients. On clinic days, research assistants approached patients in the waiting area or immediately after their medical consultation. After confirming eligibility, the study was explained, and written informed consent was obtained from those who agreed to participate. Questionnaires were completed in a designated area that ensured privacy and minimized disturbance. Participants who had difficulty reading or writing were assisted by trained enumerators, who read each question and response option verbatim and recorded answers without interpretation or suggestion. On average, each questionnaire required approximately 15–25 minutes to complete.

Immediately after completion, enumerators checked each questionnaire for missing responses and obvious inconsistencies. If missing items were identified, participants were politely asked—if still present—whether they were willing to complete the unanswered items. A daily recruitment log documented the number of patients screened, eligible, approached, consented, and completing the questionnaire, including reasons for refusal where provided. This workflow ensured a clear recruitment process and allowed

monitoring of response and dropout at each step.

Missing data were handled according to predefined rules. Questionnaires with substantial missing data (defined as more than 20% missing responses on one or more key scales: knowledge, self-efficacy, self-care behavior, family support, health worker support, or Minahasa culture) were excluded from the final analysis set. For questionnaires retained in the analysis, scale scores were calculated only when at least 80% of items in that scale were completed; if this criterion was not met, the corresponding scale score was treated as missing. No statistical imputation was performed for item-level missing values; analyses were conducted using complete available data for each variable or model, consistent with the assumptions of the analytical methods used.

Data from paper questionnaires were double-entered into a password-protected electronic database by two independent data entry personnel who were not involved in data collection. After entry, the two datasets were compared to identify discrepancies; any discrepancies were resolved by referring back to the original paper questionnaire. Range and logic checks (e.g., out-of-range values, impossible combinations) were conducted regularly to detect and correct data entry errors—a data management log documented all corrections and decisions made during cleaning to ensure transparency and reproducibility.

Paper questionnaires were stored in locked cabinets at the research office, accessible only to the principal investigator and authorized team members. Electronic data were stored on password-protected computers and/or secure drives with restricted access. Personal identifiers (e.g., name, medical record number, contact information) were recorded on separate linkage files and stored separately from the main analytical dataset. Each participant was assigned a unique study ID, and all analyses were conducted using de-identified data. Only aggregated results are reported to protect participant confidentiality.

Data Analysis

Data analysis was performed using appropriate statistical software (SmartPLS version 4; exact versions can be specified in the final manuscript). A significance level of $p < 0.05$ (two-tailed) was used, and 95% confidence intervals (95% CI) were reported where relevant. Preliminary and assumption testing were first conducted. Data screening included examining frequencies and descriptive statistics to identify impossible values or obvious data entry errors, and missing data patterns were examined; cases with extensive missing values on key variables were excluded using listwise deletion. Outlier detection was also performed: univariate outliers were identified using z-scores ($|z| > 3$) and boxplots, while multivariate outliers were assessed using Mahalanobis distance and compared with appropriate chi-square cut-offs. Distribution testing was conducted by evaluating the normality of continuous variables and regression residuals using the Shapiro–Wilk test, skewness and kurtosis values, and visual inspection of histograms and Q–Q plots.

Regression assumptions were also assessed. Linearity was evaluated using scatterplots of independent variables against self-care behavior and residual plots. Homoscedasticity was examined by plotting standardized residuals against standardized predicted values. Multicollinearity was evaluated by examining the Variance Inflation Factor (VIF) and tolerance values, where VIF > 10 indicated problematic multicollinearity. Independence of errors was assessed using the Durbin–Watson statistic in the

regression models. Descriptive (univariate) analysis was conducted to summarize the data, including sociodemographic characteristics using frequencies and percentages, as well as knowledge, self-efficacy, family support, health worker support, Minahasa culture, and self-care behavior using means, standard deviations, medians, interquartile ranges, and categorical distributions based on the defined cut-offs.

Bivariate analysis was performed to examine associations between independent variables and self-care behavior. Pearson's product–moment correlation was used for continuous variables that were normally distributed. Independent-samples t-tests or one-way ANOVA were used for comparisons between categories where appropriate, with non-parametric alternatives applied if assumptions were violated. Where relevant, effect sizes were also reported, such as the correlation coefficient (r), Cohen's d, or η^2, to describe the magnitude of associations in addition to statistical significance. Multivariate analysis was conducted using multiple linear regression to analyze the simultaneous influence of knowledge, self-efficacy, family support, health worker support, and Minahasa culture on self-care behavior, while adjusting for potential confounders such as age, sex, education, and duration of hypertension. Regression coefficients (unstandardized and standardized β), standard errors, p-values, and R^2/adjusted R^2 were reported. Model diagnostics, including residual plots, VIF values, and normal probability plots, were used to verify that the regression assumptions were reasonably satisfied.

Structural Equation Modeling using Partial Least Squares (SEM-PLS) was further conducted to explore complex relationships and pathways among variables, following the procedure described by Hardani et al. (2020). The analysis included evaluation of the measurement model and the structural model. Measurement model evaluation included indicator reliability through factor loadings, internal consistency reliability through Composite Reliability and Cronbach's alpha, convergent validity using Average Variance Extracted (AVE), and discriminant validity assessed through the Fornell–Larcker criterion and cross-loadings. Structural model evaluation included testing the significance of path coefficients using bootstrapping with __ resamples, assessing the effect size (f^2) of each predictor, examining the explained variance (R^2) of endogenous variables, and evaluating global model fit indices such as the Standardized Root Mean Square Residual (SRMR) and Normed Fit Index (NFI) where applicable.

Ethical Considerations

The study complied with the ethical principles of the Declaration of Helsinki and relevant national regulations for research involving human participants. Ethical approval was obtained from Komite Etik Penelitian Kesehatan Fakultas Kesehatan Universitas Brawijaya, with approval number [No. 222/UN10.F17.10.4/TU/2025]. Formal permission to conduct the research was also granted by the management of Mitra Sehat Type D Regional General Hospital and local health authorities, as required. All participants received an explanation of the study objectives, procedures, potential risks, and benefits, and were informed that participation was voluntary and that refusal or withdrawal would not affect their access to care. Written informed consent was obtained from all participants before data collection. Confidentiality was maintained by using identification codes (instead of names), storing data securely, and presenting study results in aggregate form only. Only the research team had access to

identifiable data, which were stored separately from the main dataset.

Results

Table 1. Respondent Characteristics Result

Characteristics	Category	Frequency (n)	Percentage (%)
Age	Young (≤ 40 years old)	43	26.0
	Early Adult (41–50 years old)	68	41.0
	Late Adult (51–60 years old)	41	25.0
	Elderly (> 60 years old)	13	8.0
	Total	165	100.0
Gender (Sex)	Male	86	52.0
	Female	79	48.0
	Total	165	100.0
Highest level of education	Junior High School	13	8.0
	Senior High School	56	34.0
	Higher Education (D3/S1/S2/S3)	96	58.0
	Total	165	100.0
Marital status	Married	160	97.0
	Unmarried/Never Married	5	3.0
	Total	165	100.0
Job	Self-employed/Entrepreneur	64	39.0
	Civil servant/Teacher	58	35.0
	Housewife	23	14.0
	Laborer	13	8.0
	Other/Unclear	7	4.0
	Total	165	100.0
Duration of hypertension	Short (≤ 5 years)	89	54.0
	Long (> 5 years)	76	46.0
	Total	165	100.0
Experience with educational programs	Yes	119	72.0
	No	46	28.0
	Total	165	100.0
Other comorbidities	Diabetes Mellitus (DM)	89	54.0
	Gout	71	43.0
	Cancer	5	3.0
TOTAL		165	100.0

Based on **Table 1.** A total of 165 hypertensive patients participated in the study. As shown in Table 1, the largest age group was early adults (41–50 years) (41.0%), followed by young adults (≤ 40 years) (26.0%) and late adults (51–60 years) (25.0%), while 8.0% were elderly (> 60 years). Slightly more than half of the respondents were male (52.0%), with female participants making up 48.0%. Most respondents had higher education (D3/S1/S2/S3) (58.0%), followed by senior high school graduates (34.0%) and junior high school or below (8.0%). The vast majority were married (97.0%). In terms of occupation, self-employed/entrepreneurs (39.0%) and civil servants/teachers (35.0%) were the dominant groups, followed by housewives (14.0%), laborers (8.0%), and others (4.0%). Regarding the duration of hypertension, 54.0% had lived with hypertension for ≤ 5 years, while 46.0% had a duration of > 5 years. A large proportion (72.0%) reported having attended educational programs about hypertension, while 28.0% had not. More

than half (54.0%) reported diabetes mellitus (DM) as a comorbidity, 43.0% reported gout, and 3.0% reported cancer. Descriptive statistics for each latent variable (knowledge, self-efficacy, family support, health worker support, Minahasa culture, and self-care behavior) including mean ± SD, minimum, maximum, and categorical distribution (e.g., low/moderate/high) should be summarized in a separate table as suggested by the reviewer (e.g., "Knowledge: good vs poor; Self-efficacy: high, moderate, low; etc.).

Table 2. Convergent Validity Score

	Minahasa Culture (X5)	Family Support (X3)	Health Worker Support (X4)	Self-Efficacy (X2)	Knowledge (X1)	Self-care Behavior (Y)
X1.1	0.769	-	-	-	-	-
X1.2	0.845	-	-	-	-	-
X1.3	0.725	-	-	-	-	-
X1.4	0.728	-	-	-	-	-
X1.5	0.916	-	-	-	-	-
X1.6	0.838	-	-	-	-	-
X2.1	-	0.726	-	-	-	-
X2.2	-	0.857	-	-	-	-
X2.3	-	0.893	-	-	-	-
X2.4	-	0.851	-	-	-	-
X3.1	-	-	0.850	-	-	-
X3.2	-	-	0.854	-	-	-
X3.3	-	-	0.841	-	-	-
X3.4	-	-	0.847	-	-	-
X4.1	-	-	-	0.859		
X4.2	-	-	-	0.837	-	-
X4.3	-	-	-	0.907	-	-
X4.4	-	-	-	0.809	-	-
X4.5	-	-	-	0.928	-	-
X5.1	-	-	-	-	0.909	-
X5.2	-	-	-	-	0.850	-
X5.3	-	-	-	-	0.844	-
X5.4	-	-	-	-	0.884	-
X5.5	-	-	-	-	0.836	-
X5.6	-	-	-	-	0.830	-
X5.7	-	-	-	-	0.832	-
X5.8	-	-	-	-	0.792	-
X5.9	-	-	-	-	0.871	-
X5.10	-	-	-	-	0.824	-
X5.11	-	-	-	-	0.844	-
X5.12	-	-	-	-	0.856	-
X5.13	-	-	-	-	0.855	-
X5.14	-	-	-	-	0.848	-
X5.15	-	-	-	-	0.902	-
X5.16	-	-	-	-	0.902	-
Y1	-	-	-	-	-	0.784
Y2	-	-	-	-	-	0.886
Y3	-	-	-	-	-	0.878
Y4	-	-	-	-	-	0.819

Based on **Table 2** It presents the factor loadings of all indicators on their respective constructs. All indicators of Knowledge (X1), Self-efficacy (X2), Family Support (X3),

Health Worker Support (X4), Minahasa Culture (X5), and Self-care Behavior (Y) have standardized loadings ranging from 0.725 to 0.928, exceeding the commonly used threshold of 0.70 for convergent validity in PLS-SEM. This is consistent with the Average Variance Extracted (AVE) values (Table 4), which range from 0.650 (Knowledge) to 0.755 (Health Worker Support), with all constructs having AVE > 0.50. These results indicate that each latent variable explains more than half of the variance of its indicators, supporting adequate convergent validity for all constructs.

Table 3. Construct Reliability and Validity

	Cronbach's alpha	Composite reliability (rho_a)	Composite reliability (rho_c)	Average variance extracted (AVE)
Minahasa Culture (X5)	0.977	1.000	0.978	0.732
Family Support (X3)	0.870	0.875	0.911	0.719
Health Worker Support (X4)	0.931	1.048	0.939	0.755
Self-Efficacy (X2)	0.852	0.860	0.901	0.696
Knowledge (X1)	0.907	0.975	0.917	0.650
Self-care Behavior (Y)	0.863	0.866	0.907	0.710

Based on **Table 3** It shows that all constructs in the model meet the criteria for good reliability and convergent validity. Cronbach's alpha values range from 0.852 (Self-efficacy) to 0.977 (Minahasa Culture), all above the recommended minimum of 0.70, indicating strong internal consistency for each scale. Similarly, both composite reliability indices (rho_a and rho_c) are high across all variables (≥0.86), with the highest values observed for Minahasa Culture (rho_c = 0.978) and Health Worker Support (rho_c = 0.939), confirming that the indicators consistently measure their intended latent constructs. The Average Variance Extracted (AVE) values range from 0.650 (Knowledge) to 0.755 (Health Worker Support), all exceeding the 0.50 threshold. This means that more than 50% of the variance in the indicators is explained by their respective latent variables, supporting adequate convergent validity. Overall, the results indicate that the measurement model is reliable and that each construct is well represented by its items.

Table 3. Loading Factor Score

	Knowledge (X1)	Self-Efficacy (X2)	Family Support (X3)	Health Worker Support (X4)	Minahasa Culture (X5)	Self-care Behavior (Y)
X1.1	0.769	0.069	0.106	-0.006	-0.002	0.018
X1.2	0.845	0.199	0.203	0.050	0.076	0.148
X1.3	0.725	0.062	0.096	-0.005	0.006	0.050
X1.4	0.728	0.096	0.138	-0.008	-0.013	0.057
X1.5	0.916	0.217	0.210	0.043	0.102	0.158
X1.6	0.838	0.141	0.180	-0.014	0.016	0.111
X2.1	0.066	0.726	0.286	0.030	-0.040	0.381
X2.2	0.233	0.857	0.273	0.100	0.138	0.409
X2.3	0.119	0.893	0.295	0.062	0.058	0.468
X2.4	0.240	0.851	0.319	0.080	0.099	0.400
X3.1	0.138	0.292	0.850	0.017	-0.039	0.427
X3.2	0.202	0.228	0.854	0.059	0.042	0.367

	Knowledge (X1)	Self-Efficacy (X2)	Family Support (X3)	Health Worker Support (X4)	Minahasa Culture (X5)	Self-care Behavior (Y)
X3.3	0.173	0.322	0.841	-0.065	-0.085	0.345
X3.4	0.219	0.347	0.847	-0.008	0.004	0.403
X4.1	-0.007	0.040	0.002	0.859	0.685	0.032
X4.2	-0.013	0.050	0.008	0.837	0.701	0.013
X4.3	0.007	0.045	-0.008	0.907	0.712	0.062
X4.4	-0.035	0.065	-0.003	0.809	0.703	0.002
X4.5	0.059	0.116	0.010	0.928	0.686	0.075
X5.1	0.066	0.143	-0.025	0.731	0.909	0.127
X5.2	0.062	0.025	0.015	0.660	0.850	0.082
X5.3	0.043	0.033	-0.011	0.707	0.844	0.021
X5.4	0.023	0.007	-0.081	0.721	0.884	0.030
X5.5	0.052	0.038	-0.095	0.680	0.836	0.030
X5.6	0.055	0.031	-0.031	0.723	0.830	0.062
X5.7	0.083	0.009	-0.049	0.650	0.832	0.044
X5.8	0.029	0.062	-0.046	0.692	0.792	-0.010
X5.9	0.086	-0.021	-0.048	0.714	0.871	0.043
X5.10	0.057	-0.025	-0.043	0.668	0.824	0.043
X5.11	-0.012	0.105	-0.013	0.621	0.844	0.098
X5.12	0.008	0.117	0.018	0.650	0.856	0.097
X5.13	0.061	0.082	0.017	0.646	0.855	0.094
X5.14	0.083	0.100	-0.014	0.677	0.848	0.013
X5.15	0.086	0.067	-0.028	0.646	0.902	0.101
X5.16	0.086	0.067	-0.028	0.646	0.902	0.101
Y1	0.185	0.389	0.417	0.046	0.070	0.784
Y2	0.102	0.429	0.428	0.069	0.054	0.886
Y3	0.161	0.443	0.368	0.039	0.136	0.878
Y4	0.029	0.421	0.325	0.063	0.069	0.819

Based on **Table 3** The cross-loadings of each indicator on all constructs. For every item, the loading on its designated construct is higher than its loadings on other constructs. For example, all Knowledge items (X1.1–X1.6) load highest on Knowledge (X1), all Self-efficacy items (X2.1–X2.4) load highest on Self-efficacy (X2), and all Self-care behavior items (Y1–Y4) load highest on Self-care Behavior (Y). This pattern supports discriminant validity at the indicator level. In addition to cross-loadings, discriminant validity should also be documented using the Fornell–Larcker criterion, by showing that the square root of AVE for each construct exceeds its correlations with other constructs. These results can be provided in an additional table, as specifically requested by the reviewer, to complete the outer-model assessment.

Table 4. AVE Score

	Average variance extracted (AVE)
X1.	0.650
X2.	0.696
X3.	0.719
X4.	0.755
X5.	0.732
Y	0.710

Table 4 presents the Average Variance Extracted (AVE) scores for each construct. The AVE values range from 0.650 for Knowledge (X1) to 0.755 for Health Worker Support (X4), indicating adequate convergent validity across all variables, with all AVE scores exceeding the threshold of 0.50.

Table 5. Composite Reliability Score

	Composite reliability (rho_c)
X1.	0.917
X2.	0.901
X3.	0.911
X4.	0.939
X5.	0.978
Y	0.907

Table 5 displays the composite reliability (rho_c) values for each latent variable. All values are well above the recommended cut-off of 0.70, indicating excellent internal consistency for all constructs. Combined with high factor loadings and AVE values, this supports the reliability and convergent validity of the measurement model.

Inner Model Test Conceptual Workflow

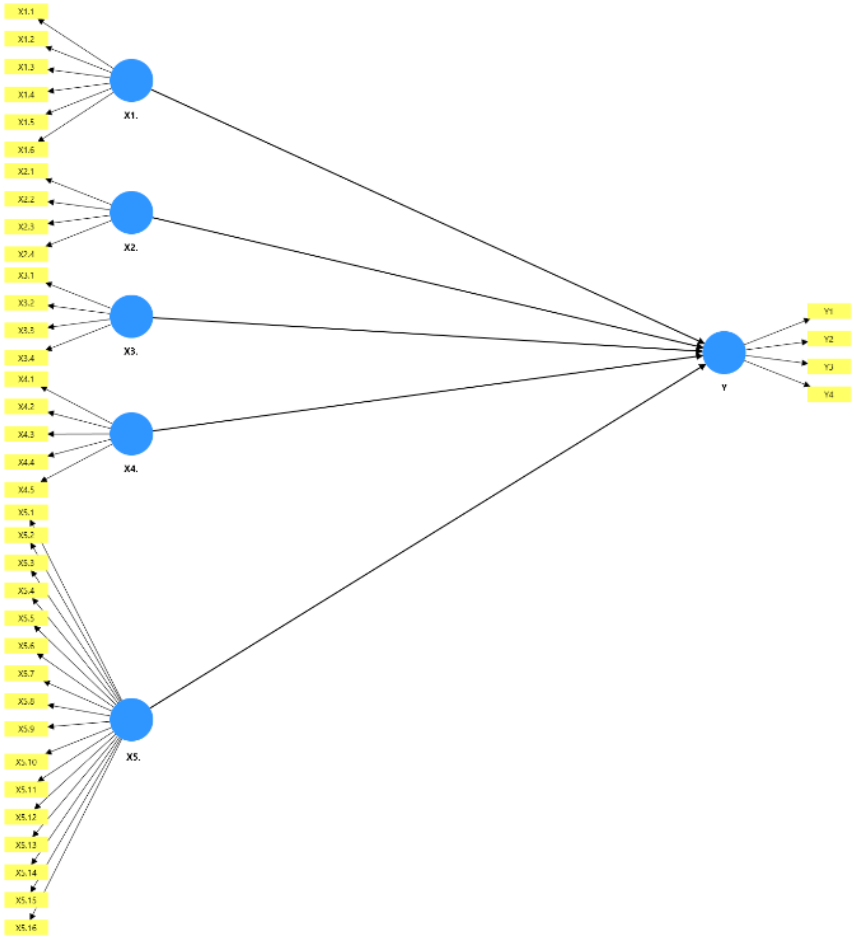

Figure 1. Conceptual Workflow

Based on **Figure 1.** Illustrates the conceptual workflow of the structural model used in this study. Five exogenous latent variables—Knowledge (X1), Self-efficacy (X2), Family Support (X3), Health Worker Support (X4) and Minahasa Culture (X5)—are specified as predictors of the endogenous latent variable Self-care Behavior (Y). Each latent variable is

measured reflectively by several observed indicators (X1.1–X1.6, X2.1–X2

Table 6. R Square (R^2) Score

	R-square	R-square adjusted
Y	0.347	0.327

Based on **Table 6** The R^2 value for Self-care Behavior (Y) is 0.347, with an adjusted R^2 of 0.327. This indicates that 34.7% of the variance in self-care behavior is explained jointly by knowledge, self-efficacy, family support, health worker support, and Minahasa culture. According to common PLS-SEM benchmarks, this represents a moderate level of explanatory power, while also suggesting that other factors not included in the model contribute to self-care behavior.

Table 7. P Value Score

	Original sample (O)	Sample mean (M)	Standard deviation (STDEV)	T statistics (|O/STDEV|)	P values
X1. -> Y	-0.009	0.008	0.065	0.132	0.895
X2. -> Y	0.381	0.376	0.072	5.288	0.000
X3. -> Y	0.329	0.325	0.075	4.398	0.000
X4. -> Y	-0.065	-0.060	0.141	0.463	0.643
X5. -> Y	0.127	0.117	0.152	0.833	0.405

Based on **Table 7**. The standardized path coefficients (original sample, O), standard deviations, t-statistics, and p-values for the relationships between each independent variable and Self-care Behavior (Y). The results are as follows:

1. Knowledge (X1 → Y):
   - β = –0.009; t = 0.132; p = 0.895
   - Approx. 95% CI: –0.14 to 0.12
   - Interpretation: Knowledge does *not* have a statistically significant direct effect on self-care behavior.
1. Self-efficacy (X2 → Y):
   - β = 0.381; t = 5.288; p = 0.000
   - Approx. 95% CI: 0.24 to 0.52
   - Interpretation: Self-efficacy has a significant and positive effect on self-care behavior. Higher self-efficacy is associated with better self-care among hypertensive patients.
2. Family Support (X3 → Y):
   - β = 0.329; t = 4.398; p = 0.000
   - Approx. 95% CI: 0.18 to 0.48
   - Interpretation: Family support also has a significant and positive effect on self-care behavior. Greater perceived family support is associated with better self-care.
3. Health Worker Support (X4 → Y):
   - β = –0.065; t = 0.463; p = 0.643
   - Approx. 95% CI: –0.34 to 0.21
   - Interpretation: Health worker support does *not* show a significant direct effect on self-care behavior in this model.
4. Minahasa Culture (X5 → Y):
   - β = 0.127; t = 0.833; p = 0.405
   - Approx. 95% CI: –0.17 to 0.42
   - Interpretation: Minahasa culture, operationalized through Mapalus-related values, does *not* have a statistically significant direct association with self-care behavior in this sample.

Overall, only Self-efficacy (X2) and Family Support (X3) emerge as significant predictors of Self-care Behavior (Y) in the structural model. Knowledge (X1), Health Worker Support (X4), and Minahasa Culture (X5) do not show significant direct effects. This finding is important for the Discussion and Abstract because the introduction and conceptual framework emphasize the role of Minahasa culture; the non-significant direct effect of culture needs to be explicitly acknowledged and interpreted (for

example, considering possible indirect, moderating, or contextual roles of culture rather than a simple direct effect).

Discussion

This study examined the influence of knowledge, self-efficacy, family support, health worker support, and Minahasa culture on self-care behavior among hypertensive patients at Mitra Sehat Regional General Hospital in Southeast Minahasa. The structural model explained 34.7% of the variance in self-care behavior, indicating a moderate level of explanatory power. From a theoretical perspective, the findings can be interpreted through the Health Belief Model (HBM), Social Cognitive Theory (SCT), and stress–coping theory. In line with SCT, self-efficacy and family support representing personal confidence and proximal social environment showed a significant positive effect on self-care behavior, while knowledge, health worker support, and Minahasa culture did not have a significant direct effect. Within the HBM, this suggests that cognitive factors (knowledge and perceived information) alone are insufficient to trigger action unless supported by perceived capability and strong cues to action in the immediate social environment. From a stress coping perspective (Lazarus & Folkman, 1984), self-efficacy and family support can be understood as key coping resources that enable patients to appraise hypertension as manageable and to adopt problem-focused coping strategies such as changing diet, adhering to medication, and monitoring blood pressure, while cultural norms provide a broader context that may or may not be activated in daily coping.

Analysis of the Influence of Knowledge on Self-care Behavior

This study found no significant direct relationship between knowledge (X1) and self-care behavior (Y) ($p = 0.895$). This contrasts with several studies reporting that increased knowledge and health literacy are positively associated with self-care among hypertensive patients (Huy et al., 2024; Pahria et al., 2022). In classical HBM formulations, knowledge is often treated as a foundation for forming perceptions of susceptibility, severity, benefits, and barriers; individuals who understand the risks and consequences of hypertension are expected to be more likely to adopt preventive and therapeutic behaviors. However, our results suggest that, in this setting, knowledge is necessary but not sufficient to change behavior and may function more as a distal enabling factor than as a direct determinant.

Several explanations are possible. First, many respondents had lived with hypertension for several years and had participated in educational programs; this may have led to relatively homogeneous and moderately high knowledge scores, reducing variability and weakening observable associations with behavior. Second, structural and contextual barriers such as economic constraints, entrenched diet patterns, and limited access to exercise facilities, which are common in many LMIC settings—may prevent patients from translating knowledge into concrete action, even when they understand the recommendations. In terms of stress–coping theory, knowledge alone does not automatically translate into effective coping; patients still require sufficient coping resources (self-efficacy, social support, environmental opportunities) to move from cognitive understanding to problem-focused coping behaviors.

The literature supports this interpretation. Technology-based education can enhance both knowledge and self-care behavior, implying that not just the amount of information but also the mode of delivery, interactivity, and continuity of support matter (Pujiastuti et al., 2023). Self-

care is shaped by family support and education level, indicating that knowledge must be embedded in a broader social and environmental context (Putri et al., 2022). Theoretically, this means that knowledge contributes to the cognitive appraisal of risk (HBM) but its impact on coping and behavior is mediated by self-efficacy and social support (SCT and stress–coping theory). Thus, in this Indonesian setting, improving knowledge remains important, but interventions should integrate interactive education, follow-up, and social and cultural support mechanisms rather than relying on one-way information provision.

Analysis of the Influence of Self-Efficacy on Self-Care Behavior

Self-efficacy (X2) showed a strong, positive, and significant association with self-care behavior (p = 0.000), making it one of the most influential predictors in the model. This is directly consistent with SCT, which places self-efficacy at the center of behavior change: individuals who believe they are capable of performing a behavior are more likely to initiate, persist with, and adapt that behavior in the face of obstacles. Within HBM, self-efficacy is also recognized as a key construct that helps translate perceived risk and benefits into concrete action.

The findings align with previous studies showing that hypertensive patients with higher self-efficacy are more consistent in adhering to diet, exercise, and medication regimens (Hani et al., 2024). From a stress–coping perspective, high self-efficacy supports problem-focused coping, where patients feel capable of modifying their lifestyle, seeking care, and solving day-to-day challenges related to hypertension, rather than relying solely on passive or emotion-focused coping. In the Minahasa context, where daily life is shaped by dense social networks and communal expectations, strengthening self-efficacy may work particularly well when combined with peer and family encouragement, role modelling, and practical support.

From a policy and practice perspective in Indonesia and other LMICs, these results suggest that hypertension programs should move beyond simple education to skill-building and confidence-building strategies: guided practice in checking blood pressure, collaborative goal setting, problem-solving for salt reduction in local cuisine, and group-based exercise tailored to older adults. Such strategies are consistent with SCT (mastery experiences, vicarious learning, verbal persuasion) and with stress–coping models that emphasize enhancing coping resources. Beliefs and motivation are as important as knowledge; this study confirms that self-efficacy is a critical pathway through which patients translate advice into sustained self-care behavior (Hani et al., 2024).

Analysis of the Influence of the Role of Family Support in Self-care Behavior

Family support (X3) also showed a significant positive influence on self-care behavior (p = 0.000). This finding is highly consistent with the cultural and social structure of Indonesia, where multigenerational households and strong family ties are common, and where chronic disease management often takes place within the home. Within the HBM, family support operates as a salient cue to action reminders to take medication, encouragement to attend check-ups, and shared decisions about diet and activity. In SCT, family support represents a key environmental determinant that interacts with personal factors (self-efficacy, outcome expectations) to shape behavior. In stress–coping theory, family support is a crucial social coping resource that buffers stress, facilitates problem-focused coping (e.g., planning healthy meals, accompanying

patients to health services), and provides emotional support that reduces feelings of burden or hopelessness.

Previous evidence supports the centrality of family in hypertension control. Hypertensive individuals living with family members tend to show better adherence to self-care, and this study's sample where almost all respondents lived with their families fits that pattern (Jariyasakulwong et al., 2025). Family support facilitates healthier lifestyle choices (Krisnawati, 2024), while family encouragement is closely linked to medication adherence and blood pressure monitoring (Pahria et al., 2022). Awareness of healthy living is shaped by family norms and expectations (Sarfika et al., 2023). These findings illustrate how cultural norms of filial responsibility, respect for elders, and shared decision-making in Indonesian families influence coping strategies: patients and relatives jointly negotiate dietary changes, physical activity, and health service use, combining problem-focused coping (concrete actions) with emotion-focused coping (comfort, reassurance, prayer).

For Southeast Minahasa, this suggests that interventions should be explicitly family-based for example, involving spouses or adult children in counseling sessions, providing family-oriented education materials, and encouraging shared activities such as group exercise or collective meal planning. This is consistent with SCT's emphasis on reciprocal determinism and with stress–coping theory, which highlights the importance of social and cultural resources in shaping how individuals cope with chronic illness.

Analysis of the Influence of Health Worker Support on Self-care Behavior

In contrast to expectations, health worker support (X4) did not show a significant direct effect on self-care behavior ($p = 0.643$). From a theoretical standpoint, health worker support is expected to function as a formal cue to action in the HBM and as an environmental facilitator and modelling source in SCT. In stress–coping terms, supportive, patient-centered care should strengthen coping resources by increasing self-efficacy, clarifying action plans, and offering problem-solving assistance. The non-significant direct effect in this study does not mean that health workers are unimportant, but it may reflect limitations in how support is currently delivered.

Busy outpatient clinics, short consultation times, and high patient loads typical of many LMIC health systems can restrict opportunities for meaningful dialogue, shared decision-making, and follow-up. Evidence suggests that effective, patient-centered communication from health workers improves understanding, satisfaction, and adherence (Sharkiya, 2023). Provider support can strengthen motivation and self-efficacy, which in turn influences self-care (Hani et al., 2024). In theoretical terms, health worker support may exert its influence indirectly by enhancing self-efficacy and shaping patients' coping appraisals, rather than through a direct pathway to behavior. Because the current analysis focused on direct effects, such mediation was not tested and may have contributed to the non-significant direct path.

These findings point to the need for qualitative and implementation-focused work to examine how health workers communicate, how often patients receive counseling, and whether messages are adapted to local culture and literacy levels. Training in motivational interviewing, use of simple visual aids, and structured follow-up possibly combined with digital tools could enhance the real-world impact of health worker support on coping and self-care. Aligning clinical encounters with SCT

(modelling, self-efficacy enhancement) and stress–coping principles (supporting problem-focused coping, validating emotional responses) may improve outcomes even in resource-constrained settings.

Analysis of the Influence of Minahasa Culture on Self-care Behavior

Although Minahasa culture and Mapalus values were central to the conceptual framing of this study, Minahasa culture (X5) did not have a significant direct association with self-care behavior (p = 0.405). At first glance, this seems to contradict the expectation derived from SCT and community health models that strong communal values and mutual cooperation would automatically translate into better individual health practices.

Several explanations may help resolve this apparent inconsistency. First, Minahasa cultural values are widely shared in the community, which may have produced a ceiling effect with limited variability in culture scores; when almost everyone scores high, it becomes difficult to detect statistical differences in behavior. Second, in both HBM and SCT terms, culture is more likely to shape distal determinants such as norms around food sharing, mutual help, and religious practices than to directly determine specific self-care behaviors measured at the individual level. Culture may exert its influence indirectly by shaping family support, social norms, and collective expectations, which in turn affect self-efficacy and self-care. In our model, however, culture was specified only as a direct predictor of self-care; potential mediating or moderating roles were not explored.

From a stress–coping perspective, cultural norms are deeply intertwined with how individuals and families appraise illness and choose coping strategies. Mapalus emphasizes mutual cooperation, shared labor, and collective responsibility, which can support problem-focused coping (e.g., communal exercise, joint participation in health education, shared preparation of healthier foods) and emotion-focused coping (e.g., social gatherings, collective prayer, spiritual reassurance). However, there may also be tensions between traditional practices and modern clinical recommendations. Communal meals and celebrations may emphasize high-salt, high-fat foods, while social drinking or other lifestyle practices may run counter to dietary and behavioral advice. In such cases, strong cultural cohesion does not necessarily promote self-care and may create social pressure that complicates adherence. Social and cultural capital can both support and constrain health behaviors (Shiri Mohammadabad & Afshani, 2023), while adherence often requires ongoing encouragement and negotiation among multiple actors (Wondmieneh et al., 2021).

Finally, prior studies in Indonesia show that family support, education, and technology-based education have clear, measurable effects on self-care (Pujiastuti et al., 2023; Putri et al., 2022), whereas the role of local culture may be more diffuse and context-dependent. In this sense, our findings do not invalidate the importance of Minahasa culture; rather, they suggest that cultural values alone are not sufficient and must be consciously integrated into specific coping and behavior-change strategies such as community-based exercise groups, culturally adapted diet counseling, Mapalus-style peer support groups, and faith-informed health messages if they are to effectively support hypertension management. Future research could test models in which culture operates as a moderator or mediator of the relationships between self-efficacy, family support, coping strategies, and self-care, thereby more fully capturing how cultural norms

shape both problem-focused and emotion-focused coping in the Minahasa community.

Implications and Limitations

This study's findings highlight that self-efficacy and family support are the primary determinants of self-care behavior among hypertensive patients. Therefore, hypertension management programs should prioritize strategies that build patients' confidence to manage their condition through goal setting, skills training, and problem-solving rather than relying solely on information transfer. At the same time, care should systematically involve family members in counseling, reminders, diet modification, and shared activities, reflecting the central role of the family in the Indonesian context. Although health worker support and Minahasa culture did not show a direct effect, they may still influence self-efficacy and family dynamics; thus, culturally sensitive, patient-centered communication and the translation of Mapalus values into concrete family- and community-based activities (such as group exercise or healthy cooking sessions) remain important as indirect levers to strengthen self-care.

This study also has several limitations. Its cross-sectional design prevents causal inference, so the direction of relationships for example, between self-efficacy and self-care cannot be firmly established. All variables were measured using self-report questionnaires, which are vulnerable to social desirability bias, recall errors, and common-method variance. The use of non-probability, hospital-based sampling at a single regional hospital limits generalizability to the wider hypertensive population in Southeast Minahasa or other settings. In addition, the Minahasa culture scale, although reliable, is newly developed and requires further cultural and construct validation, which may partly explain the non-significant direct effect of culture. Finally, important factors such as mental health, detailed socioeconomic conditions, environmental constraints, and objective disease severity were not measured, leaving room for residual confounding that may influence the observed associations.

Relevance to Practice

The results of this study suggest that clinical practice for hypertensive patients should place greater emphasis on self-efficacy building and structured family support rather than education alone. For nurses and other healthcare providers, this means designing counseling and nursing care plans that include goal setting, guided skills practice (e.g., how to monitor blood pressure, plan low-salt menus, schedule physical activity), problem-solving for common barriers, and positive reinforcement, all of which are known strategies to strengthen self-efficacy in chronic disease management. At the same time, interventions should formally involve family members inviting them to attend education sessions, training them to give reminders for medication and clinic visits, and supporting them to modify shared meals and daily routines so that the home environment consistently reinforces self-care behavior. Nursing education programs can incorporate modules on family-focused care, motivational interviewing, and culturally sensitive communication, preparing nurses to mobilize family resources and adapt self-efficacy enhancement strategies to local contexts such as Southeast Minahasa. Policymakers and hospital managers can support this by developing standard operating procedures and educational materials that explicitly target both patients and families, thereby translating the study's findings into routine practice and improving long-term hypertension control and patient outcomes.

Conclusion

This study concludes that self-efficacy and family support are the key determinants of self-care behavior among hypertensive patients at Mitra Sehat Regional General Hospital, while knowledge, health worker support, and Minahasa culture do not show a significant direct effect. The model explains a moderate proportion of variance in self-care behavior, indicating that confidence in one's ability to manage hypertension and the presence of strong family support are far more influential than information alone. This finding helps address the research gap identified in the introduction: although previous literature and local assumptions emphasize the importance of culture and general knowledge, this study shows that, in the Minahasa context, cultural values such as Mapalus do not directly translate into better self-care, and their role may be more indirect or conditional. The main take-home message is that interventions to improve hypertension control in Southeast Minahasa should prioritize strategies that strengthen patients' self-efficacy and systematically mobilize family support, while using cultural values as a supportive context rather than assuming they automatically improve behavior. Future research should further explore how local cultural values influence self-care indirectly for example, through their effects on family dynamics, norms, and motivation and develop culturally based, family-centered interventions tailored to Minahasa characteristics. Longitudinal and multi-site studies are also needed to capture changes in self-care behavior over time, clarify causal pathways, and examine additional factors that were not included in this model.

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CrediT Authorship Contributions Statement

Christina Yunitha Pelealu: Conceptualization, Methodology, Supervision, Writing - Original Draft, Software, Validation, Formal Analysis, Writing - Review & Editing, Investigation, Resources, Data Curation, Project Administration, Writing - Original Draft,

Dina Dewi Sartika Lestari Ismail: Review & Editing

Lilik Supriati: Review & Editing

Conflicts of Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Supplementary Materials

Supplementary File S1: Research Instrument contains the full questionnaire used for data collection.

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