Integrative Strategy for Improving Hypertension Medication Adherence Based on Social Determinants of Health and Health Philosophy

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ABSTRACT

Background: *Hypertension remains a major public health problem in Indonesia, with a steadily increasing prevalence and a significant contribution to cardiovascular morbidity and mortality. One of the main challenges in its management is low patient adherence to long-term treatment. This study aims to develop an integrative strategic model to improve adherence to hypertension treatment by combining the perspectives of social determinants of health and health philosophy, which are still rarely integrated in public health studies.*

Method: *This study employed a mixed-methods explanatory sequential design. Quantitative data were collected from 250 hypertensive patients using structured questionnaires and analyzed using multiple linear regression to identify determinants of medication adherence. Subsequently, 20 purposively selected participants were interviewed in-depth, and qualitative data were analyzed using thematic analysis. Significant quantitative determinants were integrated into an adherence model, and its performance*

Result: *The results showed that treatment adherence was significantly influenced by health literacy ($\beta = 0.41$; $p < 0.001$), family support ($\beta = 0.32$; $p < 0.01$), quality of healthcare services ($\beta = 0.29$; $p < 0.05$), and patient autonomy awareness ($\beta = 0.27$; $p < 0.05$). The developed integrative model demonstrated higher predictive power ($R^2 = 0.62$) compared to conventional sociodemographic-based models ($R^2 = 0.38$). Qualitative findings further confirmed that reflective awareness and individual moral responsibility play important roles in shaping long-term adherence. This integrative approach has the potential to improve long-term medication adherence among patients with hypertension through the integration of health literacy, family support, healthcare service quality, and patient autonomy.*

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INTRODUCTION

Hypertension is one of the main determinants in the development of cardiovascular diseases and contributes significantly to premature mortality in many countries. Globally, the number of individuals affected by hypertension has exceeded one billion, with a large proportion of cases persisting inadequately controlled due to low adherence to long-term therapy.(1)(2) Uncontrolled hypertension can increase the risk of serious complications, such as coronary heart disease, stroke, and kidney failure, making it a top priority in the control of non-communicable diseases at the global level.(3)(4) Recent WHO recommendations also emphasize that sustained medication adherence is a cornerstone of effective blood pressure control and long-term cardiovascular risk reduction, particularly in low- and middle-income countries where adherence remains suboptimal.(5)

Various studies indicate that adherence to antihypertensive therapy remains a major challenge in the management of this condition. Systematic review findings suggest that the rate of patient non-adherence to treatment is still high across many countries and constitutes one of the main factors contributing to long-term therapeutic failure.(5) Patient adherence is influenced by various multidimensional factors, including individual characteristics, the healthcare system, the type of therapy, and socioeconomic conditions.(6)

In Indonesia, hypertension continues to show an increasing prevalence and still becomes a public health problem that requires a comprehensive approach. National data indicate that this condition is commonly found among adult and elderly populations (7). Several studies have revealed that medication adherence is influenced by factors such as health literacy, family support, individual behavior,

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and access to primary healthcare services.(8)(9)(10) In a broader context, the social determinants of health including economic conditions, education level, and the social environment play an important role in shaping population health status.(11)(12) Recent evidence from Southeast Asia further demonstrates that educational attainment, income inequality, and social support remain dominant determinants of hypertension control and medication adherence across low- and middle-income countries.(13) In addition, the quality of healthcare services and the interaction between healthcare providers and patients have also been shown to contribute to improving treatment adherence.(13)

Nevertheless, most studies on adherence to antihypertensive treatment still employ epidemiological approaches and the quantitative analysis of sociodemographic factors. However these approaches have not widely integrated a health philosophy perspective, which underscores the importance of individuals' reflective awareness in making health-related decisions. Within the study of health philosophy, concepts such as patient autonomy, moral responsibility toward one's body, and the meaning of health in social life are considered important aspects of health behavior.(14) This reflective approach is believed to strengthen the relationship between values, individual awareness, and health practices within a social context.(15)(16)

Based of this persisting gap, an approach in corporating the social determinants of health and a health philosophy perspective is required to improve adherence to antihypertensive treatment. This integration is expected to produce a more comprehensive strategic model by considering social aspects, the quality of healthcare services, and individual autonomy awareness. Therefore, this study aims to develop an integrative strategic model to enhance adherence to antihypertensive treatment based on social determinants of health and health philosophy.

METHOD

This study employed a mixed-method explanatory sequential design, combining quantitative and qualitative approaches. The quantitative phase was conducted first to examine the relationships between social determinants of health, service quality, and patients' philosophical autonomy in relation to adherence to antihypertensive treatment. The quantitative findings were then further elaborated through a qualitative approach to explore patients' experiences, perceptions, and reflections on hypertension treatment in depth.

This study employed a mixed-methods explanatory sequential design and was conducted in several primary healthcare centers in Semarang, Indonesia, in 2026. The quantitative phase involved 250 hypertensive patients registered at primary healthcare facilities who were selected using purposive sampling. Eligible participants were adults aged 18 years or older, diagnosed with hypertension for at least six months, receiving antihypertensive medication, and willing to participate by providing written informed consent. However patients with severe hypertension-related complications, cognitive impairment, or communication difficulties that could interfere with data collection were excluded. Following the quantitative phase, the qualitative phase involved 20 purposively selected hypertensive patients. These specific participants were adults aged ≥18 years, had been diagnosed with hypertension for at least six months, were receiving antihypertensive treatment, were able to communicate effectively, and were willing to participate in an in-depth interview. Participants were selected to ensure variation in age, sex, educational level, health literacy, and medication adherence. Recruitment continued until data saturation was achieved, with no new themes emerging from subsequent interviews. Quantitative findings were used to develop an integrative medication adherence model containing health literacy, family support, healthcare service quality, and patient autonomy. The performance of the model was evaluated by comparing its coefficient of determination (R^2) and standardized regression coefficients (β) with those of the conventional sociodemographic model. The qualitative findings were subsequently used to explain and validate the relationships among these components and to refine the proposed model.

The dependent variable in this study was adherence to hypertension medication, measured using the Morisky Medication Adherence Scale (MMAS-8) with a score range of 0–8. Adherence was categorized as low (0–5), moderate (6–7), and high.(8) The independent variables included:

a. Health literacy, measured using the Health Literacy Questionnaire (HLQ),(19) to assess several domains including access to health information, comprehension of health information, communication with healthcare providers, appraisal of health information, and application of health knowledge in disease management.
b. Family support, measured using a family social support questionnaire for hypertensive patients, assessing four domains of support: emotional

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support, informational support, instrumental support, and appraisal support received from family members in managing hypertension treatment.

c. Perceived healthcare service quality, measured using a questionnaire based on the SERVQUAL dimensions, including tangibility, reliability, responsiveness, assurance, and empathy, with responses recorded on a five-point Likert scale.
d. Patient philosophical autonomy, measured using a questionnaire developed based on health philosophy concepts, containing domains of self-awareness, personal responsibility, autonomous decision-making, reflective health behavior, and commitment to long-term treatment adherence.

Quantitative data were collected using structured questionnaires and patients' medical records. Blood pressure status was determined using the average of two blood pressure measurements obtained from patients' medical records at the most recent follow-up visit. Blood pressure was classified according to the 2020 International Society of Hypertension (ISH) Global Hypertension Practice Guidelines as normotensive (<120/80 mmHg), controlled hypertension (<140/90 mmHg among patients receiving antihypertensive treatment), and uncontrolled hypertension (≥140/90 mmHg despite treatment). These categories were used in the descriptive and bivariate analyses. The questionnaire was evaluated for content validity using the Content Validity Index (CVI) and internal consistency using Cronbach's alpha. Following the quantitative phase, qualitative data were collected through in-depth interviews using a semi-structured interview guideline. All interviews were audio-recorded and transcribed verbatim. To ensure the trustworthiness of the qualitative findings, source triangulation, peer debriefing, and member checking were conducted throughout the analysis process.

Data were analyzed using univariate, bivariate, and multivariate approaches. Univariate analysis was performed to describe participants' characteristics and study variables. Bivariate analysis using the Chi-square test was conducted to examine the associations between family support, health literacy, perceived healthcare service quality, patient philosophical autonomy, and medication adherence. Variables demonstrating statistically significant associations ($p < 0.05$) were subsequently entered into a multiple linear regression model to identify the independent determinants of medication adherence. Qualitative data were analyzed thematically through coding, theme development, and interpretation. Finally, the quantitative and qualitative findings were integrated using an explanatory sequential mixed-methods approach to develop the proposed integrative strategic model for improving hypertension medication adherence.

The instruments used included the MMAS-8 questionnaire, Health Literacy Questionnaire, Family Social Support Questionnaire, Perceived Service Quality Questionnaire, a semi-structured interview guide, a digital audio recorder, and field notes. This study received ethical approval from the institution. All participants were provided with complete information regarding the study objectives, procedures, potential risks, and their right to withdraw at any time. Written informed consent was obtained from all participants prior to data collection.

RESULT AND DISCUSSION

Univariate analysis showed that, based on the predefined blood pressure classification criteria described in the Methods section, uncontrolled hypertension was the predominant condition among the study participants. This finding indicates that hypertension management remained suboptimal despite ongoing treatment suggesting that medication adherence and related behavioral determinants remain important targets for interventions aimed at improving blood pressure control.

Bivariate analysis demonstrated significant associations between family support, health literacy, perceived healthcare service quality, patient philosophical autonomy, and medication adherence (Table 1). Participants with low family support were significantly more likely to have poor medication adherence than those receiving good family support ($p < 0.001$). Likewise, poor medication adherence was significantly more frequent among participants with low health literacy, poor perceived healthcare service quality, and low patient philosophical autonomy (all $p < 0.001$). Variables with significant associations in the bivariate analysis were subsequently entered into the multiple linear regression model to identify the independent determinants of medication adherence.

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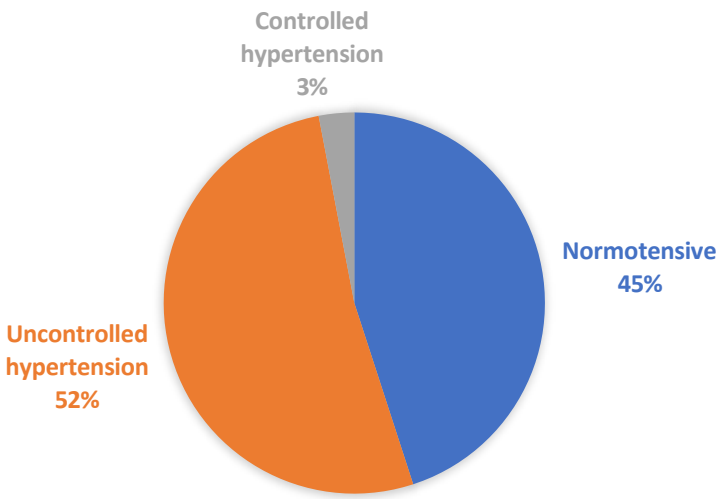


Figure 1. A distribution of blood pressure status among hypertensive patients in the study (n=250)

Table 1. Bivariate analysis of factors associated with medication adherence among hypertensive patients

Variable	Medication Adherence				Total (n)	P-value
	Poor		Good			
	n	%	n	%		
Family support						
Low	89	67.9	42	32.1	131	<0.001
Good	45	37.8	74	62.2	119	
Health literacy						
Low	81	65.3	43	34.7	124	<0.001
High	53	42.1	73	57.9	126	
Perceived healthcare service quality						
Poor	79	66.9	39	33.1	118	<0.001
Good	55	41.7	77	58.3	132	
Patient philosophical autonomy						
Low	78	65.5	41	34.5	119	<0.001
High	56	42.7	75	57.3	131	

Note: Chi-square test; $p < 0.05$ reveals statistical significance.

Table 2. The results of multiple linear regression analysis of determinant variables on adherence to hypertension treatment

Variable	Beta	P-value
Health literacy	0.410	<0.001
Family support	0.320	0.004
Service quality	0.290	0.021
Philosophical autonomy	0.270	0.031

Multivariate analysis using multiple linear regression was conducted to identify the simultaneous effects of these variables. The results denoted that health literacy had the strongest influence on adherence (Beta = 0.410; $p < 0.001$), followed by family support (Beta = 0.320; $p = 0.004$), service quality (Beta = 0.290; $p = 0.021$), and patients' philosophical autonomy (Beta = 0.270; $p = 0.031$). The integrative model combining these four variables increased the coefficient of determination to 62%, indicating that 62% of the variation in treatment adherence can be explained by the variables included in the model.

This study confirms that health literacy is the most influential determinant of adherence to hypertension treatment. Health literacy in this study was conceptualized as a multidimensional construct encompassing patients' ability to access, understand, evaluate, communicate, apply health information and in manage their condition. This finding is consistent with recent umbrella review evidence

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indicating that multifaceted interventions integrating health education, behavioral counseling, and patient empowerment produce significantly greater improvements in antihypertensive medication adherence than single-component interventions.(20) These domains collectively enable patients to comprehend medical advice, evaluate the credibility of health information, communicate effectively with healthcare providers, and make informed decisions regarding long-term antihypertensive therapy.

Therefore, interventions aimed at improving medication adherence should not be limited to providing health education alone but should also strengthen patients' skills in accessing reliable health information, communicating with healthcare professionals, critically appraising health information, and applying health knowledge in daily self-management. Such multidimensional interventions are expected to enhance patients' capacity to maintain sustained adherence to hypertension treatment. This finding demonstrates that an individual's ability to understand health information not only plays a cognitive role but also influences decision-making regarding the therapy being undertaken. Patients with good health literacy tend to have a higher ability to interpret medical information, understand the benefits of treatment, and manage their health condition independently. Similar findings have also been reported among patients with chronic diseases, where higher health literacy improves patients' capacity to interpret medical information, engage in shared decision-making, and maintain long-term treatment adherence.(23) Thus, health literacy can be considered a fundamental foundation in shaping long-term adherence behavior.(9)

In addition, family support significanly improved adherence to hypertension treatment. In this study, family support was conceptualized as a multidimensional construct comprising emotional, informational, instrumental, and appraisal support. Recent family-centered intervention studies have demonstrated that involving family members in medication monitoring and lifestyle modification significantly improves long-term adherence and blood pressure control compared with routine care alone.(24) Emotional support may strengthen patients' motivation and confidence to adhere to long-term antihypertensive therapy, while informational support helps patients better understand treatment instructions and the importance of medication adherence. Instrumental support, such as assistance with medication management, transportation to healthcare facilities, or financial support, can reduce practical barriers to treatment adherence. Appraisal support provides positive feedback and encouragement, reinforcing patients' commitment to maintaining their treatment regimen. These findings suggest that interventions to improve medication adherence should actively involve family members by strengthening these complementary forms of support, thereby creating a supportive home environment that promotes sustained adherence to hypertension treatment. This support is not only emotional in nature but also instrumental, such as reminding patients of medication schedules or accompanying them to health check-ups.(8)(10) These findings reveal that treatment adherence cannot be separated from the social context in which individuals live. The family serves as a primary support system that can strengthen patients' internal motivation to undergo therapy consistently. Therefore, family-based interventions represent a relevant strategic approach in the management of hypertension.(11)(17)

Interestingly, this study found that patient philosophical autonomy also made a significant contribution to adherence to hypertension treatment. In this study, philosophical autonomy was conceive as a multidimensional construct encompassing self-awareness, personal responsibility, autonomous decision-making, reflective health behavior, and commitment to long-term treatment adherence. These components collectively enable patients to recognize their responsibility for maintaining health, make informed and independent decisions regarding treatment, reflect on the consequences of their health behaviors, and sustain long-term commitment to antihypertensive therapy. Patients with higher philosophical autonomy are therefore more likely to be active, demonstrate self-management and consistently adhere to prescribed medication. These findings suggest that interventions to improve medication adherence should incorporate strategies that foster patients' reflective awareness, strengthen their sense of personal responsibility, support autonomous decision-making, and affirm long-term commitment to treatment as integral components of patient empowerment. This suggests that health behavior cannot be fully explained solely through rational and cognitive approaches. An individual's awareness of moral responsibility for their health becomes an important factor in shaping commitment to therapy. In other words, adherence is driven not only by an understanding of risks and benefits but also by the internal values individuals hold regarding the meaning of health in their lives.(5)(13)

These findings broaden the theoretical perspective that has long been dominated by conventional health behavior models. Approaches such as the Health Belief Model or the Theory of Planned Behavior generally accentuate aspects of perceived risk, benefits, and behavioral control.(8)(10) However, the results of this study imply that reflective and moral dimensions also play an

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equally important role. The integration of social determinants of health and a health philosophy perspective provides a more comprehensive understanding of patient adherence behavior.(11)(12)

Furthermore, the results of this study reinforce that adherence to hypertension treatment is a multidimensional phenomenon influenced by interactions among individual, social, and healthcare system factors.(14) In this study, perceived healthcare service quality was assessed using the SERVQUAL dimensions, including tangibility, reliability, responsiveness, assurance, and empathy. These dimensions collectively influence patients' experiences with healthcare services by ensuring adequate healthcare facilities, consistent and dependable service delivery, timely responses to patients' needs, professional competence and trustworthiness of healthcare providers, and empathetic communication during care. Positive experiences across these dimensions may strengthen patients' confidence in healthcare providers, facilitate continuity of care, and encourage sustained adherence to antihypertensive medication. Therefore, interventions to improve medication adherence should not only focus on patient-related factors but also emphasize continuous improvement in healthcare service quality across these dimensions. Together with health literacy, family support, and patient philosophical autonomy, these healthcare service dimensions form an integrated framework for promoting long-term adherence to hypertension treatment.(1– 4)(18) Emerging evidence also suggests that patient empowerment and autonomy function as mediating mechanisms through which social determinants influence long-term treatment adherence, supporting the importance of integrating ethical and behavioral perspectives into chronic disease management.(25)

The implications of these findings are significant for the development of health policies, particularly in primary healthcare services. Designing strategies to improve treatment adherence should focus not only on patient education but also on strengthening the role of the family, improving the quality of interactions between healthcare providers and patients, and developing approaches that encourage individuals' reflective awareness of their health. This approach enables the formation of more sustainable health behaviors, as it is based on a combination of understanding, social support, and internal awareness.(12)

Thus, this study confirms that integrating social determinants of health and a health philosophy perspective can serve as a foundation for designing more comprehensive intervention strategies. This approach not only improves treatment adherence in practical terms but also reinforces the meaning of health as part of individual and social responsibility. In the future, the development of this integrative intervention model needs to be tested in broader contexts to ensure its effectiveness and sustainability within public healthcare systems.

CONCLUSION

This study shows that an integrative strategy combining a social determinants approach with a health philosophy perspective contributes toward improve patient adherence to hypertension treatment. The findings imply that adherence is influenced not only by individual behavioral factors but also by the social context, the meaning of health in everyday life, and patients' reflective capacity for making health-related decisions. Therefore, an approach that integrates social, behavioral, and reflective dimensions provides a more comprehensive understanding in efforts to improve the success of hypertension treatment.

Based on these findings, this integrative strategy is recommended to be considered in the development of regional health policies, particularly in programs for controlling non-communicable diseases in primary healthcare services. In addition, strengthening community-based interventions and patient empowerment is necessary to enhance awareness and autonomy in maintaining health sustainably. Future research is recommended to test this integrative model in broader populations and to develop intervention approaches that can be practically implemented within public healthcare systems.

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